October 29, 2021

James Plosay
Program Manager – Program Manager
Air Permits Program
Division of Air Quality
Department of Environmental Conservation
P.O. Box 111800
Juneau, AK 99811-1800

**RE: Donlin Gold Project – Air Quality Construction Permit Application**

Dear Mr. Plosay,

Donlin Gold LLC (Donlin Gold) is hereby submitting to the Alaska Department of Environmental Conservation (ADEC) an Air Quality Construction Permit Application for the proposed Donlin Gold Project. Based on the potential emissions the project is subject to Prevention of Significant Deterioration (PSD) permitting per 18 Alaska Administrative Code (AAC) 50.306 and 40 Code of Federal Regulations (CFR) 52.21(a)(2). Pursuant to 18 AAC 50.302(a)(1), Donlin Gold is submitting this application and enclosed information to obtain a PSD Air Quality Construction Permit.

In addition to the application form, enclosed is a PSD Construction Permit Application Report which includes the following appendices: Process, Power Generation, and Ancillary Source Information; Detailed Emission Calculations; Best Available Control Technology Review; Air Quality Analysis; Fugitive Dust Control Plan, Public Easement Plan, and Vendor Data.

Please contact me should you have any questions or require additional information.

Sincerely,

Enrique Fernandez

Permitting and Environmental Manager

enclosures:

Air Quality Construction Permit Application
PSD Construction Permit Application Report, October 2021

cc:

Brittany Crutchfield, Division of Air Quality, ADEC
Aaron Simpson, Division of Air Quality, ADEC
Dan Graham, General Manager, Donlin Gold
Cathe Heroy, Project Coordinator, Alaska OPMP

Donlin Gold, 4720 Business Park Blvd., Suite G-25, Anchorage, AK 99503
Tel (907) 273-0200 Fax (907) 273-0201 www.DonlinGold.com

## Alaska Department of Environmental Conservation
# AIR QUALITY CONSTRUCTION PERMIT APPLICATION
## Project Information Form

### Section 1 Stationary Source Information

| | | | |
|---|---|---|---|
| Stationary Source Name: **Donlin Gold Project** | | | SIC: **1041** |
| Project Name (if different): | Stationary Source Contact: **Dan Graham, General Manager** | | |
| Source Physical Address: **Within T22N and 23N / R48W and T22N and 23N / R49W, Seward Meridian** | City: **Anchorage** | State: **AK** | Zip: **99503** |
| | Telephone: **907-273-0200**<br>E-Mail Address: **dgraham@donlingold.com** | | |
| UTM Coordinates (m) or Latitude/Longitude: | Northing: | Easting: | Zone: |
| | Latitude: **62.02°** | Longitude: **-158.2° (NAD 83)** | |

### Section 2 Legal Owner

| | | |
|---|---|---|
| Name: **Donlin Gold LLC** | | |
| Mailing Address: **2525 C St., Suite 400** | | |
| City: **Anchorage** | State: **AK** | Zip: **99503** |
| Telephone: **907-273-0200** | | |
| E-Mail Address: | | |

### Section 3 Operator *(if different from owner)*

| | | |
|---|---|---|
| Name: | | |
| Mailing Address: | | |
| City: | State: | Zip: |
| Telephone: | | |
| E-Mail Address: | | |

### Section 4 Designated Agent *(for service of process)*

| | | |
|---|---|---|
| Name: **Dan Graham, General Manager** | | |
| Mailing Address: **2525 C St., Suite 450** | | |
| City: **Anchorage** | State: **AK** | Zip: **99503** |
| Physical Address: **2525 C St., Suite 450** | | |
| City: **Anchorage** | State: **AK** | Zip: **99503** |
| Telephone: **907-273-0200** | | |
| E-Mail Address: **dgraham@donlingold.com** | | |

### Section 5 Billing Contact Person *(if different from owner)*

| | | |
|---|---|---|
| Name: | | |
| Mailing Address: | | |
| City: | State: | Zip: |
| Telephone: | | |
| E-Mail Address: | | |

### Section 6 Application Contact

| | | | |
|---|---|---|---|
| Name: **Enrique Fernandez, Permitting and Environmental Manager** | | | |
| Mailing Address: **2525 C St., Suite 450** | City: **Anchorage** | State: **AK** | Zip: **99503** |
| | Telephone: **907-273-0200** | | |
| | E-Mail Address: **efernandez@donlingold.com** | | |

### Section 7 Major Permit Classification(s)
*(Check all that apply)*

☒ 18 AAC 50.306
☐ 18 AAC 50.311
☐ 18 AAC 50.316

### Section 8 Minor Permit Classification(s)
*(Check all that apply)*

☐ 18 AAC 50.502(b)(1)
☐ 18 AAC 50.502(b)(2)
☐ 18 AAC 50.502(b)(3)
☐ 18 AAC 50.502(b)(4)
☐ 18 AAC 50.502(b)(5)
☐ 18 AAC 50.502(b)(6)
☐ 18 AAC 50.502(c)(2)(A)
☐ 18 AAC 50.502(c)(2)(B)
☐ 18 AAC 50.502(c)(3)
☐ 18 AAC 50.508(3)
☐ 18 AAC 50.508(5)
☐ 18 AAC 50.508(6)

## Section 9 Project Description

Provide/attach a short narrative describing the project. Discuss the purpose for conducting this project, what emission units/activities will be added/modified under this project (i.e., project scope), and the project timeline. If the project is a modification to an existing stationary source, describe how this project will affect the existing process. Include any other discussion that may assist the Department in understanding your project or processing your application. Include a schedule of construction and the desired date for permit issuance.

If this application includes an Owner Requested Limit or a request to revise an existing permit term or condition, describe the intent of the limit, and provide sample language for the limit, and for monitoring, record keeping, and reporting for showing compliance with the limit.

*Add additional pages if necessary.*

**See attached PSD Construction Permit Application Report.**

## Section 10 Certification

This certification applies to the Air Quality Control Construction Permit Application for the **Donlin Gold Project** (Stationary Source Name)

submitted to the Department on: ________.

### Type of Application

☒ Initial Application

☐ Change to Initial Application

The application is **NOT** complete unless the certification of truth, accuracy, and completeness on this form bears the **signature of a responsible official** of the firm making the application. (18 AAC 50.205)

### CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS

"Based on information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete."

| | |
|---|---|
| Signature: Eric Fernandez | Date: 10/29/2021 |
| Printed Name: Enrique Fernandez | Title: Permitting and Environmental Manager |

## Section 11 Attachments

☒ Attachments Included. List attachments:

**PSD Construction Permit Application Report**

## Section 12 Mailing Address

Submit the construction permit application to the Permit Intake Clerk in the Department's Anchorage office. Submitting to a different office will delay processing. The mailing address and phone number for the Anchorage office is:

Permit Intake Clerk
Alaska Department of Environmental
Conservation Air Permit Program
555 Cordova Street
Anchorage, Alaska 99501
(907) 269-3070

AIR SCIENCES INC.

DENVER • PORTLAND

# PSD Construction Permit Application Report

# Donlin Gold Project, Alaska

PREPARED FOR:
DONLIN GOLD LLC

PROJECT NO. 281-21B-1
OCTOBER 27, 2021

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| °F | Degrees Fahrenheit |
| µm | Micron |
| AAC | Alaska Administrative Code |
| Air Permit | Air Quality Control Construction Permit No. AQ0934CPT01 issued June 30, 2017 |
| ANFO | Ammonium Nitrate and Fuel Oil |
| BACT | Best Available Control Technology |
| CCD | Counter-Current Decantation |
| CFR | Code of Federal Regulations |
| CI | Compression Ignition |
| CIL | Carbon-in-Leach |
| CISWI | Commercial and Industrial Solid Waste Incineration |
| CO | Carbon Monoxide |
| Donlin Gold | Donlin Gold LLC |
| HAP | Hazardous Air Pollutant |
| hr | Hour |
| ICE | Internal Combustion Engine |
| kW | Kilowatt |
| lb | Pound |
| LOM | Life of Mine |
| MCF2 | Mill-Chemical-Float-Mill-Chemical-Float |
| MMBtu | Million British Thermal Units |
| MW | Megawatt |
| NESHAP | National Emission Standards for Hazardous Air Pollutants |
| NG | Natural Gas |
| $NO_X$ | Oxides of Nitrogen |
| NSPS | New Source Performance Standards |
| ORL | Owner Requested Limit |

| | |
|---|---|
| PM | Particulate Matter |
| $PM_{10}$ | Particulate Matter less than 10 Microns in Aerodynamic Diameter |
| $PM_{2.5}$ | Particulate Matter less than 2.5 Microns in Aerodynamic Diameter |
| POX | Pressure Oxidation |
| Project | Donlin Gold |
| PSD | Prevention of Significant Deterioration |
| RICE | Reciprocating Internal Combustion Engine |
| ROM | Run-of-Mine |
| SAG | Semi-Autogenous Grinding |
| $SO_2$ | Sulfur Dioxide |
| SSI | Sewage Sludge Incineration |
| ton | Short Ton |
| ULSD | Ultra-Low-Sulfur Diesel |
| VOC | Volatile Organic Compound |
| yr | Year |

# 1.0 INTRODUCTION

Donlin Gold LLC (Donlin Gold) is proposing to construct and operate the Donlin Gold mine: a hard rock, open-pit, gold mine (Project). The Project is located in southwest Alaska, approximately 280 miles west of Anchorage. Donlin Gold is an Alaskan operated company that is owned by Barrick Gold U.S. Inc., a subsidiary of Barrick Gold Corporation, and NovaGold Resources Alaska Inc., a subsidiary of NovaGold Resources, Inc.

With regards to air pollutant emissions presented in Section 2.2, the Project is a major stationary source subject to the Prevention of Significant Deterioration (PSD) regulations of 40 Code of Federal Regulations (CFR) 52.21, adopted by reference in 18 Alaska Administrative Code (AAC) 50.040(h). As such, the Project is subject to the PSD permitting per 18 AAC 50.302(a)(1) and 50.306.

The Alaska Department of Environmental Conservation (ADEC) issued Air Quality Control Construction Permit No. AQ0934CPT01 for the Project on June 30, 2017 (Air Permit). Because the Project has not yet commenced construction, ADEC has request that a new PSD application be submitted. The information provided in this application validates and remains consistent with the terms and conditions currently established in the Air Permit.

This following PSD Construction Permit Application Report provides a description of the Project, a location map, process flow diagrams, a potential emissions summary, an Owner Requested Limit (ORL), and a regulatory applicability analysis. Additional information is provided in the following appendices at the end of this report:

- Appendix A – Process, Power Generation, and Ancillary Source Information
- Appendix B – Detailed Emission Calculations
- Appendix C – Best Available Control Technology Review
- Appendix D – Air Quality Analysis
- Appendix E – Fugitive Dust Control Plan
- Appendix F – Vendor Data

# 2.0 PROJECT DESCRIPTION

The Donlin Gold deposit is located on the western slopes of the Kuskokwim Mountains in the Yukon–Kuskokwim region of southwestern Alaska, a remote area with no existing road or rail access or other public infrastructure. Beyond mining and processing operations, the Project will require the construction of significant infrastructure, including a natural gas (NG) pipeline, power generation facilities, an onsite employee accommodation complex, an access road, ports, shipping and barging infrastructure, and an airstrip. The 28-mile-long access road will be required to transport cargo and supplies from the Jungjuk port[1] to the mine site. The Project location is presented in Figure 2-1.

The Project will have an operating mine life of 27 years. Conventional open-pit methods will be used to extract ore and waste rock, including drilling, blasting, excavating, and hauling. Hydraulic shovels and front-end loaders will be used to load ore and waste material into haul trucks. Waste rock will be hauled to the waste rock facility (some waste rock will be backfilled to the pit later in the mine life). Ore will be hauled to the primary crusher, where it will be directly fed to the crusher dump pocket or stockpiled; or it will be hauled to a long-term ore stockpile for later transfer to the primary crusher. The gold will be recovered through conventional ore crushing and milling, followed by flotation, pressure oxidation (POX), and carbon-in-leach (CIL) circuits. The process plant will be rated at a nominal production rate of 59,000 short tons (ton) of ore per day.

Donlin Gold anticipates the following schedule for permitting and construction:

- November 2021 – Submit application.
- June 2023 – Receive air quality control construction permit.
- Commence construction within 18 months[2] after construction permit issuance.

[1] The Jungjuk port will include power generators and emergency and ancillary equipment. A separate construction permit application will be submitted for the sources at the Jungjuk port.

[2] Commencing construction more than 18 months after permit issuance would require approval from the Alaska Department of Environmental Conservation.

**Figure 2-1. Project Location**

## 2.1 Process Description and Emission Sources

The Donlin Gold deposit has been divided into two main deposit areas, ACMA and Lewis, which will ultimately be mined in a single open-pit. These areas have similar mineralization characteristics, with ore-grade gold hosted in both intrusive and sedimentary rock units. The mine and process operations will operate on a continuous, 24-hour-per-day basis. A process flow diagram showing the ore process emission sources and controls is provided in Figure 2-2, and the power generation and ancillary sources are shown in Figure 2-3. All the process, power generation, and ancillary sources and controls are labeled by source identification codes (also referenced in this report) on each process flow diagram. A summary of all sources and control identification codes is provided in Appendix A.

# Figure 2-2. Process Flow Diagram – Process Sources

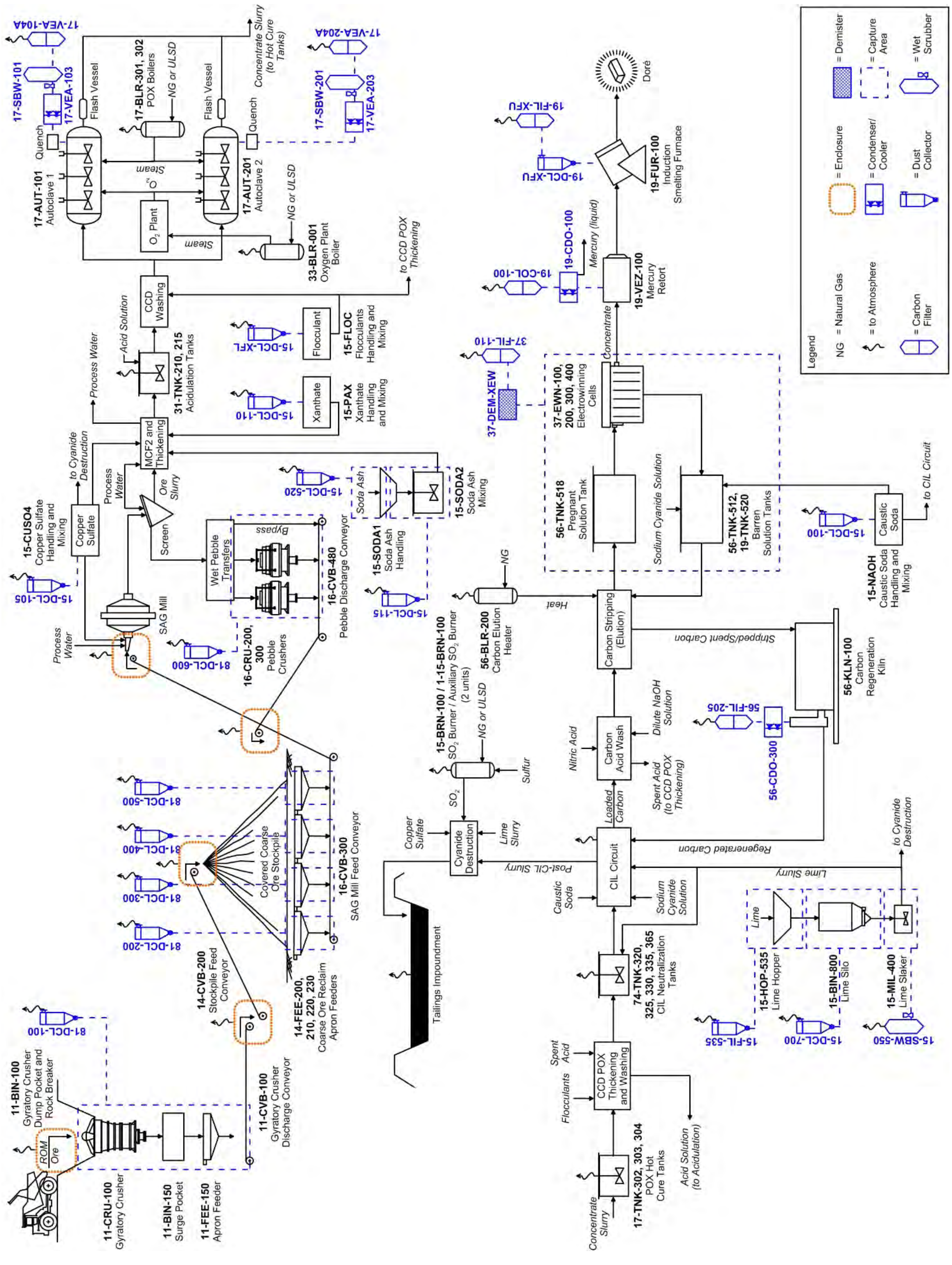
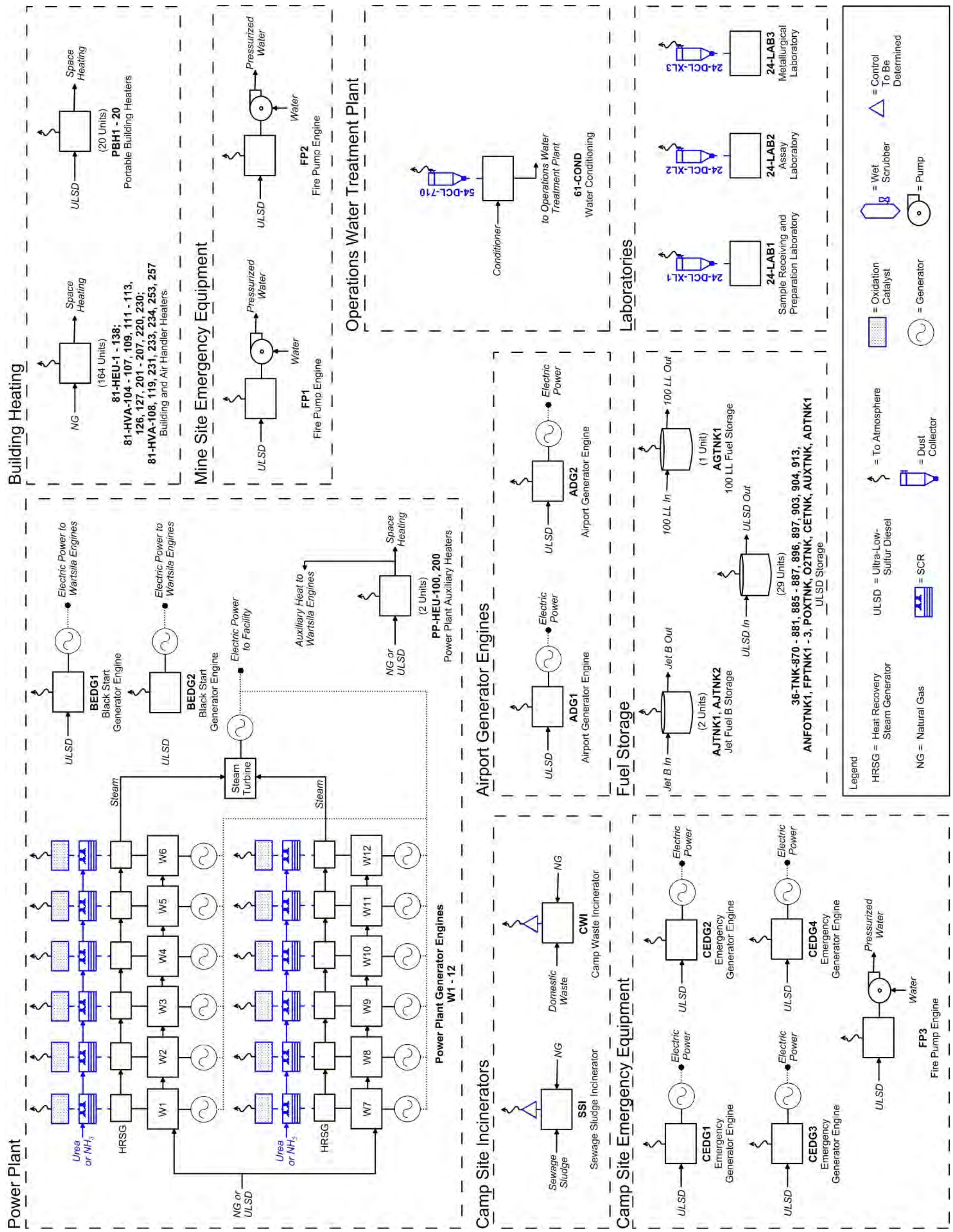


**Figure 2-3. Process Flow Diagram – Power Generation and Ancillary Sources**



### 2.1.1 Open-Pit Mining

The initial step of the mining process will include surveying and drilling of blast holes. Each hole will be loaded with an ammonium nitrate and fuel oil (ANFO)-based explosive emulsion. Once a pattern is blasted, a surveying crew will demark the ore and waste boundaries.

The ore and waste will be loaded by front-end loaders and hydraulic shovels into 400-ton payload capacity end-dump haul trucks. A 95-foot-wide, two-way haul road will be built between the pit phases and the ore and waste destinations. Waste rock will be hauled to the waste rock facility. Ore will be hauled to the gyratory crusher (11-CRU-100), where it will be directly fed to the gyratory crusher dump pocket (with a rock breaker) (11-BIN-100) or stockpiled; or it will be hauled to a long-term ore stockpile for later transfer to the gyratory crusher (11-CRU-100).

Pollutant emissions from open-pit mining will consist of fugitive dust from drilling, blasting, hauling, loading, and unloading activities; fugitive dust from wind erosion from the various ore and waste stockpiles and exposed surfaces; and products of combustion from explosive detonation and equipment tailpipes. Fugitive dust will be minimized by employing dust control measures and best practical methods, detailed in the Fugitive Dust Control Plan provided in Appendix E.

### 2.1.2 Ore Crushing and Grinding, and Flotation

Haul trucks will unload run-of-mine (ROM) ore from the open-pits into the gyratory crusher dump pocket (with a rock breaker) (11-BIN-100). Emissions from the gyratory crusher dump pocket are controlled by an enclosure. ROM ore will be crushed in the gyratory crusher (11-CRU-100) at a maximum rate of 5,100 tons per hour (ton/hr) (122,400 tons per day [ton/day]). The gyratory crusher circuit will be located south of the open-pits and housed in a concrete building equipped with a dust collector (81-DCL-100) to control dust emissions from crushing and associated ore handling. The crushed ore will discharge onto the gyratory crusher discharge conveyor (11-CVB-100) via the surge pocket (11-BIN-150) and the apron feeder (11-FEE-150), located underneath the crusher. The crushed ore will be transferred onto the stockpile feed conveyor (14-CVB-200) and finally discharged onto a covered coarse ore stockpile.

A coarse ore reclaim tunnel and reclaim feeder chamber with four coarse ore reclaim apron feeders (14-FEE-200, 210, 220, 230) will be installed underneath the coarse ore stockpile to transfer the coarse ore to a semi-autogenous grinding (SAG) mill via the SAG mill feed conveyor (16-CVB-300). The coarse ore reclaim and discharge system will be equipped with multiple dust collectors (81-DCL-200, 300, 400, 500) to control dust emissions.

The overall grinding configuration will consist of an open-circuit SAG mill followed by the "mill-chemical-float-mill-chemical-float" (MCF2) circuit. The SAG mill will be designed to operate at a maximum rate of 3,303 ton/hr. Process water (primarily overflow from the MCF2 circuit) will be added to the SAG mill feed to provide correct dilution for grinding. Copper sulfate will also be added to the SAG mill feed to activate sulfide mineralization. The SAG mill discharge will be screened, and oversized pebbles (larger than 0.5-inch material) will be conveyed to the two large cone pebble crushers (16-CRU-200, 300). Crushed pebbles will be returned to the SAG mill feed conveyor (16-CVB-300) via the pebble discharge conveyor (16-CVB-480). The pebble handling and crushing circuit will be equipped with a dust collector (81-DCL-600) for dust control. All conveyor transfer points (11-CVB-100, 14-CVB-200, 16-CVB-300, 16-CVB-480) will be enclosed to control dust emissions. The MCF2 circuit following the SAG mill will consist of a primary ball mill and primary rougher flotation followed by a secondary ball mill, secondary rougher flotation, and thickening.

Several reagents, such as acidic solution from the POX counter-current decantation (CCD) washing circuit, lime, copper sulfate, potassium amyl xanthate, soda ash, caustic soda, flocculants, dispersants, and frothers, will be added during different processing stages to condition the concentrate slurry. Sources of emissions from reagent handling and mixing include the following:

- Lime hopper (15-HOP-535) controlled by a dust collector (15-FIL-535)
- Lime silo (15-BIN-800) controlled by a dust collector (15-DCL-700)
- Lime slaker (15-MIL-400) controlled by a wet scrubber (15-SBW-550)
- Flocculants handling and mixing (15-FLOC) controlled by a dust collector (15-DCL-XFL)
- Caustic soda handling and mixing (15-NAOH) controlled by a dust collector (15-DCL-100)
- Copper sulfate handling and mixing (15-CUSO4) controlled by a dust collector (15-DCL-105)
- Xanthate handling and mixing (15-PAX) controlled by a dust collector (15-DCL-110)
- Soda ash handling (15-SODA1) controlled by a dust collector (15-DCL-520)
- Soda ash mixing (15-SODA2) controlled by a dust collector (15-DCL-115)

### 2.1.3 Acidulation and CCD Washing

The thickener concentrate slurry will proceed to an acidulation circuit (31-TNK-210, 215). Acidic solution recovered from the POX CCD washing circuit will be added to the concentrate slurry to reduce its carbonate gangue component. The acidulated concentrate slurry will be washed in a three-thickener CCD circuit to remove chlorides and pumped to the POX circuit.

### 2.1.4 Autoclaving

Concentrate POX is carried out within the autoclave circuit. This circuit includes two autoclaves (17-AUT-101, 201) operating in parallel. POX refers to the oxidation of gold-bearing sulfide minerals to metal sulfates using a combination of heat, acid, and oxygen sparging in a specifically designed pressure vessel (i.e., autoclave). The oxidation of the sulfide minerals effectively releases the gold locked within the mineral matrix, rendering it amenable to leaching by cyanidation. High-pressure steam will be supplied to this process when needed by the two dual-fuel (NG and ultra-low-sulfur diesel [ULSD]) POX boilers (17-BLR-301, 302). High-pressure steam is not required for normal operation, but it is required for autoclave heat-up.

Each autoclave will have a design processing rate of 210 ton/hr of ore concentrate. The autoclave feed slurry will be pre-heated before entering the autoclaves. An onsite air separation plant consisting of the dual-fuel (NG and ULSD) oxygen plant boiler (33-BLR-001) will provide high pressure oxygen gas for the POX reaction. The autoclaves will discharge into flash vessels to depressurize the autoclaved concentrate slurry, which will then be transferred to three POX hot cure tanks (17-TNK-302, 303, 304).

Exhaust gas from each autoclave will discharge into a vent gas quench vessel. The quench vessel will reduce the temperature of the exhaust gas and the quantity of steam (through condensation) that will be fed to downstream exhaust treatment equipment. Vent gas from the quench vessel will be piped to a condenser vessel (17-VEA-103, 203), where cooling water will accomplish further gas cooling and steam condensation. The gas will then pass through a venturi scrubber (17-SBW-101, 201), where it will be further cleaned of particulates. Finally, the gas will pass through a two-chamber carbon filter (17-VEA-104A, 204A). The first chamber will contain activated carbon to remove organic compounds followed by sulfur-impregnated carbon in the second chamber, specifically designed to adsorb mercury.

### 2.1.5 CCD POX Thickening and Washing, and CIL Neutralization

Concentrate slurry flow from the POX circuit will be washed in a four-thickener CCD circuit. Reclaim water will be added to the last thickener in a flow direction counter to the solids to decrease the acidity of the pulp. Washed concentrate slurry in the underflow from the final thickener will be pumped to the CIL solids neutralization circuit, and the overflow will be clarified and used within the plant to provide acidification to the acidulation circuit (31-TNK-210, 215).

The CIL neutralization circuit will consist of mechanically agitated tanks (74-TNK-320, 325, 330, 335, 365), where lime slurry will be added to the concentrate slurry in the presence of oxygen to bring the pH to approximately 9 before it is pumped to the CIL circuit.

## 2.1.6 CIL Circuit

The CIL circuit will consist of six CIL tanks, each retaining the concentrate slurry for four hours. Sodium cyanide solution will be pumped to the CIL circuit for cyanide leaching of gold. Lime slurry and caustic soda will be added to maintain a pH of approximately 10.5.

## 2.1.7 Cyanide Destruction System

The cyanide destruction system will consist of an agitated tank where compressed air and gaseous sulfur dioxide ($SO_2$) generated in the NG-fired $SO_2$ burner (15-BRN-100) will be added to the post-CIL concentrate slurry to oxidize (destruct) the residual cyanide. Copper sulfate solution will be added to maintain the reaction kinetics, and lime slurry will be used to maintain the pH level.

## 2.1.8 Carbon Acid Washing, Elution, and Reactivation

The loaded carbon from the CIL circuit will be washed with a 3 percent nitric acid solution, neutralized with a caustic solution in two acid wash vessels, and then pumped to two similar-sized strip vessels. Barren solution composed of 1 percent sodium hydroxide and 1 percent sodium cyanide will be pumped through the bottom of the strip vessels to strip the gold adsorbed on the carbon. The dual-fuel (NG and ULSD) carbon elution heater (56-BLR-200) will provide hot glycol solution for heat exchange in this process. The pregnant solution (containing stripped gold) will exit the vessels, pass through a heat exchanger, and go to the pregnant solution tank (56-TNK-518). The stripped carbon will be washed and sent to the carbon regeneration kiln (56-KLN-100, electrically heated) for reuse in the CIL circuit. The exhaust gas from the carbon regeneration kiln will pass through an off-gas cooler (56-CDO-300) and a carbon filter (56-FIL-205) before exiting to the atmosphere.

## 2.1.9 Electrowinning and Refining

The pregnant solution will be pumped through two parallel trains of electrowinning cells (37-EWN-100, 200, 300, 400) at a nominal flow rate of 211 gallons per minute. Once precious metals are removed in the electrowinning cells, the solution will return to the barren solution tanks (56-TNK-512, 19-TNK-520) for recirculation through the strip vessels. The electrowinning circuit (which includes the pregnant and barren tanks) exhaust controls will include a demister (37-DEM-XEW) followed by a carbon filter (37-FIL-110). The precious-metal-bearing sludge recovered in the electrowinning process will be washed, press-filtered, and loaded into the mercury retort (19-VEZ-100), where it will be electrically heated to a temperature of approximately 1,200°F for 12 hours to remove mercury. The exhaust controls on the mercury retort will consist of a condenser (19-CDO-100) and a carbon filter (19-COL-100).

After retorting, the sludge will be mixed with smelting fluxes and charged to the induction smelting furnace (19-FUR-100). Doré bars will be poured from the smelting furnace and shipped offsite for further refining. The induction smelting furnace will be equipped with a dust collector (19-DCL-XFU) and a carbon filter (19-FIL-XFU) for emissions control.

### 2.1.10 Power Generation

Electric power for the mine will be generated from a dual-fuel (NG and ULSD) reciprocating-engine onsite power plant with a steam turbine utilizing waste heat recovered from the engines (combined cycle power plant). The combined cycle power plant will consist of 12 Wärtsilä Model 18V50DF engines (W1 to W12), each rated at approximately 17 megawatts (MW), for a total of 205 MW (gross) from the engines and an additional 15 MW (gross) from the steam turbine. The total gross power output from the plant will be 220 MW. Each Wärtsilä engine will be equipped with selective catalytic reduction and oxidation catalysts to control combustion emissions. Initially, 10 engines will be installed with a provision to install 2 additional engines at a later stage for N+2 redundancy, thus allowing uninterrupted operation during planned maintenance and outages.

These engines will be supported by two black start ULSD-fired generators (BEDG1, 2), each rated at approximately 600 kilowatts (kW), to restore the power plant operations in the event of a plant shutdown.

Two dedicated ULSD-fired generators (ADG1, 2), rated at approximately 200 kW each, will be used to power the airstrip and associated operations.

### 2.1.11 Emergency Equipment

Four ULSD-fired emergency generators (CEDG1 to 4), rated at approximately 1,500 kW each, will be used to provide power to the camp site during emergency situations. Three ULSD-fired fire pumps (FP1 to 3), rated at approximately 252 horsepower each, will be installed at strategic locations within the facility for safety and emergency situations.

### 2.1.12 Ancillary Sources

The Project will also include the following ancillary sources:

- An auxiliary ULSD-fired $SO_2$ burner (1-15-BRN-100) will be installed as a backup for the primary NG-fired $SO_2$ burner (15-BRN-100).
- Two dual-fuel (NG and ULSD) heaters (PP-HEU-100, 200) to provide auxiliary heat to power plant engines and space heating.
- Building space heating (81-HEU-1 to 138; 81-HVA-104 to 107, 109, 111 to 113, 126, 127, 201 to 207, 220, 230; 81-HVA-108, 119, 231, 233, 234, 253, 257) will be provided by NG-fired heaters. ULSD-fired portable building heaters (PBH1 to 20) will also be used to provide on-demand heating and backup heat in the event of an NG pipeline shutdown.

- A water conditioning system (61-COND) equipped with a dust collector (54-DCL-710) will be used at the operations water treatment plant.

- A camp waste incinerator (CWI) and a sewage sludge incinerator (SSI) will be utilized for disposal of the waste generated at the camp and mine sites. Both of the incinerators will be equipped with appropriate emission control equipment to meet the applicable regulatory emission standards.

- The mine site will also include a sample preparation laboratory (24-LAB1), an assay analysis laboratory (24-LAB2), and a metallurgical analysis laboratory (24-LAB3) to perform sampling and analysis activities. Each laboratory will be equipped with a dust collector (24-DCL-XL1, XL2, XL3).

- A number of fuel storage tanks (36-TNK-870 to 881, 885 to 887, 896, 897, 903, 904, 913, ANFOTNK1, FPTNK1 to 3, ADTNK1, AGTNK1, AJTNK1 to 2) will be used at various locations throughout the project site. All tanks will be submerged fill to control volatile organic compound (VOC) emissions.

## 2.2 Pollutants and Emissions

This section describes the maximum potential emissions from the operation and construction phases of the Project.

## 2.2.1 Operations Emissions

In addition to dust emissions (particulate matter [PM], particulate matter less than 2.5 micrometers [µm] in aerodynamic diameter [$PM_{2.5}$] and less than 10 µm in aerodynamic diameter [$PM_{10}$]) from mining activities (drilling, blasting, material handling, and hauling) and ore preparation activities (crushing, milling, and conveyance), the Project will also generate combustion emissions ($PM_{2.5}$, $PM_{10}$, carbon monoxide [CO], oxides of nitrogen [$NO_X$], $SO_2$, and VOC) from blasting, primary and backup power generation, process and ancillary equipment, and mobile machinery tailpipes. The maximum potential Project total annual emissions in tons per year (ton/yr) are provided in Table 2-1.

**Table 2-1. Project Maximum Potential Emissions Summary (ton/yr)**

| Source Category | CO | $NO_X$ | $PM_{2.5}$ | $PM_{10}$ | PM | $SO_2$ | VOC |
|---|---|---|---|---|---|---|---|
| Point Sources | 1,256 | 1,225 | 639 | 656 | 688 | 23 | 1,168 |
| Fugitive Sources | 1,925 | 54 | 169 | 1,350 | 4,775 | 0.18 | 0.18 |
| Mobile Machinery | 2,046 | 1,979 | 23 | 22 | 22 | 3.9 | 111 |
| Project Total | 5,227 | 3,258 | 831 | 2,028 | 5,485 | 27 | 1,279 |
| LOM Year | 19 | 19 | 16 | 20 | 20 | 19 | 19 |

The emissions provided in Table 2-1 are based on the maximum design rates for the process and ancillary sources (ore processing, power generation, and ancillary equipment), including emissions based on all 12 Wärtsilä engines operating continuously on ULSD. In the case of dual-fuel boilers, the higher emissions for each pollutant associated with either fuel are provided in this table. The mining activity (fugitive sources) and mobile machinery total emissions represent the maximum annual emissions over the Project life. As shown in Table 2-1, the total maximum emissions occur during life of mine (LOM) year 16 for $PM_{2.5}$; LOM year 19 for CO, $NO_X$, $SO_2$, and VOC; and LOM year 20 for $PM_{10}$ and PM.

Process, power generation, and ancillary source specifications, annual potential emissions, and exhaust parameters are presented in Appendix A. The source parameters listed in Appendix A are release-point-specific.

In addition to the criteria pollutant emissions discussed in this section, Hazardous Air Pollutants (HAP) will be emitted from the Project. The estimated potential HAP emissions from the Project are less than 10 ton/yr of a single HAP or 25 ton/yr of combined HAPs. Therefore, the Project will be classified as an area (or minor) source for HAPs. Detailed emission calculations, including HAPs, are provided in Appendix B.

### 2.2.2 Construction Emissions

Construction of the Project is expected to occur over a three-to-four-year period. The total construction emissions during this period are summarized in Table 2-2.

**Table 2-2. Project Construction Emissions Summary (ton)**

| Source Category | CO | $NO_X$ | $PM_{2.5}$ | $PM_{10}$ | PM | $SO_2$ | VOC |
|---|---|---|---|---|---|---|---|
| Fugitive Sources | 152 | 4 | 105 | 749 | 3,011 | 0 | 0 |
| Mobile Machinery | 2,055 | 861 | 16 | 16 | 16 | 4 | 152 |
| Project Total | 2,207 | 865 | 121 | 765 | 3,027 | 4 | 152 |

As shown in Table 2-2, the total construction emissions are significantly less than the annual emissions during operation shown in Table 2-1.

# 3.0 OWNER REQUESTED LIMIT

Donlin Gold intends to limit formaldehyde emissions from the 12 Wärtsilä engines (EU IDs 1 through 12) at the power plant to less than 10 ton/yr to avoid being classified as a HAP major source. To accomplish this, Donlin Gold is requesting an ORL per 18 AAC 50.225 for formaldehyde across all 12 Wärtsilä engines. Donlin Gold proposes that the formaldehyde emissions from all 12 Wärtsilä engines combined be limited to 9.7 ton/yr on a 12-month rolling basis. Compliance with the annual limit will be achieved by the following requirements taken from Condition 46 of the current Air Permit:

46. The Permittee shall limit the total formaldehyde from EU IDs 1 through 12 to no more than 9.7 tons per 12-month rolling period. To show compliance with the formaldehyde limit the Permittee shall:

    46.1 Operate and maintain, according to the manufacturer's recommendation, an oxidation catalyst control for EU IDs 1 through 12 for removing formaldehyde to less than or equal to 0.184 lb/hr per engine.

    a. The Permittee shall submit to the Department vendor verification of the 0.184 lb/hr per engine formaldehyde emission rate at least 60 days before initial startup of any of EU IDs 1 through 12.

    b. The Permittee shall conduct an initial formaldehyde source test on any three of EU IDs 1 through 12, within 365 days of any of EU IDs 1 through 12 becoming fully operational on natural gas as outlined in Conditions 46.1b(i) through 46.1b(vi).

    (i) Conduct each source test while firing natural gas.

    (ii) Conduct each source test downstream of each oxidation catalyst.

    (iii) Use the applicable test method set out in 40 C.F.R. 60, Appendix A. The Permittee shall source test downstream of the oxidation catalyst.

    (iv) Each source test shall consist of at least three 1-hour or longer valid test runs. Emission results shall be reported as the arithmetic average of all valid test runs and shall be in terms of pounds per hour.

    (v) During each test run, the inlet temperature and pressure drop across each of the oxidation catalyst units shall be measured.

(vi) The Permittee shall report the results of the source test(s) to the Department within 60 calendar days after completing the test(s).

c. Conduct a source test for formaldehyde on a replacement engine that is not an identical make/model for the engine being replaced for any of EU IDs 1 through 12 according to Conditions 46.1b(i) through 46.1b(vi) and within 120 days of initial startup of a replacement engine.

d. Conduct a source test for formaldehyde on a replacement oxidation catalyst unit that is not an identical make/model for the oxidation catalyst being replaced for any of EU IDs 1 through 12 according to Conditions 46.1b(i) through 46.1b(vi) an within 120 days of the oxidation catalyst unit replacement.

e. In the source test report required by Condition 46.1b(vi) compare the annual formaldehyde emissions assuming continuous operation of EU IDs 1 through 12 to the maximum 9.7 tons per year specified in Condition 46. If the annual formaldehyde emissions are greater than 9.7 tons per year report as excess emissions and permit deviations under Condition 52.[3]

46.2 Monitor the oxidation catalyst operating parameters as follows:

a. Install temperature sensing devices to monitor the inlet temperature of each installed oxidation catalyst unit.

(i) Monitor engine exhaust temperature at the inlet to each oxidation catalyst unit at least once per hour during all periods of operation. Record for each calendar day the minimum and maximum inlet gas temperature of each oxidation catalyst unit. Data capture and recording may be electronic.

(ii) Report the minimum and maximum daily inlet gas temperature of each oxidation catalyst unit for each calendar month in the operating report required by Condition 53.[4]

(iii) Report in accordance with Condition 52, whenever the inlet gas temperature of an oxidation catalyst unit is outside the acceptable range

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[3] Condition 52 of the Air Permit is: Excess Emissions and Permit Deviation Reports.

[4] Condition 53 of the Air Permit is: Operating Reports. The Permittee shall submit to the Department an operating report by August 1 for the period January 1 through June 30 of the current year and by February 1 for the period July 1 through December 31 of the previous year.

identified in the manufacturer's specifications. The report should include any corrective actions taken.

b. Install gauges before and after the oxidation catalyst controls to monitor the pressure drop across each installed oxidation catalyst unit.

(i) Maintain the oxidation catalyst controls such that the pressure drop across each oxidation unit is within the acceptable range identified in the manufacturer's specifications.

(ii) If the pressure drop exceeds the acceptable differential identified in the manufacturer's specifications, the oxidation catalyst unit shall be inspected, cleaned, or replaced, as necessary.

(iii) Report in accordance with Condition 52, whenever the pressure drop across an oxidation catalyst unit is outside the acceptable range identified in the manufacturer's specifications. The report should include any corrective actions taken.

# 4.0 REGULATORY APPLICABILITY ANALYSIS

This section presents the federal and Alaska regulatory applicability determination analysis for the Project sources.

## 4.1 Applicable Regulations

### 4.1.1 Prevention of Significant Deterioration Construction Permit

A comparison of the Project stationary source emissions with the applicable PSD major source thresholds is provided in Table 4-1 (fugitive and mobile machinery emissions are not included for a PSD major source determination per 40 CFR 52.21(b)(1)(iii)).

**Table 4-1. Project Potential Emissions and PSD Major Source Thresholds (ton/yr)**

| Parameter | CO | $NO_X$ | $PM_{2.5}$ | $PM_{10}$ | PM | $SO_2$ | VOC |
|---|---|---|---|---|---|---|---|
| Process and Ancillary Source Emissions | 1,256 | 1,225 | 639 | 656 | 688 | 23 | 1,168 |
| PSD Major Source Threshold | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| PSD Review Triggered | Yes | Yes | Yes | Yes | Yes | No | Yes |

This table shows that the Project has the potential to emit 250 ton/yr or more of a regulated New Source Review pollutant; therefore, it is subject to PSD permitting requirements pursuant to the 18 AAC 50.302(a)(1), 50.306, and 40 CFR 52.21(a)(2)(iii). This PSD Construction Permit Application Report is submitted with the intent to obtain a PSD construction permit in order to comply with the applicable PSD permitting requirements.

### 4.1.2 Best Available Control Technology Review

The Project is classified as a PSD major source; therefore, it is subject to the Best Available Control Technology (BACT) review under 40 CFR 52.21(j)(2) for each regulated pollutant (including greenhouse gases) with the potential to emit greater than the applicable PSD major source or significant emission thresholds. A detailed source specific BACT analysis is provided in Appendix C.

### 4.1.3 Ambient Air Quality Analysis

As a part of a PSD construction permit application, Donlin Gold is required to conduct an air quality analysis per 40 CFR 51.21(m). An air quality analysis report showing the Project compliance with the applicable ambient standards and increments is provided in Appendix D.

### 4.1.4 Mandatory Greenhouse Gas Reporting

The Project is subject to the mandatory greenhouse gas reporting requirement of 40 CFR 98 because it meets the requirements listed in §98.2(a)(3).

All applicable recordkeeping and reporting requirements will be met according to the requirements of this regulation.

### 4.1.5 National Emission Standards for Hazardous Air Pollutants

The HAP emission calculations for the Project are provided in Appendix B. Based on these calculations and the ORL (addressed in Section 3.0), the Project is classified as an area source for HAP emissions. The National Emission Standards for Hazardous Air Pollutants (NESHAP) from 40 CFR 63 applicable to the Project are outlined in the following sections.

#### 4.1.5.1 Subpart ZZZZ – NESHAP for Stationary Reciprocating Internal Combustion Engines

40 CFR 63, Subpart ZZZZ, applies to all stationary reciprocating internal combustion engines (RICE) operated at an area source of HAP emissions. For new (constructed after June 12, 2006, per §63.6590(a)(2)(iii)) stationary RICE operated at an area source of HAP emissions, the compliance requirements of 40 CFR 63, Subpart ZZZZ, are met by complying with the requirements of 40 CFR 60, Subparts IIII and/or JJJJ.

All stationary RICE located at the Project will be classified as new sources per this subpart and, therefore, will be subject to the compliance requirements of 40 CFR 60, Subparts IIII and/or JJJJ per §63.6590(c)(1).

#### 4.1.5.2 Subpart EEEEEEE – NESHAP: Gold Mine Ore Processing and Production Area Source Category

40 CFR 63, Subpart EEEEEEE, applies to gold mine ore processing and production facilities at an area source of HAP emissions, as defined under §63.11651. According to §63.11651, the following emission sources at the Project are subject to this subpart:

- Autoclaves
- Carbon regeneration kiln
- Electrowinning circuit – Electrowinning cells and pregnant solution tanks
- Mercury retort
- Induction smelting furnace

Per §63.11645(e), the proposed autoclaves are subject to the mercury emission standard of less than or equal to 84 pounds per million tons of ore processed. The remaining sources are subject to the mercury emission standard of less than or equal to 0.8 lb/ton of concentrate processed, per §63.11645(f).

All applicable compliance, monitoring, recordkeeping, testing, and reporting requirements will be met according to the requirements of this subpart.

### 4.1.6 New Source Performance Standards

The New Source Performance Standards (NSPS) from 40 CFR 60 applicable to the Project are outlined in the following sections.

#### 4.1.6.1 Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

40 CFR 60, Subpart Dc, applies to each steam generating unit constructed after June 9, 1989, with a maximum heat input capacity of greater than 10 MMBtu/hr and less than 100 MMBtu/hr, per §60.40c(a).

The oxygen plant boiler, carbon elution heater, and two power plant auxiliary heaters meet the applicability requirements of this subpart. These sources are required to meet the following emission standards per §60.42c(d):

1. $SO_2$ limit of no more than 0.5 lb/MMBtu; or
2. Sulfur limit of no more than 0.5 percent weight

These units are rated at less than 30 MMBtu/hr each; therefore, they are not subject to the PM and opacity limits of §60.43c.

The two proposed POX boilers are classified as "process heaters"[5] per §60.41c; therefore, they are not subject to this subpart. The air handler heaters are also not subject to NSPS Dc because they do not heat "any heat transfer medium" (§60.41c) across a physical barrier (i.e., heat exchanger).

All applicable compliance, monitoring, recordkeeping, testing, and reporting requirements will be met according to the requirements of this subpart.

#### 4.1.6.2 Subpart LL – Standards of Performance for Metallic Mineral Processing Plants

40 CFR 60, Subpart LL, applies to metallic mineral processing plants that use the specified processing equipment listed in §60.380.

The following are the proposed ore processing sources at the Project with emissions vented through stacks, and that are subject to the requirements of 40 CFR 60, Subpart LL:

- Gyratory crushing circuit

[5] "Process heater means a device that is primarily used to heat a material to initiate or promote a chemical reaction in which the material participates as a reactant or catalyst." [40 CFR 60.41c] In this case, the POX boilers produce steam (i.e., "heat a material"), which is injected directly into the autoclaves along with oxygen, to promote the oxidation reaction.

- Coarse ore reclaim apron feeders
- Pebble crushers

These sources are required to meet the following emission standards per §60.382(a)(1) and (2):

1. PM limit of no more than 0.05 grams per dry standard cubic meter
2. Opacity limit of no more than 7 percent

The dust emissions from the proposed gyratory crusher dump pocket and conveyor transfer points at the Project will be fugitive (i.e., not vented through stacks) and are only subject to the opacity standard of no more than 10 percent, per §60.382(b).

All applicable compliance, monitoring, recordkeeping, testing, and reporting requirements will be met according to the requirements of this subpart.

#### 4.1.6.3 Subpart CCCC – Standards of Performance for Commercial and Industrial Solid Waste Incineration Units

40 CFR 60, Subpart CCCC, applies to new commercial and industrial solid waste incineration (CISWI) units that meet the definition of CISWI in §60.2265, and that commence construction after June 4, 2010, and that are not exempt under §60.2020.

The camp waste incinerator proposed at the Project will combust less than 12 tons of waste per day (but potentially more than 3 tons per day) and will comply with the applicability requirements of this subpart.

The emission standards for incinerators listed in Table 5 of this subpart apply to this source. Appropriate control equipment will be selected as needed to comply with this subpart.

All applicable emission standards, compliance, monitoring, recordkeeping, testing, and reporting requirements will be met according to the requirements of this subpart.

#### 4.1.6.4 Subpart LLLL – Standards of Performance for New Sewage Sludge Incineration Units

40 CFR 60, Subpart LLLL, applies to new sewage sludge incineration (SSI) units that meet the definition of an SSI unit in §60.4930, and that commence construction after October 14, 2010, and that are not exempt under §60.4780.

The SSI unit proposed at the Project will combust approximately 0.058 tons of sewage sludge per day and meets the applicability requirements of this subpart.

The emission standards for new multiple hearth SSI units listed in Table 2 of this subpart apply to this source. Appropriate control equipment will be selected as needed to comply with this subpart.

All applicable emission standards, compliance, monitoring, recordkeeping, testing, and reporting requirements will be met according to the requirements of this subpart.

#### 4.1.6.5 Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

All stationary compression ignition (CI) internal combustion engines (ICE) proposed at the Project will be ordered after the applicable trigger dates specified in §60.4200, and they are therefore subject to the compliance requirements of this subpart.

The emission standards applicable to these engines are provided in Appendix B.

All applicable emission standards, compliance, monitoring, recordkeeping, testing, and reporting requirements will be met according to the requirements of this subpart.

#### 4.1.6.6 Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

The proposed power plant will consist of 12 dual-fuel (NG and ULSD) engines. These engines will primarily operate on NG and will be ordered after the applicable trigger date specified in §60.4230. They are therefore subject to the compliance requirements of this subpart.

The emission standards applicable to these engines are provided in Appendix B.

All applicable emission standards, compliance, monitoring, recordkeeping, testing, and reporting requirements will be met according to the requirements of this subpart.

### 4.1.7 Alaska Air Quality Control Regulations (18 AAC 50)

The Alaska Air Quality Control regulations (18 AAC 50) applicable to the Project are described in this section.

#### 4.1.7.1 Federal Standards Adopted by Reference (18 AAC 50.040)

The federal regulations addressed in the preceding sections have been adopted by reference in 18 AAC 50.040.

#### 4.1.7.2 Incinerator Emission Standards (18 AAC 50.050)

The camp waste and sewage sludge incinerators proposed at the Project are subject to the opacity standards of no more than 20 percent per 18 AAC 50.050(a). These sources are not subject to the PM limit per 18 AAC 50.050(b) because they are rated at less than 1,000 lb/hr.

Both incinerators proposed at the Project will meet the opacity limit of this regulation.

#### 4.1.7.3 Industrial Processes and Fuel-Burning Equipment (18 AAC 50.055)

The proposed industrial processes and fuel-burning equipment at the Project are subject to the following emission standards specified in 18 AAC 50.055:

1. PM limit of no more than 0.05 grains per dry standard cubic foot.

2. Opacity limit of no more than 20 percent.

3. $SO_2$ limit of no more than 500 parts per million.

All proposed sources at the Project will meet the respective applicable emission standards of this regulation.

#### 4.1.7.4 Title V Operating Permits Insignificant Sources (18 AAC 50.326)

The following proposed units at the Project are insignificant sources based on their emission rates per 18 AAC 50.326(e):

- Auxiliary $SO_2$ Burner

The following proposed units at the Project are insignificant sources based on their size per 18 AAC 50.326(g):

- Primary $SO_2$ Burner
- Air Handler Heaters (2.5 MMBtu/hr rated units)
- Portable Heaters
- Building Heaters
- ANFO Mixing Plant Tank
- Mill, Tank Farm, and Camp Fire Pump Tanks
- POX Boiler Tank
- Oxygen Plant Boiler Tank

- Carbon Elution Heater Tank
- Jet Fuel Tanks 1 and 2
- Auxiliary $SO_2$ Burner Tank
- Airport Generator Tank

## 4.2 Inapplicable Regulations

### 4.2.1 NESHAP

The NESHAP regulations from 40 CFR Parts 61 and 63 that do not apply to the Project are addressed in this section.

#### 4.2.1.1 Subpart E – National Emission Standard for Mercury

40 CFR 61, Subpart E, applies to sources that process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge. Operations at the Project do not include processing mercury ore for mercury recovery or use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide. Also, the proposed sewage sludge incinerator will not incinerate wastewater sludge from the mercury processes mentioned in this subpart. Therefore, the Project is not subject to this subpart.

#### 4.2.1.2 Subpart CCCCCC – NESHAP for Source Category: Gasoline Dispensing Facilities

40 CFR 63, Subpart CCCCCC, applies to each gasoline dispensing facility located at an area source. This includes each gasoline cargo tank during delivery of the product to a gasoline dispensing facility and each storage tank. The loading of aviation gasoline into storage tanks at an airport and the transfer of aviation gasoline within an airport is not subject to this regulation per §63.11111(g). Therefore, the proposed 5,000-gallon aviation gasoline tank at the Project airport site is not subject to this subpart.

#### 4.2.1.3 Subpart JJJJJJ – NESHAP for Industrial, Commercial, and Institutional Boilers Area Sources

40 CFR 63, Subpart JJJJJJ, applies to industrial, commercial, and institutional boilers operated at an area source of HAP emissions. Per §63.11194(a)(2), an affected source must fall within a boiler subcategory listed in §63.11200 and meet the definition of the subcategory in §63.11237.

The ULSD-fired auxiliary $SO_2$ burner rated at 2 MMBtu/hr does not meet the definition of "boiler" per §63.11237. Therefore, this burner is not subject to this subpart.

The ULSD-fired portable heaters meet the definition of temporary boilers in §63.11237 and, therefore, are exempt from 40 CFR 63 Subpart JJJJJJ per §63.11195(h).

All other proposed boilers at the Project will be primarily fired with NG; some (dual fuel) boilers may utilize ULSD, but only in the event of gas supply interruption. Therefore, these boilers meet the definition of gas-fired boilers listed in §63.11237. Gas-fired boilers are not subject to this subpart per §63.11195(e).

## 4.2.2 NSPS

The NSPS regulations from 40 CFR Part 60 that do not apply to the Project are addressed in this section.

### 4.2.2.1 Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units

40 CFR 60 Subpart Db applies to steam generating units with a heat input capacity of greater than 100 MMBtu/hr per §60.40b(a). All the proposed steam generating units at the Project are rated at less than 100 MMBtu/hr; therefore, they are not subject to this subpart.

### 4.2.2.2 Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels

All the proposed fuel storage tanks at the Project that are less than 75 cubic meters are not subject to this subpart per §60.110b(a). All the proposed fuel storage tanks at the Project that are greater than 75 cubic meters will only store ULSD, which has a true vapor pressure of less than 3.5 kilopascals; therefore, they are not subject to this subpart per §60.110b(b).

### 4.2.2.3 Subpart KKKK – Standards of Performance for Stationary Combustion Turbines

The steam turbine proposed for the Project power plant is not a combustion turbine; therefore, it is not subject to this subpart.

# Appendix A – Process, Power Generation, and Ancillary Source Information

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# Process, Power Generation, and Ancillary Source Information

# Donlin Gold Project, Alaska

PREPARED FOR:
DONLIN GOLD LLC

PROJECT NO. 281-21B-1
OCTOBER 27, 2021

**Process, Power Generation, and Ancillary Source Specifications and Potential Emissions**

| | | | | | Per Release Point | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model ID | Source ID | Permit EU ID | Source Description | Release Points | Rating | Control | Control ID | Control EU ID | CO (ton/yr) | $NO_X$ (ton/yr) | $PM_{2.5}$ (ton/yr) | $PM_{10}$ (ton/yr) | $SO_2$ (ton/yr) | VOC (ton/yr) |
| **Ore Crushing, Grinding, Flotation, and Reagents** | | | | | | | | | | | | | | |
| OREDUMP | 11-BIN-100 | 38 | Gyratory Crusher Dump Pocket and Rock Breaker | 1 | 5,100 *ton/hr* | Enclosure | -- | -- | -- | -- | 0.762 | 5.033 | -- | -- |
| 81DCL100 | 11-CRU-100, 11-BIN-150, 11-FEE-150 | 41-43 | Gyratory Crusher, Surge Pocket, Apron Feeder (common exhaust) | 1 | 5,100 *ton/hr* | Dust Collector | 81-DCL-100 | 40 | -- | -- | 9.391 | 9.391 | -- | -- |
| ORETRFER | 11-CVB-100 | 44 | Gyratory Crusher Discharge Conveyor | 1 | 5,100 *ton/hr* | Enclosure | -- | -- | -- | -- | 0.762 | 5.033 | -- | -- |
| ORESTKP | 14-CVB-200 | 45 | Stockpile Feed Conveyor | 1 | 5,100 *ton/hr* | Enclosure | | | -- | -- | 0.762 | 5.033 | -- | -- |
| 81DCL200 | 14-FEE-200, 210, 220, 230 | 46, 48, 50, 52 | Coarse Ore Reclaim Apron Feeder | 4 | 3,303 *ton/hr, total* | Dust Collector | 81-DCL-200, 300, 400, 500 | 47, 49, 51, 53 | -- | -- | 2.099 | 2.099 | -- | -- |
| SAGFEED | 16-CVB-300 | 54 | SAG Mill Feed Conveyor | 1 | 3,303 *ton/hr* | Enclosure | -- | | -- | -- | 0.494 | 3.259 | -- | -- |
| 81DCL600 | 16-CRU-200, 300 | 55-56 | Pebble Crushers (common exhaust) | 1 | 660 *ton/hr, total* | Dust Collector | 81-DCL-600 | 57 | -- | -- | 11.269 | 11.269 | -- | -- |
| 480TO300 | 16-CVB-480 | 58 | Pebble Discharge Conveyor | 1 | 660 *ton/hr* | Enclosure | -- | -- | -- | -- | 0.099 | 0.651 | -- | -- |
| 15FIL535 | 15-HOP-535 | 59 | Lime Hopper | 1 | 34,491 *ton/yr* | Dust Collector | 15-FIL-535 | 60 | -- | -- | 1.126 | 1.126 | -- | -- |
| 15DCL700 | 15-BIN-800 | 61 | Lime Silo | 1 | 34,491 *ton/yr* | Dust Collector | 15-DCL-700 | 62 | -- | -- | 1.126 | 1.126 | -- | -- |
| 15SBW550 | 15-MIL-400 | 63 | Lime Slaker | 1 | 34,491 *ton/yr* | Wet Scrubber | 15-SBW-550 | 64 | -- | -- | 0.472 | 0.472 | -- | -- |
| 15DCLXFL | 15-FLOC | 65 | Flocculant Handling and Mixing | 1 | 3,662 *ton/yr* | Dust Collector | 15-DCL-XFL | 66 | -- | -- | 0.631 | 0.631 | -- | -- |
| 15DCL100 | 15-NAOH | 67 | Caustic Soda Handling and Mixing | 1 | 304 *ton/yr* | Dust Collector | 15-DCL-100 | 68 | -- | -- | 0.994 | 0.994 | -- | -- |
| 15DCL105 | 15-CUSO4 | 69 | Copper Sulfate Handling and Mixing | 1 | 2,436 *ton/yr* | Dust Collector | 15-DCL-105 | 70 | -- | -- | 2.254 | 2.254 | -- | -- |
| 15DCL110 | 15-PAX | 71 | Xanthate Handling and Mixing | 1 | 4,306 *ton/yr* | Dust Collector | 15-DCL-110 | 72 | -- | -- | 2.254 | 2.254 | -- | -- |
| 15DCL520 | 15-SODA1 | 73 | Soda Ash Handling | 1 | 1,076 *ton/yr* | Dust Collector | 15-DCL-520 | 74 | -- | -- | 1.502 | 1.502 | -- | -- |
| 15DCL115 | 15-SODA2 | 75 | Soda Ash Mixing | 1 | 1,076 *ton/yr* | Dust Collector | 15-DCL-115 | 76 | -- | -- | 2.254 | 2.254 | -- | -- |
| **Acidulation and CCD Washing** | | | | | | | | | | | | | | |
| -- | 31-TNK-210, 215 | 124 | Acidulation Tanks (common exhaust) | 1 | -- | -- | -- | | -- | -- | -- | -- | -- | -- |
| **Autoclaving** | | | | | | | | | | | | | | |
| ACLAVE1 | 17-AUT-101, 201 | 77, 81 | Autoclave | 2 | 210 *ton/hr* | Condenser<br>Venturi Scrubber<br>VOC/Hg Carbon Filter | 17-VEA-103, 203<br>17-SBW-101, 201<br>17-VEA-104, 204 | 78, 82<br>79, 83<br>80, 84 | 385.518 | -- | 0.966 | 0.966 | 4.896 | 0.185 |
| 17BLR301 | 17-BLR-301, 302 | 15, 16 | POX Boiler | 2 | 29.29 *MMBtu/hr* | | -- | -- | 10.565 | 19.712 | 0.956 | 0.986 | 0.199 | 0.692 |
| 33BLR001 | 33-BLR-001 | 17 | Oxygen Plant Boiler | 1 | 20.66 *MMBtu/hr* | | -- | -- | 7.453 | 13.906 | 0.674 | 0.695 | 0.141 | 0.488 |
| 17STKXHC | 17-TNK-302, 303, 304 | 85-87 | POX Hot Cure Tank (common exhaust) | 1 | -- | Good Operating Practices (GOP) | -- | -- | -- | -- | 1.749 | 1.749 | -- | -- |

**Process, Power Generation, and Ancillary Source Specifications and Potential Emissions**

| Model ID | Source ID | Permit EU ID | Source Description | Release Points | Per Release Point | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Rating | Control | Control ID | Control EU ID | CO (ton/yr) | $NO_X$ (ton/yr) | $PM_{2.5}$ (ton/yr) | $PM_{10}$ (ton/yr) | $SO_2$ (ton/yr) | VOC (ton/yr) |
| **CCD POX Thickening and Washing, and Neutralization** | | | | | | | | | | | | | | |
| -- | 74-TNK-320, 325, 330, 335, 365 | 125 | Neutralization Tank (common exhaust) | 1 | -- | GOP | -- | -- | -- | -- | -- | -- | -- | -- |
| **Cyanide Destruction System** | | | | | | | | | | | | | | |
| 15BRN100 | 15-BRN-100 | 21 | SO2 Burner | 1 | 2 *MMBtu/hr* | Clean Fuel / GOP | -- | -- | 0.721 | 0.859 | 0.065 | 0.065 | 0.005 | 0.047 |
| **Carbon Elution, Electrowinning, Reactivation, and Gold Refining** | | | | | | | | | | | | | | |
| 56BLR200 | 56-BLR-200 | 18 | Carbon Elution Heater | 1 | 16 *MMBtu/hr* | | -- | -- | 5.771 | 10.768 | 0.522 | 0.538 | 0.109 | 0.378 |
| 37STK110 | 37-EWN-100, 200, 300, 400, 56-TNK-518, 512, 19-TNK-520 | 91-94 | Electrowinning Circuit - EW Cells, Pregnant and Barren Solution Tanks (common exhaust) | 1 | 211 *gpm, total* | Demister<br>Carbon Filter | 37-DEM-XEW<br>37-FIL-110 | 95<br>96 | -- | -- | 0.825 | 0.825 | -- | -- |
| 56STK115 | 56-KLN-100 | 88 | Carbon Regeneration Kiln | 1 | 1.65 *ton/hr* | Off Gas Cooler<br>Carbon Filter | 56-CDO-300<br>56-FIL-205 | 89<br>90 | 3.849 | 0.077 | 1.925 | 1.925 | -- | 1.925 |
| 19STKXRE | 19-VEZ-100 | 97 | Mercury Retort | 1 | -- | Condenser<br>Carbon Filter | 19-CDO-100<br>19-COL-100 | 98<br>99 | -- | -- | 0.133 | 0.133 | -- | -- |
| 19STK105 | 19-FUR-100 | 100 | Induction Smelting Furnace | 1 | -- | Dust Collector<br>Carbon Filter | 19-DCL-XFU<br>19-FIL-XFU | 101<br>102 | -- | -- | 4.152 | 4.152 | -- | -- |
| **Power Generation** | | | | | | | | | | | | | | |
| ENGINE1 | W1 to 12 | 1-12 | Power Plant Generator Engine - Wärtsilä 18V50DF ULSD Mode | 12 | 16,786 *kWe* | SCR<br>Oxidation Catalyst | --<br>-- | --<br>-- | 29.176 | 85.908 | 47.006 | 47.006 | 0.959 | 93.562 |
| | | | Power Plant Generator Engine - Wärtsilä 18V50DF NG Mode | 12 | 17,076 *kWe* | SCR<br>Oxidation Catalyst | --<br>-- | --<br>-- | 19.787 | 13.191 | 21.436 | 21.436 | 0.378 | 40.791 |
| GENAIRP1 | ADG1, 2 | 13-14 | Airport Generator Engine | 2 | 200 *kWe* | Clean Fuel / GOP | -- | -- | 8.449 | 0.966 | 0.048 | 0.048 | 0.013 | 0.459 |
| GENBLCK1 | BEDG1, 2 | 29-30 | Black Start Generator Engine | 2 | 600 *kWe* | Clean Fuel / GOP | -- | -- | 1.447 | 2.646 | 0.083 | 0.083 | 0.002 | 2.646 |
| **Emergency Equipment** | | | | | | | | | | | | | | |
| GENCAMP1 | CEDG1 to 4 | 31-34 | Emergency Generator Engine | 4 | 1,500 *kWe* | Clean Fuel / GOP | -- | -- | 3.617 | 6.614 | 0.207 | 0.207 | 0.006 | 6.614 |
| FPTANK | FP1 to 3 | 35-37 | Fire Pump Engine | 3 | 252 *hp* | Clean Fuel / GOP | -- | -- | 0.458 | 0.514 | 0.026 | 0.026 | 0.001 | 0.514 |

**Process, Power Generation, and Ancillary Source Specifications and Potential Emissions**

| Model ID | Source ID | Permit EU ID | Source Description | Release Points | Per Release Point Rating | Control | Control ID | Control EU ID | CO (ton/yr) | $NO_X$ (ton/yr) | $PM_{2.5}$ (ton/yr) | $PM_{10}$ (ton/yr) | $SO_2$ (ton/yr) | VOC (ton/yr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ancillary Sources** | | | | | | | | | | | | | | |
| PPHTR100 | PP-HEU-100, 200 | 19-20 | Power Plant Auxiliary Heater | 2 | 16.5 *MMBtu/hr* | Low NOx Burner | -- | -- | 5.95 | 11.10 | 0.54 | 0.56 | 0.11 | 0.39 |
| 15BRNAUX | 1-15-BRN-100 | 22 | Auxiliary SO2 Burner | 1 | 2 *MMBtu/hr* | Clean Fuel / GOP | -- | -- | 0.336 | 1.346 | 0.017 | 0.067 | 0.014 | 0.0229 |
| BHEAT1 | 81-HEU-1 to 138 | 23 | Building Heater | 138 | 0.175 *MMBtu/hr* | Clean Fuel / GOP | -- | -- | 0.030 | 0.071 | 0.006 | 0.006 | 0.0005 | 0.004 |
| AIRH1 | 81-HVA-104 to 107, 109, 111 to 113, 126, 127, 201 to 207, 220, 230 | 24 | Air Handler Heater | 19 | 5 *MMBtu/hr* | Clean Fuel / GOP | -- | -- | 1.804 | 2.147 | 0.163 | 0.163 | 0.013 | 0.118 |
| AIRH9 | 81-HVA-108, 119, 231, 233, 234, 253, 257 | 25 | Air Handler Heater | 7 | 2.5 *MMBtu/hr* | Clean Fuel / GOP | -- | -- | 0.902 | 1.074 | 0.082 | 0.082 | 0.006 | 0.059 |
| PHEAT2 | PBH1 to 20 | 26 | Portable Building Heater | 20 | 0.86 *MMBtu/hr* | Clean Fuel / GOP | -- | -- | 0.145 | 0.579 | 0.007 | 0.029 | 0.006 | 0.010 |
| 54DCL710 | 61-COND | 111 | Water Treatment Plant Conditioning | 1 | -- | Dust Collector | 54-DCL-710 | 112 | -- | -- | 1.126 | 1.126 | -- | -- |
| WINCIN | CWI | 27 | Camp Waste Incinerator | 1 | 990 *lb/hr* | As needed to meet 40 CFR 60 Subpart CCCC | -- | -- | 0.351 | 0.780 | 0.319 | 0.319 | 0.520 | -- |
| SINCIN | SSI | 28 | Sewage Sludge Incinerator | 1 | 0.058 *ton/day* | As needed to meet 40 CFR 60 Subpart LLLL | -- | -- | 0.010 | 0.064 | 0.009 | 0.009 | 0.011 | -- |
| 24DCLXL1 | 24-LAB1 | 103-104 | Sample Receiving and Preparation Laboratory | 1 | 3,575 *lb/day* | Dust Collector | 24-DCL-XL1 | 105 | -- | -- | 1.989 | 1.989 | -- | -- |
| 24DCLXL2 | 24-LAB2 | 106 | Assay Laboratory | 1 | 3,575 *lb/day* | Dust Collector | 24-DCL-XL2 | 107 | -- | -- | 4.137 | 4.137 | -- | -- |
| 24DCLXL3 | 24-LAB3 | 108-109 | Metallurgical Laboratory | 1 | 3,575 *lb/day* | Dust Collector | 24-DCL-XL3 | 110 | -- | -- | 1.989 | 1.989 | -- | -- |
| -- | 36-TNK-870 to 881, 885 to 887 | 126-140 | Tank Farm Tank | 15 | 7,500,000 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.101 |
| -- | 36-TNK-896, 897 | 141-142 | Fuel Station Tank | 2 | 19,035,000 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.020 |
| -- | ANFOTNK1 | 143 | ANFO Mixing Plant Tank | 1 | 1,106,184 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.002 |
| -- | FPTNK1 to 3 | 144-145, 153 | Fire Pump Tank | 3 | 6,776 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.00005 |
| -- | POXTNK | 146 | POX Boilers Tank | 1 | 3,942,411 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.004 |
| -- | O2TNK | 147 | Oxygen Plant Boiler Tank | 1 | 1,390,621 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.0020 |
| -- | CETNK | 148 | Carbon Elution Heater Tank | 1 | 1,076,771 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.0016 |
| -- | AUXTNK | 149 | Auxiliary SO2 Burner Tank | 1 | 134,596 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.0002 |
| -- | 36-TNK-903, 904 | 150-151 | Power Plant Tank | 2 | 3,899,388 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.009 |
| -- | 36-TNK-913 | 152 | Camp Generator Tank | 1 | 218,800 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.002 |
| -- | AJTNK1, 2 | 154-155 | Jet Fuel Tank | 2 | 55,000 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.080 |
| -- | AGTNK1 | 156 | Aviation Gasoline Tank | 1 | 10,000 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.087 |
| -- | ADTNK1 | 157 | Airport Generator Tank | 1 | 252,695 *gal/yr* | Submerged Fill | -- | -- | -- | -- | -- | -- | -- | 0.001 |

**Process, Power Generation, and Ancillary Source Source Parameters**

| Model ID | Source ID | Permit EU ID | Source Description | Release Points | Per Release Point: Release Height (m) | Exhaust Temperature (°K) | Exhaust Velocity (m/s) | Exhaust Diameter (m) | Exhaust Flow ($m^3/s$) | Source Type |
|---|---|---|---|---|---|---|---|---|---|---|
| **Ore Crushing, Grinding, Flotation, and Reagents** | | | | | | | | | | |
| OREDUMP | 11-BIN-100 | 38 | Gyratory Crusher Dump Pocket and Rock Breaker | 1 | 6.93 | N/A | N/A | N/A | N/A | VOLUME |
| 81DCL100 | 11-CRU-100, 11-BIN-150, 11-FEE-150 | 41-43 | Gyratory Crusher, Surge Pocket, Apron Feeder (common exhaust) | 1 | 17.90 | Ambient | 12.42 | 1.10 | 11.81 | POINTCAP |
| ORETRFER | 11-CVB-100 | 44 | Gyratory Crusher Discharge Conveyor | 1 | 3.70 | N/A | N/A | N/A | N/A | VOLUME |
| ORESTKP | 14-CVB-200 | 45 | Stockpile Feed Conveyor | 1 | 22.40 | N/A | N/A | N/A | N/A | VOLUME |
| 81DCL200 | 14-FEE-200, 210, 220, 230 | 46, 48, 50, 52 | Coarse Ore Reclaim Apron Feeder | 4 | 2.00 | Ambient | 13.02 | 0.51 | 2.64 | POINTCAP |
| SAGFEED | 16-CVB-300 | 54 | SAG Mill Feed Conveyor | 1 | 18.30 | N/A | N/A | N/A | N/A | VOLUME |
| 81DCL600 | 16-CRU-200, 300 | 55-56 | Pebble Crushers (common exhaust) | 1 | 19.00 | Ambient | 14.91 | 1.10 | 14.17 | POINTCAP |
| 480TO300 | 16-CVB-480 | 58 | Pebble Discharge Conveyor | 1 | 2.30 | N/A | N/A | N/A | N/A | VOLUME |
| 15FIL535 | 15-HOP-535 | 59 | Lime Hopper | 1 | 7.00 | Ambient | 6.21 | 0.38 | 0.71 | POINTCAP |
| 15DCL700 | 15-BIN-800 | 61 | Lime Silo | 1 | 16.70 | Ambient | 6.21 | 0.38 | 0.71 | POINTCAP |
| 15SBW550 | 15-MIL-400 | 63 | Lime Slaker | 1 | 39.45 | Ambient | 2.60 | 0.38 | 0.30 | POINTCAP |
| 15DCLXFL | 15-FLOC | 65 | Flocculant Handling and Mixing | 1 | 7.00 | Ambient | 3.48 | 0.38 | 0.40 | POINTCAP |
| 15DCL100 | 15-NAOH | 67 | Caustic Soda Handling and Mixing | 1 | 39.45 | Ambient | 5.48 | 0.38 | 0.63 | POINTCAP |
| 15DCL105 | 15-CUSO4 | 69 | Copper Sulfate Handling and Mixing | 1 | 39.45 | Ambient | 12.43 | 0.38 | 1.42 | POINTCAP |
| 15DCL110 | 15-PAX | 71 | Xanthate Handling and Mixing | 1 | 39.45 | Ambient | 12.43 | 0.38 | 1.42 | POINTCAP |
| 15DCL520 | 15-SODA1 | 73 | Soda Ash Handling | 1 | 39.45 | Ambient | 8.28 | 0.38 | 0.94 | POINTCAP |
| 15DCL115 | 15-SODA2 | 75 | Soda Ash Mixing | 1 | 39.45 | Ambient | 12.43 | 0.38 | 1.42 | POINTCAP |
| **Acidulation and CCD Washing** | | | | | | | | | | |
| -- | 31-TNK-210, 215 | 124 | Acidulation Tanks (common exhaust) | 1 | -- | -- | -- | -- | -- | -- |
| **Autoclaving** | | | | | | | | | | |
| ACLAVE1 | 17-AUT-101, 201 | 77, 81 | Autoclave | 2 | 26.70 | 313.15 | 9.17 | 0.75 | 4.05 | POINTCAP |
| 17BLR301 | 17-BLR-301, 302 | 15, 16 | POX Boiler | 2 | 26.70 | 477.59 | 10.72 | 0.75 | 4.73 | POINTCAP |
| 33BLR001 | 33-BLR-001 | 17 | Oxygen Plant Boiler | 1 | 3.66 | 477.59 | 45.78 | 0.30 | 3.34 | POINTCAP |
| 17STKXHC | 17-TNK-302, 303, | 85-87 | POX Hot Cure Tank (common exhaust) | 1 | 16.69 | 373.15 | 8.21 | 0.10 | 0.06 | POINTCAP |

**Process, Power Generation, and Ancillary Source Source Parameters**

| Model ID | Source ID | Permit EU ID | Source Description | Release Points | Per Release Point: Release Height (m) | Exhaust Temperature (°K) | Exhaust Velocity (m/s) | Exhaust Diameter (m) | Exhaust Flow ($m^3/s$) | Source Type |
|---|---|---|---|---|---|---|---|---|---|---|
| **CCD POX Thickening and Washing, and Neutralization** | | | | | | | | | | |
| -- | 74-TNK-320, 325, 330, 335, 365 | 125 | Neutralization Tank (common exhaust) | 1 | -- | -- | -- | -- | -- | -- |
| **Cyanide Destruction System** | | | | | | | | | | |
| 15BRN100 | 15-BRN-100 | | SO2 Burner | 1 | 37.75 | 477.59 | 17.97 | 0.15 | 0.33 | POINTCAP |
| **Carbon Elution, Electrowinning, Reactivation, and Gold Refining** | | | | | | | | | | |
| 56BLR200 | 56-BLR-200 | 18 | Carbon Elution Heater | 1 | 43.54 | 467.04 | 11.55 | 0.51 | 2.34 | POINTCAP |
| 37STK110 | 37-EWN-100, 200, 300, 400, 56-TNK-518, 512, 19-TNK-520 | 91-94 | Electrowinning Circuit - EW Cells, Pregnant and Barren Solution Tanks (common exhaust) | 1 | 39.45 | 356.15 | 9.58 | 0.80 | 4.82 | POINTCAP |
| 56STK115 | 56-KLN-100 | 88 | Carbon Regeneration Kiln | 1 | 39.45 | 312.15 | 10.09 | 0.40 | 1.27 | POINTCAP |
| 19STKXRE | 19-VEZ-100 | 97 | Mercury Retort | 1 | 39.45 | 314.15 | 5.48 | 0.13 | 0.07 | POINTCAP |
| 19STK105 | 19-FUR-100 | 100 | Induction Smelting Furnace | 1 | 39.45 | 353.15 | 10.08 | 1.30 | 13.38 | POINTCAP |
| **Power Generation** | | | | | | | | | | |
| ENGINE1 | W1 to 12 | 1-12 | Power Plant Generator Engine - Wärtsilä 18V50DF ULSD Mode | 12 | 49.00 | 458.15 | 21.95 | 1.60 | 44.14 | POINT |
| | | | Power Plant Generator Engine - Wärtsilä 18V50DF NG Mode | 12 | 49.00 | 458.15 | 17.94 | 1.60 | 36.06 | POINT |
| GENAIRP1 | ADG1, 2 | 13-14 | Airport Generator Engine | 2 | 3.66 | 764.15 | 10.74 | 0.30 | 0.76 | POINTCAP |
| GENBLCK1 | BEDG1, 2 | 29-30 | Black Start Generator Engine | 2 | 3.66 | 713.15 | 32.25 | 0.30 | 2.28 | POINTCAP |
| **Emergency Equipment** | | | | | | | | | | |
| GENCAMP1 | CEDG1 to 4 | 31-34 | Emergency Generator Engine | 4 | 3.66 | 764.15 | 80.55 | 0.30 | 5.69 | POINTCAP |
| FPTANK | FP1 to 3 | 35-37 | Fire Pump Engine | 3 | 3.66 | 718.15 | 9.02 | 0.3 | 0.64 | POINTCAP |

**Process, Power Generation, and Ancillary Source Source Parameters**

| Model ID | Source ID | Permit EU ID | Source Description | Release Points | Per Release Point: Release Height (m) | Exhaust Temperature (°K) | Exhaust Velocity (m/s) | Exhaust Diameter (m) | Exhaust Flow ($m^3/s$) | Source Type |
|---|---|---|---|---|---|---|---|---|---|---|
| **Ancillary Sources** | | | | | | | | | | |
| PPHTR100 | PP-HEU-100, 200 | 19-20 | Power Plant Auxiliary Heater | 2 | 21.81 | 467.04 | 13.16 | 0.51 | 2.67 | POINTCAP |
| 15BRNAUX | 1-15-BRN-100 | 22 | Auxiliary SO2 Burner | 1 | 37.75 | 477.59 | 17.48 | 0.15 | 0.32 | POINTCAP |
| BHEAT1 | 81-HEU-1 to 138 | 23 | Building Heater | 138 | 34.90 | 673.15 | 6.29 | 0.08 | 0.03 | POINTCAP |
| AIRH1 | 81-HVA-104 to 107, 109, 111 to 113, 126, 127, 201 to 207, 220, 230 | 24 | Air Handler Heater | 19 | 34.90 | 673.15 | 25.27 | 0.20 | 0.82 | POINTCAP |
| AIRH9 | 81-HVA-108, 119, 231, 233, 234, 253, 257 | 25 | Air Handler Heater | 7 | 34.60 | 673.15 | 22.46 | 0.15 | 0.41 | POINTCAP |
| PHEAT2 | PBH1 to 20 | 26 | Portable Building Heater | 20 | 2.40 | 673.15 | 30.06 | 0.08 | 0.14 | POINTCAP |
| 54DCL710 | 61-COND | 111 | Water Treatment Plant Conditioning | 1 | 18.10 | Ambient | 6.21 | 0.38 | 0.71 | POINTCAP |
| WINCIN | CWI | 27 | Camp Waste Incinerator | 1 | 5.66 | 773.15 | 12.56 | 0.30 | 0.92 | POINTCAP |
| SINCIN | SSI | 28 | Sewage Sludge Incinerator | 1 | 10.20 | 773.15 | 1.26 | 0.15 | 0.02 | POINTCAP |
| 24DCLXL1 | 24-LAB1 | 103-104 | Sample Receiving and Preparation Laboratory | 1 | 35.10 | 293.15 | 13.71 | 0.51 | 2.78 | POINTCAP |
| 24DCLXL2 | 24-LAB2 | 106 | Assay Laboratory | 1 | 35.10 | 313.15 | 14.61 | 1.10 | 13.89 | POINTCAP |
| 24DCLXL3 | 24-LAB3 | 108-109 | Metallurgical Laboratory | 1 | 35.10 | 293.15 | 13.71 | 0.51 | 2.78 | POINTCAP |
| -- | 36-TNK-870 to 881, 885 to 887 | 126-140 | Tank Farm Tank | 15 | -- | -- | -- | -- | -- | -- |
| -- | 36-TNK-896, 897 | 141-142 | Fuel Station Tank | 2 | -- | -- | -- | -- | -- | -- |
| -- | ANFOTNK1 | 143 | ANFO Mixing Plant Tank | 1 | -- | -- | -- | -- | -- | -- |
| -- | FPTNK1 to 3 | 144-145, 153 | Fire Pump Tank | 3 | -- | -- | -- | -- | -- | -- |
| -- | POXTNK | 146 | POX Boilers Tank | 1 | -- | -- | -- | -- | -- | -- |
| -- | O2TNK | 147 | Oxygen Plant Boiler Tank | 1 | -- | -- | -- | -- | -- | -- |
| -- | CETNK | 148 | Carbon Elution Heater Tank | 1 | -- | -- | -- | -- | -- | -- |
| -- | AUXTNK | 149 | Auxiliary SO2 Burner Tank | 1 | -- | -- | -- | -- | -- | -- |
| -- | 36-TNK-903, 904 | 150-151 | Power Plant Tank | 2 | -- | -- | -- | -- | -- | -- |
| -- | 36-TNK-913 | 152 | Camp Generator Tank | 1 | -- | -- | -- | -- | -- | -- |
| -- | AJTNK1, 2 | 154-155 | Jet Fuel Tank | 2 | -- | -- | -- | -- | -- | -- |
| -- | AGTNK1 | 156 | Aviation Gasoline Tank | 1 | -- | -- | -- | -- | -- | -- |
| -- | ADTNK1 | 157 | Airport Generator Tank | 1 | -- | -- | -- | -- | -- | -- |

# Appendix B – Detailed Emission Calculations

AIR SCIENCES INC.

DENVER • PORTLAND • LOS ANGELES

# Detailed Emission Calculations

# Donlin Gold Project, Alaska

PREPARED FOR:
DONLIN GOLD LLC

PROJECT NO. 281-21B-1
OCTOBER 27, 2021

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| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
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| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

Calculations for LOM: 16

**Facility-Wide Emissions Summary** *(ton/yr)*

| Activity | CO | NOx | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|
| Mining Activities | 1,921.0 | 51.6 | 165.2 | 1,298.0 | 4,544.4 | 0.2 | |
| Power Generation | 367.0 | 1,032.8 | 564.2 | 564.2 | 564.2 | 11.5 | 1,123.7 |
| Emergency Equipment | 18.7 | 33.3 | 1.1 | 1.1 | 1.1 | 0.03 | 33.3 |
| Mobile Machinery | 2,042.4 | 1,977.8 | 22.9 | 22.9 | 22.9 | 3.9 | 110.9 |
| Processing Operations | 774.9 | 0.1 | 64.5 | 80.6 | 101.8 | 9.8 | 2.3 |
| Boilers | 94.9 | 158.1 | 8.9 | 9.5 | 20.9 | 1.4 | 6.5 |
| Incinerators | 0.4 | 0.8 | 0.3 | 0.3 | 0.3 | 0.53 | -- |
| Access Roads | 4.5 | 2.3 | 4.3 | 43.2 | 174.2 | 0.01 | 0.2 |
| Tanks | | | | | | | 1.8 |
| Process and Ancillary Source Subtotal | 1,256 | 1,225 | 639 | 656 | 688 | 23 | 1,168 |
| Mining Activity (including access roads) Subtotal | 1,925 | 54 | 169 | 1,341 | 4,719 | 0 | 0 |
| Mobile Machinery Subtotal | 2,042 | 1,978 | 23 | 23 | 23 | 4 | 111 |
| **Facility Total** | **5,224** | **3,257** | **831** | **2,020** | **5,430** | **27** | **1,279** |

Assessable PTE 11,058 ton/yr

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 2 | OF: 7 | SHEET: Summary |
| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

Calculations for LOM: 16

**Detailed Emissions Summary** *(ton/yr)*

| Activity | Rate | | CO | NOx | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|---|---|
| **Mining Activities - Subtotal** | | | **1,921** | **52** | **165** | **1,298** | **4,544** | **0.17** | **0.00** |
| Drilling (EU ID: 113) | 141,512 | *holes/yr* | | | 2.76 | 47.83 | 91.98 | | |
| Blasting (EU ID: 114) | 620 | *blasts/yr* | 1,921 | 51.61 | 5.41 | 93.81 | 180.41 | 0.17 | |
| **Material Handling (Loading and Unloading) (EU ID: 115-120)** | | | | | | | | | |
| Ore Loading (In-Pit) | 13,059,932 | *ton/yr* | | | 1.48 | 9.77 | 20.66 | | |
| Ore Unloading (Short-Term Stockpile) | 5,876,969 | *ton/yr* | | | 0.67 | 4.40 | 9.30 | | |
| Ore Unloading (Long-Term Stockpile) | 0 | *ton/yr* | | | 0.00 | 0.00 | 0.00 | | |
| Ore Reloading (Long-Term Stockpile) | 7,948,468 | *ton/yr* | | | 0.90 | 5.95 | 12.58 | | |
| Waste (incl. OVB/PAG) Loading (In-Pit) | 152,286,568 | *ton/yr* | | | 17.26 | 114.0 | 240.9 | | |
| Waste (incl. OVB/PAG) Un- & Re-loading | 155,123,914 | *ton/yr* | | | 17.58 | 116.1 | 245.4 | | |
| **Material Hauling (EU ID: 160)** | | | | | | | | | |
| Ore Hauling | 273,366 | *VMT/yr* | | | 4.49 | 44.87 | 184.5 | | |
| Waste Hauling | 4,573,774 | *VMT/yr* | | | 75.07 | 750.7 | 3,087 | | |
| **Maintenance Equipment (EU ID: 121-123)** | | | | | | | | | |
| Dozer Use | 75,495 | *hr/yr* | | | 34.07 | 58.14 | 324.5 | | |
| Grader Use | 45,653 | *hr/yr* | | | 1.32 | 18.86 | 42.70 | | |
| Water Truck Use | 13,986 | *hr/yr* | | | 1.78 | 17.83 | 73.29 | | |
| **Wind Erosion of Exposed Surfaces (EU ID: 161)** | | | | | | | | | |
| Tailings Beach (Dry) | 798 | *acre* | | | 0.29 | 1.93 | 3.86 | | |
| Haul Roads | 215 | *acre* | | | 0.13 | 0.90 | 1.79 | | |
| Access Roads | 143 | *acre* | | | 0.09 | 0.60 | 1.19 | | |
| Waste Rock Facility | variable | *acre* | | | 1.74 | 11.62 | 23.23 | | |
| Short-term Stockpile | variable | *acre* | | | 0.02 | 0.15 | 0.30 | | |
| Long-term Stockpile West | variable | *acre* | | | 0.0285 | 0.1901 | 0.380 | | |
| Long-term Stockpile East (& PAG) | variable | *acre* | | | 0.0486 | 0.3242 | 0.648 | | |
| Overburden Stockpile South | variable | *acre* | | | 0.0153 | 0.1021 | 0.204 | | |
| **Power Generation - Subtotal** | | | **367.0** | **1,033** | **564.2** | **564.2** | **564.2** | **11.54** | **1,124** |
| Power Plant Generators (12) | 204,912 | *kWe* | 350.1 | 1,031 | 564.1 | 564.1 | 564.1 | 11.51 | 1,123 |
| Airport Generators (2) | 400 | *kWe* | 16.90 | 1.93 | 0.097 | 0.097 | 0.097 | 0.026 | 0.92 |
| **Mobile Machinery - Subtotal** | | | **2,042** | **1,978** | **22.92** | **22.92** | **22.92** | **3.86** | **110.9** |
| Hydraulic Shovel | 9,961,449 | *hp-hr/yr* | 28.66 | 28.66 | 0.33 | 0.33 | 0.33 | 0.05 | 1.56 |
| Front-End Loader | 12,669,447 | *hp-hr/yr* | 36.45 | 36.45 | 0.42 | 0.42 | 0.42 | 0.07 | 1.98 |
| Haul Truck | 588,306,418 | *hp-hr/yr* | 1,693 | 1,693 | 19.34 | 19.34 | 19.34 | 3.20 | 91.88 |
| Drill | 32,268,357 | *hp-hr/yr* | 92.84 | 86.79 | 1.02 | 1.02 | 1.02 | 0.18 | 5.04 |
| Track Dozer | 27,401,903 | *hp-hr/yr* | 78.83 | 55.94 | 0.75 | 0.75 | 0.75 | 0.15 | 4.28 |
| Wheel Dozer | 11,963,331 | *hp-hr/yr* | 34.42 | 34.42 | 0.39 | 0.39 | 0.39 | 0.07 | 1.87 |
| Grader | 10,220,103 | *hp-hr/yr* | 29.40 | 3.36 | 0.17 | 0.17 | 0.17 | 0.06 | 1.60 |
| Water Truck | 6,870,588 | *hp-hr/yr* | 19.77 | 19.77 | 0.23 | 0.23 | 0.23 | 0.04 | 1.07 |
| Hydraulic Excavator | 4,297,026 | *hp-hr/yr* | 12.36 | 9.89 | 0.13 | 0.13 | 0.13 | 0.02 | 0.67 |
| Fuel Truck | 3,134,146 | *hp-hr/yr* | 9.02 | 9.02 | 0.10 | 0.10 | 0.10 | 0.02 | 0.49 |
| Service Truck | 171,440 | *hp-hr/yr* | 0.49 | 0.056 | 0.0028 | 0.0028 | 0.0028 | 0.0009 | 0.027 |
| Mobile Crane | 214,301 | *hp-hr/yr* | 0.62 | 0.070 | 0.0035 | 0.0035 | 0.0035 | 0.0012 | 0.033 |
| Low Boy Truck | 1,000,069 | *hp-hr/yr* | 2.88 | 0.33 | 0.016 | 0.016 | 0.016 | 0.0054 | 0.16 |
| Tire Handler | 1,428,671 | *hp-hr/yr* | 4.11 | 0.47 | 0.023 | 0.023 | 0.023 | 0.0078 | 0.22 |
| Light Plant | 3,428,810 | *hp-hr/yr* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | | BY: E. Memon |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 3 | OF: 7 | SHEET: Summary |
| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

Calculations for LOM: 16

**Detailed Emissions Summary (*ton/yr*) - continued**

| Activity | Rate | CO | NOx | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|---|
| **Emergency Equipment - Subtotal** | | **18.74** | **33.29** | **1.07** | **1.07** | **1.07** | **0.03** | **33.29** |
| Black Start Generators (2) | 1,200 *kWe* | 2.89 | 5.29 | 0.17 | 0.17 | 0.17 | 0.0044 | 5.29 |
| Emergency Generators (4) | 6,000 *kWe* | 14.47 | 26.46 | 0.83 | 0.83 | 0.83 | 0.022 | 26.46 |
| Fire Pumps (3) | 756 *hp* | 1.38 | 1.54 | 0.079 | 0.079 | 0.079 | 0.00205 | 1.54 |
| **Processing Operations - Subtotal** | | **774.88** | **0.08** | **64.50** | **80.63** | **101.81** | **9.79** | **2.30** |
| ROM Ore Discharge and Crushing | 5,100 *ton/hr* | | | 10.92 | 19.456 | 30.67 | | |
| Coarse Ore Transfer | 5,100 *ton/hr* | | | 9.26 | 14.081 | 20.41 | | |
| Pebble Crushers and Recycle | 660 *ton/hr* | | | 11.76 | 14.529 | 18.16 | | |
| Reagents Handling and Mixing | | | | 12.61 | 12.613 | 12.61 | | |
| Refinery Sources | | 774.9 | 0.1 | 10.71 | 10.71 | 10.71 | 9.79 | 2.30 |
| Laboratories | | | | 8.11 | 8.11 | 8.11 | | |
| Water Treatment Plant | | | | 1.13 | 1.13 | 1.13 | | |
| **Boilers - Subtotal** | | **94.94** | **158.14** | **8.87** | **9.49** | **20.90** | **1.36** | **6.52** |
| POX Boilers (2) | 58.58 *MMBtu/hr* | 21.13 | 39.42 | 1.91 | 1.97 | 6.50 | 0.40 | 1.38 |
| Oxygen Plant Boiler | 20.66 *MMBtu/hr* | 7.45 | 13.91 | 0.67 | 0.70 | 2.29 | 0.14 | 0.49 |
| Carbon Elution Heater | 16 *MMBtu/hr* | 5.77 | 10.77 | 0.52 | 0.54 | 1.78 | 0.11 | 0.38 |
| Power Plant Auxiliary Heaters (2) | 33 *MMBtu/hr* | 11.90 | 22.21 | 1.08 | 1.11 | 3.66 | 0.22 | 0.78 |
| SO2 Burner | 2 *MMBtu/hr* | 0.72 | 0.86 | 0.07 | 0.07 | 0.07 | 0.01 | 0.05 |
| Auxiliary SO2 Burner | 2 *MMBtu/hr* | 0.34 | 1.35 | 0.02 | 0.07 | 0.22 | 0.01 | 0.02 |
| Building Heaters (138) | 24.15 *MMBtu/hr* | 4.15 | 9.75 | 0.79 | 0.79 | 0.79 | 0.06 | 0.57 |
| Air Handlers (19) | 95 *MMBtu/hr* | 34.27 | 40.79 | 3.10 | 3.10 | 3.10 | 0.24 | 2.24 |
| Air Handlers (7) | 17.5 *MMBtu/hr* | 6.31 | 7.51 | 0.57 | 0.57 | 0.57 | 0.05 | 0.41 |
| Portable Heaters (20) | 17.2 *MMBtu/hr* | 2.89 | 11.58 | 0.14 | 0.58 | 1.91 | 0.12 | 0.20 |
| **Incinerators - Subtotal** | | **0.361** | **0.84** | **0.33** | **0.33** | **0.33** | **0.531** | |
| Camp Waste Incinerator (EU ID: 27) | 0.50 *ton/hr* | 0.351 | 0.78 | 0.32 | 0.32 | 0.32 | 0.5197 | |
| Sewage Sludge Incinerator (EU ID: 28) | 0.007 *ton/hr* | 0.0096 | 0.064 | 0.0089 | 0.0089 | 0.0089 | 0.0110 | |
| **Access Roads - Subtotal** | | **4.47** | **2.29** | **4.30** | **43.18** | **174.15** | **0.0091** | **0.183** |
| Camp to Mine Site (EU ID: 158) | | 0.344 | 0.113 | 0.32 | 3.22 | 13.09 | 0.00069 | 0.0118 |
| Airport to Camp (EU ID: 159) | | 0.297 | 0.049 | 0.186 | 1.88 | 7.55 | 0.00038 | 0.0113 |
| Jungjuk Port to Mine Site | | 3.83 | 2.13 | 3.79 | 38.08 | 153.51 | 0.0080 | 0.160 |
| **Tanks - Subtotal** | | | | | | | | **1.840** |
| Mine Site Tanks | | | | | | | | 1.57 |
| Power Plant Tanks | | | | | | | | 0.018 |
| Camp Site Tanks | | | | | | | | 0.002 |
| Airport Tanks | | | | | | | | 0.249 |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
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| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

**Life-of-Mine Mining Activity, Machinery Tailpipes, Wind Erosion, and Access Roads Emissions Summary** ***(ton/yr)***

| LOM | CO | NOX | PM2.5 | PM10 | PM | SO2 | VOC | Total |
|---|---|---|---|---|---|---|---|---|
| 4 | 3,097.4 | 1,159.0 | 140.7 | 967.6 | 3,241.6 | 2.40 | 63.80 | 8,672 |
| 5 | 3,240.5 | 1,302.9 | 151.3 | 1,059.9 | 3,579.6 | 2.67 | 71.57 | 9,408 |
| 6 | 3,296.9 | 1,354.7 | 165.6 | 1,162.4 | 3,945.9 | 2.77 | 74.63 | 10,003 |
| 7 | 3,411.3 | 1,465.4 | 160.6 | 1,111.1 | 3,694.8 | 2.99 | 80.85 | 9,927 |
| 8 | 3,568.3 | 1,622.5 | 174.0 | 1,230.8 | 4,192.8 | 3.29 | 89.37 | 10,881 |
| 9 | 3,702.0 | 1,752.5 | 182.6 | 1,306.3 | 4,505.3 | 3.54 | 96.63 | 11,549 |
| 10 | 3,484.2 | 1,539.9 | 161.1 | 1,110.2 | 3,722.6 | 3.13 | 84.80 | 10,106 |
| 11 | 3,487.7 | 1,547.0 | 169.6 | 1,193.9 | 4,072.5 | 3.13 | 84.99 | 10,559 |
| 12 | 3,602.4 | 1,664.9 | 166.6 | 1,149.6 | 3,883.6 | 3.35 | 91.22 | 10,562 |
| 13 | 3,692.2 | 1,755.7 | 176.8 | 1,243.7 | 4,278.9 | 3.52 | 96.09 | 11,247 |
| 14 | 3,764.3 | 1,829.3 | 176.4 | 1,226.7 | 4,194.0 | 3.66 | 100.01 | 11,294 |
| 15 | 3,868.1 | 1,930.2 | 181.7 | 1,271.3 | 4,371.9 | 3.85 | 105.64 | 11,733 |
| 16 | 3,967.8 | 2,031.7 | **192.4** | 1,364.1 | 4,741.4 | 4.04 | 111.06 | **12,413** |
| 17 | 3,900.3 | 1,961.9 | 190.0 | 1,351.5 | 4,702.9 | 3.91 | 107.39 | 12,218 |
| 18 | 3,894.6 | 1,958.2 | 183.7 | 1,296.9 | 4,534.0 | 3.90 | 107.08 | 11,978 |
| 19 | **3,971.3** | **2,032.8** | 182.3 | 1,280.6 | 4,518.4 | **4.05** | **111.24** | 12,101 |
| 20 | 3,891.3 | 1,951.6 | 188.2 | **1,372.3** | **4,796.7** | 3.90 | 106.90 | 12,311 |
| 21 | 3,559.2 | 1,621.3 | 183.2 | 1,319.9 | 4,577.1 | 3.27 | 88.88 | 11,353 |
| 22 | 2,749.4 | 829.9 | 123.3 | 844.7 | 2,784.6 | 1.74 | 44.91 | 7,379 |
| 23 | 2,522.8 | 616.3 | 91.5 | 614.4 | 2,059.2 | 1.31 | 32.61 | 5,938 |
| 24 | 2,551.2 | 643.7 | 80.9 | 535.1 | 1,863.7 | 1.36 | 34.15 | 5,710 |
| 25 | 2,199.0 | 309.0 | 46.7 | 286.5 | 1,022.7 | 0.70 | 15.03 | 3,880 |
| 26 | 2,013.3 | 141.8 | 15.1 | 129.4 | 473.7 | 0.35 | 4.95 | 2,779 |
| 27 | 2,001.7 | 130.1 | 13.8 | 118.5 | 435.0 | 0.33 | 4.32 | 2,704 |

*Red numbers represent the highest values*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

TOT_MINING_FU( TOT_MINING_FUG_NOX TOT_MINING_FUG_ TOT_MINING_FU( TOT_MINING_I TOT_MINING_FUG_SO2

**Life-of-Mine Mining Activity Fugitive Emissions Summary (*ton/yr*)**

APP_C4_23

| LOM | CO | NOX | PM2.5 | PM10 | PM | SO2 |
|---|---|---|---|---|---|---|
| 4 | **1,921** | **51.61** | 121.4 | 897.7 | 3,027 | **0.17** |
| 5 | **1,921** | **51.61** | 130.3 | 988.5 | 3,364 | **0.17** |
| 6 | **1,921** | **51.61** | 143.8 | 1,089.0 | 3,727 | **0.17** |
| 7 | **1,921** | **51.61** | 137.5 | 1,036.2 | 3,474 | **0.17** |
| 8 | **1,921** | **51.61** | 149.1 | 1,154.0 | 3,970 | **0.17** |
| 9 | **1,921** | **51.61** | 156.4 | 1,228.9 | 4,283 | **0.17** |
| 10 | **1,921** | **51.61** | 137.1 | 1,034.4 | 3,501 | **0.17** |
| 11 | **1,921** | **51.61** | 145.6 | 1,117.9 | 3,850 | **0.17** |
| 12 | **1,921** | **51.61** | 141.2 | 1,072.2 | 3,660 | **0.17** |
| 13 | **1,921** | **51.61** | 150.5 | 1,166.2 | 4,056 | **0.17** |
| 14 | **1,921** | **51.61** | 149.1 | 1,147.3 | 3,968 | **0.17** |
| 15 | **1,921** | **51.61** | 153.3 | 1,190.6 | 4,145 | **0.17** |
| 16 | **1,921** | **51.61** | **162.8** | 1,282.2 | 4,513 | **0.17** |
| 17 | **1,921** | **51.61** | 161.3 | 1,271.4 | 4,477 | **0.17** |
| 18 | **1,921** | **51.61** | 155.1 | 1,216.5 | 4,307 | **0.17** |
| 19 | **1,921** | **51.61** | 152.9 | 1,199.7 | 4,292 | **0.17** |
| 20 | **1,921** | **51.61** | 160.0 | **1,294.6** | **4,576** | **0.17** |
| 21 | **1,921** | **51.61** | 159.2 | 1,248.8 | 4,365 | **0.17** |
| 22 | **1,921** | **51.61** | 108.4 | 782.9 | 2,582 | **0.17** |
| 23 | **1,921** | **51.61** | 79.2 | 555.3 | 1,860 | **0.17** |
| 24 | **1,921** | **51.61** | 68.2 | 475.5 | 1,664 | **0.17** |
| 25 | **1,921** | **51.61** | 38.0 | 230.9 | 827 | **0.17** |
| 26 | **1,921** | **51.61** | 8.4 | 75.9 | 280 | **0.17** |
| 27 | **1,921** | **51.61** | 7.3 | 65.8 | 243 | **0.17** |

*Red numbers represent the highest values*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

TOT_MACHINES_FUG_C TOT_MACHINES_FU TOT_MACHINES_ TOT_MACHINI TOT_MACHINES_FUG_NMHC

**Life-of-Mine Machinery Tailpipes Emissions Summary (*ton/yr*)**

APP_C4_23

| LOM | CO | NOx | PM | SO2 | VOC |
|---|---|---|---|---|---|
| 4 | 1,172 | 1,105 | 12.96 | 2.21 | 63.6 |
| 5 | 1,315 | 1,249 | 14.60 | 2.48 | 71.4 |
| 6 | 1,371 | 1,301 | 15.22 | 2.59 | 74.5 |
| 7 | 1,486 | 1,412 | 16.50 | 2.81 | 80.7 |
| 8 | 1,643 | 1,569 | 18.30 | 3.10 | 89.2 |
| 9 | 1,777 | 1,699 | 19.80 | 3.36 | 96.4 |
| 10 | 1,559 | 1,486 | 17.34 | 2.95 | 84.6 |
| 11 | 1,562 | 1,493 | 17.41 | 2.95 | 84.8 |
| 12 | 1,677 | 1,611 | 18.74 | 3.17 | 91.0 |
| 13 | 1,767 | 1,702 | 19.77 | 3.34 | 95.9 |
| 14 | 1,839 | 1,775 | 20.61 | 3.47 | 99.8 |
| 15 | 1,943 | 1,876 | 21.77 | 3.67 | 105.5 |
| 16 | 2,042 | 1,978 | 22.92 | 3.86 | 110.9 |
| 17 | 1,975 | 1,908 | 22.14 | 3.73 | 107.2 |
| 18 | 1,969 | 1,904 | 22.09 | 3.72 | 106.9 |
| 19 | **2,046** | **1,979** | **22.95** | **3.87** | **111.1** |
| 20 | 1,966 | 1,898 | 22.03 | 3.71 | 106.7 |
| 21 | 1,634 | 1,567 | 18.24 | 3.09 | 88.7 |
| 22 | 824 | 776 | 9.11 | 1.56 | 44.7 |
| 23 | 597 | 562 | 6.60 | 1.13 | 32.4 |
| 24 | 626 | 590 | 6.92 | 1.18 | 34.0 |
| 25 | 274 | 255 | 3.01 | 0.52 | 14.9 |
| 26 | 88 | 88 | 1.00 | 0.17 | 4.8 |
| 27 | 76 | 76 | 0.87 | 0.14 | 4.1 |

*Red numbers represent the highest values*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 7 | OF: 7 | SHEET: Summary |
| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | | DATE: October 14, 2021 | |

**Life-of-Mine Wind Erosion and Access Road Fugitive Emissions Summary (*ton/yr*)**

| LOM | CO | NOX | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|
| 4 | **4.47** | **2.29** | 6.37 | 56.95 | 201.70 | **0.01** | **0.18** |
| 5 | **4.47** | **2.29** | 6.35 | 56.82 | 201.43 | **0.01** | **0.18** |
| 6 | **4.47** | **2.29** | 6.55 | 58.14 | 204.09 | **0.01** | **0.18** |
| 7 | **4.47** | **2.29** | 6.58 | 58.33 | 204.47 | **0.01** | **0.18** |
| 8 | **4.47** | **2.29** | 6.60 | 58.49 | 204.77 | **0.01** | **0.18** |
| 9 | **4.47** | **2.29** | 6.47 | 57.60 | 203.00 | **0.01** | **0.18** |
| 10 | **4.47** | **2.29** | 6.60 | 58.47 | 204.74 | **0.01** | **0.18** |
| 11 | **4.47** | **2.29** | 6.61 | 58.55 | 204.90 | **0.01** | **0.18** |
| 12 | **4.47** | **2.29** | 6.62 | 58.62 | 205.04 | **0.01** | **0.18** |
| 13 | **4.47** | **2.29** | 6.49 | 57.74 | 203.28 | **0.01** | **0.18** |
| 14 | **4.47** | **2.29** | 6.64 | 58.79 | 205.38 | **0.01** | **0.18** |
| 15 | **4.47** | **2.29** | 6.66 | 58.87 | 205.55 | **0.01** | **0.18** |
| 16 | **4.47** | **2.29** | **6.67** | **58.98** | **205.76** | **0.01** | **0.18** |
| 17 | **4.47** | **2.29** | 6.51 | 57.91 | 203.63 | **0.01** | **0.18** |
| 18 | **4.47** | **2.29** | 6.58 | 58.33 | 204.46 | **0.01** | **0.18** |
| 19 | **4.47** | **2.29** | 6.51 | 57.91 | 203.63 | **0.01** | **0.18** |
| 20 | **4.47** | **2.29** | 6.17 | 55.63 | 199.05 | **0.01** | **0.18** |
| 21 | **4.47** | **2.29** | 5.75 | 52.84 | 193.48 | **0.01** | **0.18** |
| 22 | **4.47** | **2.29** | 5.73 | 52.70 | 193.21 | **0.01** | **0.18** |
| 23 | **4.47** | **2.29** | 5.70 | 52.51 | 192.81 | **0.01** | **0.18** |
| 24 | **4.47** | **2.29** | 5.72 | 52.60 | 192.99 | **0.01** | **0.18** |
| 25 | **4.47** | **2.29** | 5.71 | 52.55 | 192.89 | **0.01** | **0.18** |
| 26 | **4.47** | **2.29** | 5.71 | 52.56 | 192.91 | **0.01** | **0.18** |
| 27 | **4.47** | **2.29** | 5.60 | 51.84 | 191.48 | **0.01** | **0.18** |

*Red numbers represent the highest values*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 1 | OF: 11 | SHEET: Mining |
| AIR EMISSION CALCULATIONS | SUBJECT: Mining Activity Emissions | | DATE: October 14, 2021 | |

Calculations for LOM: 16 Max Daily Ore: Yes

**Mining Activity Emissions Summary**

HgDustPM2.5 HgDustPM10 HgDust

**Particulate Emissions**

| **Activity** | **Rate** | | **PM2.5** (lb/hr) | (lb/day) | **PM2.5** (ton/yr) | **PM10** (lb/hr) | (lb/day) | **PM10** (ton/yr) | **PM** (ton/yr) |
|---|---|---|---|---|---|---|---|---|---|
| Drilling (EU ID: 113) | 141,512 | *holes/yr* | 0.63 | 15.12 | 2.76 | 10.92 | 262.09 | 47.83 | 92.0 |
| Blasting (EU ID: 114) | 620 | *blasts/yr* | 87.30 | 87.30 | 5.41 | 1,513.12 | 1,513.12 | 93.81 | 180.4 |
| **Material Handling (Loading and Unloading) (EU ID: 115-120)** | | | | | - | | | - | - |
| Ore Loading (In-Pit) | 13,059,932 | *ton/yr* | 1.16 | 27.74 | 1.48 | 7.63 | 183.19 | 9.77 | 20.7 |
| Ore Unloading (Short-Term Stockpile) | 5,876,969 | *ton/yr* | 0.15 | 3.65 | 0.67 | 1.00 | 24.10 | 4.40 | 9.3 |
| Ore Unloading (Long-Term Stockpile) | 0 | *ton/yr* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| Ore Reloading (Long-Term Stockpile) | 7,948,468 | *ton/yr* | 0.21 | 4.94 | 0.90 | 1.36 | 32.59 | 5.95 | 12.6 |
| Waste (incl. OVB/PAG) Loading (In-Pit) | 152,286,568 | *ton/yr* | 3.94 | 94.56 | 17.26 | 26.02 | 624.43 | 113.96 | 240.9 |
| Waste (incl. OVB/PAG) Un- & Re-loading | 155,123,914 | *ton/yr* | 4.01 | 96.32 | 17.58 | 26.50 | 636.07 | 116.08 | 245.4 |
| **Material Hauling (EU ID: 160)** | | | | | - | | | - | - |
| Ore Hauling | 273,366 | *VMT/yr* | 1.02 | 24.59 | 4.49 | 10.24 | 245.86 | 44.87 | 184.5 |
| Waste Hauling | 4,573,774 | *VMT/yr* | 17.14 | 411.36 | 75.07 | 171.40 | 4,113.58 | 750.73 | 3,086.5 |
| **Maintenance Equipment (EU ID: 121-123)** | | | | | - | | | - | - |
| Dozer Use | 75,495 | *hr/yr* | 7.78 | 186.68 | 34.07 | 13.28 | 318.60 | 58.14 | 324.5 |
| Grader Use | 45,653 | *hr/yr* | 0.30 | 7.25 | 1.32 | 4.31 | 103.34 | 18.86 | 42.7 |
| Water Truck Use | 13,986 | *hr/yr* | 0.41 | 9.77 | 1.78 | 4.07 | 97.68 | 17.83 | 73.3 |
| **Wind Erosion of Exposed Surfaces (EU ID: 161)** | | | | | - | | | - | - |
| Tailings Beach (Dry) | 798.0 | *acre* | 0.07 | 1.59 | 0.29 | 0.44 | 10.58 | 1.93 | 3.86 |
| Haul Roads | 214.7 | *acre* | 0.03 | 0.74 | 0.13 | 0.20 | 4.91 | 0.90 | 1.79 |
| Access Roads | 143.0 | *acre* | 0.02 | 0.49 | 0.09 | 0.14 | 3.27 | 0.60 | 1.19 |
| Waste Rock Facility | *variable* | *acre* | 0.40 | 9.55 | 1.74 | 2.65 | 63.65 | 11.62 | 23.23 |
| Short-term Stockpile | *variable* | *acre* | 0.01 | 0.12 | 0.02 | 0.03 | 0.81 | 0.15 | 0.30 |
| Long-term Stockpile West | *variable* | *acre* | 0.0065 | 0.16 | 0.029 | 0.043 | 1.04 | 0.19 | 0.38 |
| Long-term Stockpile East (& PAG) | *variable* | *acre* | 0.0111 | 0.27 | 0.049 | 0.074 | 1.78 | 0.32 | 0.65 |
| Overburden Stockpile South | *variable* | *acre* | 0.0035 | 0.08 | 0.015 | 0.023 | 0.56 | 0.10 | 0.20 |
| **Total** | | | **124.59** | **982.25** | **165.16** | **1,793.46** | **8,241.23** | **1,298.04** | **4,544.35** |

**Other Emissions**

| **Activity** | **CO** (lb/hr) | (lb/day) | (ton/yr) | **NOx** (lb/hr) | (lb/day) | (ton/yr) | **SO2** (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|---|---|---|---|---|---|
| Blasting (EU ID: 114) | 30,983.3 | 30,983.3 | 1,921.0 | 832.39 | 832.39 | 51.61 | 2.77 | 2.77 | 0.17 |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 16

**Drilling (EU ID: 113)**

**Activity Information**

| | | | | |
|---|---|---|---|---|
| Tota Total Drilling | 1,924,557 | *m/yr* | *Donlin* | APP_C4_23 |
| Drill Hole Depth | 13.6 | *m* | *Donlin* | |
| No. of Holes | 141,512 | *holes/yr* | | |
| Operation | 365 | *days/yr* | | |
| | 24 | *hr/day* | | |

**Emission Factor(s)**

| | | | |
|---|---|---|---|
| TSP | 1.3 | *lb/hole* | *AP-42, Tab. 11.9-4, 7/98 (overburden)* |

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.03 | *AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)* |
| PM10 | 0.52 | *AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)* |
| PM | 1 | |

| Emissions | *(lb/hole)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|---|
| PM2.5 | 0.039 | 0.6 | 15.1 | 2.8 |
| PM10 | 0.676 | 10.9 | 262.1 | 47.8 |
| PM | 1.3 | 21.0 | 504.0 | 92.0 |

**Sample Calculations**

**PM10**

| | (Activity) | (TSP EF) | (Conversion) | (SF) |
|---|---|---|---|---|
| 47.8 *ton/yr* | 141,512 ~~*hole*~~ / *yr* | 1.3 ~~*lb*~~ / ~~*hole*~~ | *ton* / 2,000 ~~*lb*~~ | 0.52 |

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 16

**Blasting (EU ID: 114)**

**Activity Information**

| | | | | |
|---|---|---|---|---|
| Tota Material Mined | | 150,000,000 | t/yr | Donlin |
| BVol | | 55,516,975 | $m^3$/yr | Donlin |
| Con: Blasting Agent Use | | 60,000 | t/yr | Donlin (11/08/2016) |
| Excluding Water | (13.3%) | 52,020 | t/yr | Donlin |
| | | 57,342 | ton/yr | |
| Blas No. of Blasts | | 620 | blasts/yr | Donlin |
| Bench Height | | 12 | m | Donlin |
| Operation | | 365 | days/yr | |
| | | 24 | hr/day | |

APP_C4_23

**Emission Factor(s)**

| | | | |
|---|---|---|---|
| Emission Factor Equation | TSP (lb/blast) = 0.000014 x $A^{1.5}$ | | AP-42, Tab. 11.9-1, 7/98 (blasting, overburden) |
| Where, A = Area per Blast | 120,000 | $ft^2$ | Donlin (11/08/2016) |
| TSP | 582.0 | lb/blast | |
| CO | 67 | lb/ton-ANFO | AP-42, Tab. 13.3-1, 2/80 (ANFO) |
| NOx | 0.9 | kg/t-ANFO | CSIRO |
| | 1.80 | lb/ton-ANFO | |
| SO2 | 0.006 | lb/ton-ANFO | Based on 15 ppm S in FO and a maximum of 10% FO in ANFO |

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.03 | AP-42, Tab. 11.9-1, 7/98 (blasting, overburden) |
| PM10 | 0.52 | AP-42, Tab. 11.9-1, 7/98 (blasting, overburden) |

| Emissions | (lb/blast) | (lb/hr) (1) | (lb/day) (1) | (ton/yr) |
|---|---|---|---|---|
| PM2.5 | 17.46 | 87.30 | 87.30 | 5.41 |
| PM10 | 302.62 | 1,513.12 | 1,513.12 | 93.81 |
| PM | 581.97 | 2,909.85 | 2,909.85 | 180.41 |
| CO | 6,196.65 | 30,983.27 | 30,983.27 | 1,920.96 |
| NOx | 166.48 | 832.39 | 832.39 | 51.61 |
| SO2 | 0.55 | 2.77 | 2.77 | 0.17 |

(1) *Based on:* 5 *blasts/day, occurring in 1 hour*

**Sample Calculations**

**PM10**

93.8 *ton/yr* = (Activity) 620 ~~blast~~ / yr × (TSP EF) 582.0 ~~lb~~ / ~~blast~~ × (SF) 0.52 × (Conversion) ton / 2,000 ~~lb~~

**SO2 Emission Factor**

0.006 *lb/ton-ANFO* = 0.000015 ~~lb S~~ / ~~lb FO~~ × 2 lb SO2 / ~~lb S~~ × 10% ~~lb FO~~ / ~~lb~~ ANFO × 2,000 ~~lb~~ / ton

Conversion(s):

| | |
|---|---|
| 2,000 | lb/ton |
| 1.1023 | ton/t |
| 2.2046 | lb/kg |
| 3.2808 | ft/m |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 16

**Material Handling (Loading and Unloading) (EU ID: 115-120)**

**Activity Information**

| | | | | | |
|---|---|---|---|---|---|
| OreM | In-Pit Ore Removed | 11,847,785 | *t/yr* | *Donlin* | APP_C4_23 |
| | | 13,059,932 | *ton/yr* | | |
| | | 122,400 | *ton/day (daily maximum ore processing rate)* | | |
| M2S1 | Long-Term Ore Stockpiled | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |
| STS2 | Short-Term Ore Stockpiled | 5,331,503 | *t/yr* | *Donlin* | |
| | | 5,876,969 | *ton/yr* | | |
| S2PT | Long-Term Stockpile Ore Processed (to Crusher) | 7,210,737 | *t/yr* | *Donlin* | |
| | | 7,948,468 | *ton/yr* | | |
| Wast | In-Pit Waste (including OVB and PAG) Removed | 138,152,215 | *t/yr* | *Donlin* | |
| | | 152,286,568 | *ton/yr* | | |
| W&C | Waste (including OVB) Deposited to Waste Dump | 138,142,943 | *t/yr* | *Donlin* | |
| | | 152,276,347 | *ton/yr* | | |
| OVB- | OVB Stockpiled | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |
| PAG- | PAG Stockpiled | 9,272 | *t/yr* | *Donlin* | |
| | | 10,221 | *ton/yr* | | |
| OVB- | Stockpiled OVB to Waste Dump Reclamation | 1,287,000 | *t/yr* | *Donlin* | |
| | | 1,418,673 | *ton/yr* | | |
| PAG- | Stockpiled PAG to In-Pit Backfill | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |
| W-BI | In-Pit Waste to In-Pit Backfill | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |
| W-TI | Waste Deposited to Tails Dam | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |

Operation 365 *days/yr*
24 *hr/day*

**Emission Factor(s)**

| | | | | |
|---|---|---|---|---|
| Emission Factor Equation | $E = 0.0032k(U/5)^{1.3}/(M/2)^{1.4}$ | | | *AP-42, Sec. 13.2.4, Eq. 1, 11/06* |
| U = Mean wind speed | 7.947 *mph* | | | *American Ridge 07/05 - 06-10* |
| M = Material moisture content | 2.5 % | | | *Donlin* |
| | PM2.5 | PM10 | PM | |
| k = Particle size multiplier | 0.053 | 0.35 | 0.74 | *AP-42, Sec. 13.2.4, Pg. 4, 11/06* |
| E = Emission factor | 0.000227 | 0.001497 | 0.003164 | *lb/ton* |

**Ore Loading (In-Pit) (EU ID: 115)**

| Emissions | *(lb/hr)** | *(lb/day)** | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 1.2 | 27.7 | 1.5 |
| PM10 | 7.6 | 183.2 | 9.8 |
| PM | 16.1 | 387.3 | 20.7 |

*Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

* *Based on the daily maximum ore processing rate.*

**Ore Unloading (Long-Term Stockpile) (EU ID: 117)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.00 | 0.0 | 0.00 |
| PM10 | 0.00 | 0.0 | 0.00 |
| PM | 0.00 | 0.0 | 0.00 |

Conversion(s): 2,000 *lb/ton*
1.1023 *ton/t*
2.2369 *mph/mps*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 16

**Material Handling (Loading and Unloading) (EU ID: 115-120) - continued**

**Ore Unloading (Short-Term Stockpile)** [1] **(EU ID: 116)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.2 | 3.6 | 0.7 |
| PM10 | 1.0 | 24.1 | 4.4 |
| PM | 2.1 | 50.9 | 9.3 |

(1) *See Mill emissions for ore unloading at crusher*

**Ore Reloading (Long-Term Stockpile)** [1] **(EU ID: 118)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.2 | 4.9 | 0.9 |
| PM10 | 1.4 | 32.6 | 5.9 |
| PM | 2.9 | 68.9 | 12.6 |

(1) *See Mill emissions for ore unloading at crusher*

**Waste (including OVB and PAG) Loading (In-Pit) (EU ID: 119)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 3.9 | 94.6 | 17.3 |
| PM10 | 26.0 | 624.4 | 114.0 |
| PM | 55.0 | 1,320.2 | 240.9 |

*Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

**Waste (including OVB*) Unloading (Waste Dump) (EU ID: 120)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 4.0 | 95.4 | 17.4 |
| PM10 | 26.3 | 630.2 | 115.0 |
| PM | 55.5 | 1,332.4 | 243.2 |

*Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

** Includes stockpiled OVB for reclamation*

**OVB Unloading (OVB Stockpile)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.0 | 0.0 |
| PM | 0.0 | 0.0 | 0.0 |

**OVB Reloading (OVB Stockpile)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.0 | 0.9 | 0.2 |
| PM10 | 0.2 | 5.8 | 1.1 |
| PM | 0.5 | 12.3 | 2.2 |

**PAG Unloading (PAG Stockpile)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.0 | 0.0 |
| PM | 0.0 | 0.1 | 0.0 |

**PAG Reloading (PAG Stockpile)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.0 | 0.0 |
| PM | 0.0 | 0.0 | 0.0 |

**Backfill (PAG and In-Pit Waste) Unloading (In-Pit)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.0 | 0.0 |
| PM | 0.0 | 0.0 | 0.0 |

**Waste Unloading (Tails Dam)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.0 | 0.0 |
| PM | 0.0 | 0.0 | 0.0 |

*Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

**Sample Calculations**

**PM10 - Ore Loading**

| | (Activity) | (PM10 EF) | (Conversion) |
|---|---|---|---|
| 9.8 *ton/yr* | 13,059,932 ~~ton~~ / *yr* | 0.0015 ~~lb~~ / ~~ton~~ | *ton* / 2,000 ~~lb~~ |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 6 | OF: 11 | SHEET: Mining |
| AIR EMISSION CALCULATIONS | SUBJECT: Mining Activity Emissions | DATE: October 14, 2021 | | |

Calculations for LOM: 16

**Material Hauling (EU ID: 160)**

**Activity Information**

| | | | | | |
|---|---|---|---|---|---|
| | Ore Hauled (from Pit and Stockpile) | 19,058,522 | *t/yr* | *Donlin* | OPSUM_P1 |
| | | 21,008,399 | *ton/yr* | | |
| Ore-VKT | | 439,939 | *VKT/yr* | *Donlin* | |
| | | 273,366 | *VMT/yr* | | |
| | Waste Hauled* (from Pit and Stockpile) | 139,439,215 | *t/yr* | *Donlin* | |
| | ** Includes OVB and PAG* | 153,705,241 | *ton/yr* | | |
| Watste-VKT | | 7,360,758 | *VKT/yr* | *Donlin* | |
| | | 4,573,774 | *VMT/yr* | | |
| | Operation | 365 | *days/yr* | | |
| | | 24 | *hr/day* | | |
| | Control Type | Water/Chemical Application | | | |
| | Control Efficiency | 90% | | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06. See note below.* | |

**Truck Hauling Fraction Calculation**

| | | | | | | |
|---|---|---|---|---|---|---|
| 351- | Liebherr T282B | 7,460,289 | *t-km* | 95.6% | *Donlin* | APP_C4_23 |
| 131- | Caterpillar 785C | 340,408 | *t-km* | 4.4% | *Donlin* | |

**Haul Truck Information**

| **Make and Model** | Empty (*ton*) | Payload (*ton*) | Total (*ton*) | |
|---|---|---|---|---|
| Liebherr T282B | 261 | 400 | 661 | *Liebherr, BK-RP LME 1100398-web-08.10* |
| Caterpillar 785C | 116 | 159 | 275 | *Caterpillar, AEHQ5320-02 (4-02)* |

**Emission Factor(s)**

| | | | |
|---|---|---|---|
| Emission Factor Equation | $E = k(s/12)^a (W/3)^b [(365-P)/365]$ | | *AP-42, Sec. 13.2.2, Eqs. 1a and 2, 11/06* |
| s = Surface material silt content | 3.8 | % | (2) |
| W = Mean vehicle weight | 449.4 | *ton* | *Average of empty and full weights of fleet.* |
| P = Days/year with ≥0.01 in precip. | 129 | | *American Ridge, 2007-08, 2010-12* |

(2) *AP-42, Chapter 13.2-2, Related Information "r13s0202_dec03.xls" (http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html)*

| | PM2.5 | PM10 | PM | | |
|---|---|---|---|---|---|
| k = Size-specific empirical constant | 0.15 | 1.5 | 4.9 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| a = Size-specific empirical constant | 0.9 | 0.9 | 0.7 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| b = Size-specific empirical constant | 0.45 | 0.45 | 0.45 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| E = Size-specific emission factor | 0.33 | 3.28 | 13.50 | *lb/VMT* | |

**Ore Hauling**

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| PM2.5 | 1.0 | 24.6 | 4.5 |
| PM10 | 10.2 | 245.9 | 44.9 |
| PM | 42.1 | 1,010.8 | 184.5 |

*Note:*
*In section 13.2.2 of AP-42, Figures 13.2.2-2 and 13.2.2-5 provide estimated unpaved road control efficiencies for water application and chemical dust suppressants.*
*These figures provide a range of up to 95 percent control for water application only and a range of up to 91 percent control for chemical application only.*
*Donlin will apply a combination of water (or snow, as applicable) and chemical dust suppressant. In addition, see Section 2.18 of Appendix C and Section 3.7.1 of Appendix D*

| | | |
|---|---|---|
| Conversion(s): | 2,000 | *lb/ton* |
| | 1.1023 | *ton/t* |
| | 1.609 | *km/mi* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 16

**Material Hauling (EU ID: 160) - continued**

**Waste Hauling**

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| PM2.5 | 17.1 | 411.4 | 75.1 |
| PM10 | 171.4 | 4,113.6 | 750.7 |
| PM | 704.7 | 16,912.4 | 3,086.5 |

**Sample Calculations**

| **PM10 - Waste Hauling** | (Activity) | (PM10 EF) | (Conversion) | (Control) |
|---|---|---|---|---|
| 750.7 *ton/yr* | 4,573,774 ~~*VMT*~~ / *yr* | 3.3 ~~*lb*~~ / ~~*VMT*~~ | *ton* / 2,000 ~~*lb*~~ | (1 - 0.9) |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 16

**Maintenance Equipment (EU ID: 121-123)**

**Activity Information**

| | | | | |
|---|---|---|---|---|
| DOZ Dozer Use | 75,495 | hr/yr | Donlin | APP_C4_23 |
| GRA Grader Use | 45,653 | hr/yr | Donlin | |
| Eqp Water Truck Use | 13,986 | hr/yr | Donlin | |
| HT_ Water Truck Speed | 18.74 | kph | Average haul truck speed | HaulDist AirModel |
| | 162,861 | VMT | | |
| Operation | 365 | days/yr | | |
| | 24 | hr/day | | |

**Control and Efficiency**

| | | | |
|---|---|---|---|
| Dozer Use | None | 0% | |
| Grader Use | None | 0% | |
| Water Truck Use | Water/Chemical Application | 90% | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06. See note below.* |

**Dozer Use**

**Emission Factor(s)**

Emission Factor Equation

$TSP\ (lb/hr) = 5.7\ (s)^{1.2} / (M)^{1.3}$ *AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)*

$PM15\ (lb/hr) = 1\ (s)^{1.5} / (M)^{1.4}$ *AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)*

| | | | |
|---|---|---|---|
| M = Material moisture content | 2.5 | % | *Donlin* |
| s = Surface material silt content | 3.8 | % | (2) |

(2) *AP-42, Chapter 13.2-2, Related Information "r13s0202_dec03.xls" (http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html)*

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.105 | *AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)* |
| PM10 | 0.75 | *AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)* |

**Estimated Emission Factors**

| | | |
|---|---|---|
| PM2.5 | 0.9 | lb/hr |
| PM10 | 1.54 | lb/hr |
| PM | 8.60 | lb/hr |

**Dozer Use** **(EU ID: 122)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 7.78 | 186.7 | 34.1 |
| PM10 | 13.28 | 318.6 | 58.1 |
| PM | 74.08 | 1,777.9 | 324.5 |

**Sample Calculations**

| **PM10 - Dozer Use** | (Activity) | (PM10 EF) | (Conversion) | (Control) |
|---|---|---|---|---|
| 58.1 *ton/yr* | 75,495 ~~hr~~ / *yr* | 1.5 ~~lb~~ / ~~hr~~ | *ton* / 2,000 ~~lb~~ | (1 - 0) |

**Grader Use**

**Emission Factor(s)**

Emission Factor Equation

$TSP\ (lb/VMT) = 0.04\ (S)^{2.5}$ *AP-42, Tab. 11.9-1, 07/98, (grading)*

$PM15\ (lb/VMT) = 0.051\ (S)^{2}$ *AP-42, Tab. 11.9-1, 07/98, (grading)*

S = Mean vehicle speed 3 *mph* *Donlin*

*Note:*
*In section 13.2.2 of AP-42, Figures 13.2.2-2 and 13.2.2-5 provide estimated unpaved road control efficiencies for water application and chemical dust suppressants.*
*These figures provide a range of up to 95 percent control for water application only and a range of up to 91 percent control for chemical application only.*
*Donlin will apply a combination of water (or snow, as applicable) and chemical dust suppressant. In addition, see Section 2.18 of Appendix C and Section 3.7.1 of Appendix D*

Conversion(s): 2,000 *lb/ton*
1.609 *km/mi*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 16

**Maintenance Equipment (EU ID: 121-123) - continued**

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.031 | *AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)* |
| PM10 | 0.6 | *AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)* |

**Estimated Emission Factors**

| | | |
|---|---|---|
| PM2.5 | 0.02 | *lb/VMT* |
| PM10 | 0.28 | *lb/VMT* |
| PM | 0.62 | *lb/VMT* |

**Grader Use** **(EU ID: 123)**

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| PM2.5 | 0.30 | 7.3 | 1.3 |
| PM10 | 4.31 | 103.3 | 18.9 |
| PM | 9.75 | 234.0 | 42.7 |

**Sample Calculations**

**PM10 - Grader Use**

| | (Activity) | (PM10 EF) | (Speed) | (Conversion) | (Control) |
|---|---|---|---|---|---|
| 18.9 *ton/yr* | 45,653 ~~*hr*~~ / *yr* | 0.3 ~~*lb*~~ / ~~*VMT*~~ | 3 ~~*VMT*~~ / ~~*hr*~~ | *ton* / 2,000 ~~*lb*~~ | (1 - 0) |

**Water Truck Use**

**Truck Specifications**

| **Make and Model** | Empty (*ton*) | Payload (*ton*) | Total (*ton*) | |
|---|---|---|---|---|
| Caterpillar 785C | 116 | 134 | 249 | *Caterpillar, AEHQ5320-02 (4-02)* |
| | | 32,000 *gal* | | |

**Emission Factor(s)**

Emission Factor Equation $E = k(s/12)^a (W/3)^b [(365-P)/365]$ *AP-42, Sec. 13.2.2, Eqs. 1a and 2, 11/06*

s = Surface material silt content 3.8 % [1]

[1] *AP-42, Chapter 13.2-2, Related Information "r13s0202_dec03.xls" (http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html)*

W = Mean vehicle weight 183 *ton* *Average of empty and full weights*

P = Days/year with ≥0.01 in precip. 129 *American Ridge, 2007-08, 2010-12*

| | PM2.5 | PM10 | PM | | |
|---|---|---|---|---|---|
| k = Size-specific empirical constant | 0.15 | 1.5 | 4.9 | *lb/VMT* | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| a = Size-specific empirical constant | 0.9 | 0.9 | 0.7 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| b = Size-specific empirical constant | 0.45 | 0.45 | 0.45 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| E = Size-specific emission factor | 0.22 | 2.19 | 9.00 | *lb/VMT* | |

**Water Truck Use** **(EU ID: 121)**

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| PM2.5 | 0.4 | 9.8 | 1.8 |
| PM10 | 4.1 | 97.7 | 17.8 |
| PM | 16.7 | 401.6 | 73.3 |

**Sample Calculations**

**PM10 - Water Truck Use**

| | (Activity) | (PM10 EF) | (Conversion) | (Control) |
|---|---|---|---|---|
| 17.8 *ton/yr* | 162,861 ~~*VMT*~~ / *yr* | 2.2 ~~*lb*~~ / ~~*VMT*~~ | *ton* / 2,000 ~~*lb*~~ | (1 - 0.9) |

Conversion(s): 2,000 *lb/ton*

8.345 *lb/gal water*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| **Air Sciences Inc.** | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 10 | OF: 11 | SHEET: Mining |
| **AIR EMISSION CALCULATIONS** | SUBJECT: Mining Activity Emissions | DATE: October 14, 2021 | | |

Calculations for LOM: 16

**Wind Erosion of Exposed Surfaces (EU ID: 161)**

**Exposed Flat Surfaces**

TA Tailings Beach (Dry) 798.0 *acre* *Donlin*

| | | | | | |
|---|---|---|---|---|---|
| Haul Roads | | Haul Road Width | 29 m | *Donlin* |
| Inside Pit | 130.5 *acre* | 18,206 *meters* | | |
| Outside Pit | 84.2 *acre* | 11,749 *meters* | | |
| Access Roads | | Access Road Width | 9 m | *Donlin* |
| Camp to Mine Site (EU ID: 158) | 15.0 *acre* | | | |
| Airport to Camp (EU ID: 159) | 22.4 *acre* | | | |
| Jungjuk Port to Mine Site | 105.5 *acre* | | | |

Operation 365 *days/yr*
24 *hr/day*

**Control and Efficiency**

| | | | |
|---|---|---|---|
| Tailings Beach (Dry) | None | 0% | |
| Haul Roads | Water/Chemical Application | 90% | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06. See note below.* |
| Access Roads | Water/Chemical Application | 90% | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06. See note below.* |

**Emission Factor(s)**

TSP - Wind Erosion - Road Surfaces 0.0834 *ton/acre-yr* *AP-42, Sec. 13.2.5, 11/06 (industrial wind erosion)* (1)

(1) *Hourly emission calculations provided in Wind_Calcs*

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.075 | *AP-42, Sec. 13.2.5, Pg. 3, 11/06* |
| PM10 | 0.5 | *AP-42, Sec. 13.2.5, Pg. 3, 11/06* |

| **Emissions** | **PM2.5** | | | **PM10** | | | **PM** | | |
|---|---|---|---|---|---|---|---|---|---|
| | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| TA Tailings Beach (Dry) (1)(2) | 0.07 | 1.59 | 0.29 | 0.44 | 10.58 | 1.93 | 0.88 | 21.15 | 3.86 |
| Haul Road - Inside Pit | 0.02 | 0.45 | 0.08 | 0.12 | 2.98 | 0.54 | 0.25 | 5.96 | 1.09 |
| Haul Road - Outside Pit | 0.01 | 0.29 | 0.05 | 0.08 | 1.92 | 0.35 | 0.16 | 3.85 | 0.70 |
| Access Road - Camp to Mine Site (EU ID: 158) | 0.00 | 0.05 | 0.01 | 0.01 | 0.34 | 0.06 | 0.03 | 0.69 | 0.13 |
| Access Road - Airport to Camp (EU ID: 159) | 0.00 | 0.08 | 0.01 | 0.02 | 0.51 | 0.09 | 0.04 | 1.03 | 0.19 |
| Access Road - Jungjuk Port to Mine Site | 0.02 | 0.36 | 0.07 | 0.10 | 2.41 | 0.44 | 0.20 | 4.82 | 0.88 |

(1) *AP-42, Sec. 13.2.5, 11/06 (industrial wind erosion), hourly emission calculations provided in Wind_Calcs*

(2) *Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

*Note:*

*In section 13.2.2 of AP-42, Figures 13.2.2-2 and 13.2.2-5 provide estimated unpaved road control efficiencies for water application and chemical dust suppressants.*
*These figures provide a range of up to 95 percent control for water application only and a range of up to 91 percent control for chemical application only.*
*Donlin will apply a combination of water (or snow, as applicable) and chemical dust suppressant. In addition, see Section 2.18 of Appendix C and Section 3.7.1 of Appendix D*

Conversion(s): 2,000 *lb/ton*
4,047 *$m^2$/acre*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
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| AIR EMISSION CALCULATIONS | SUBJECT: Mining Activity Emissions | DATE: October 14, 2021 | | |

Calculations for LOM: 16

**Wind Erosion of Exposed Surfaces (EU ID: 161) - continued**

**Exposed Stockpile/Waste Rock Facility**

| | **Emissions** [1] | **PM2.5** | | | **PM10** | | | **PM** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| WA | Waste Rock Facility [2] | 0.40 | 9.55 | 1.74 | 2.65 | 63.65 | 11.62 | 5.30 | 127.30 | 23.23 |
| STI | Short-term Stockpile | 0.01 | 0.12 | 0.02 | 0.03 | 0.81 | 0.15 | 0.07 | 1.62 | 0.30 |
| LTI | Long-term Stockpile West | 0.01 | 0.16 | 0.03 | 0.04 | 1.04 | 0.19 | 0.09 | 2.08 | 0.38 |
| LTI | Long-term Stockpile East (& PAG) | 0.01 | 0.27 | 0.05 | 0.07 | 1.78 | 0.32 | 0.15 | 3.55 | 0.65 |
| OV | Overburden Stockpile South | 0.003 | 0.08 | 0.02 | 0.02 | 0.56 | 0.10 | 0.05 | 1.12 | 0.20 |

(1) *AP-42, Sec. 13.2.5, 11/06 (industrial wind erosion), hourly emission calculations provided in Wind_Calcs*

(2) *Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

*Sample emission calculations provided on page: 98*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 1 | OF: 4 | SHEET: Machines |
| AIR EMISSION CALCULATIONS | SUBJECT: Mobile Machinery Tailpipes | DATE: October 14, 2021 | | |

Calculations for LOM: 16

**Mobile Machinery Tailpipes Emissions Summary** *(ton/yr)*

| Machinery Type | Output (*hp-hr/yr*) | CO | NOx | PM | SO2 | VOC |
|---|---|---|---|---|---|---|
| Hydraulic Shovel | 9,961,449 | 28.66 | 28.66 | 0.33 | 0.05 | 1.56 |
| Front-End Loader | 12,669,447 | 36.45 | 36.45 | 0.42 | 0.07 | 1.98 |
| Haul Truck | 588,306,418 | 1,692.55 | 1,692.55 | 19.34 | 3.20 | 91.88 |
| Drill | 32,268,357 | 92.84 | 86.79 | 1.02 | 0.18 | 5.04 |
| Track Dozer | 27,401,903 | 78.83 | 55.94 | 0.75 | 0.15 | 4.28 |
| Wheel Dozer | 11,963,331 | 34.42 | 34.42 | 0.39 | 0.07 | 1.87 |
| Grader | 10,220,103 | 29.40 | 3.36 | 0.17 | 0.06 | 1.60 |
| Water Truck | 6,870,588 | 19.77 | 19.77 | 0.23 | 0.04 | 1.07 |
| Hydraulic Excavator | 4,297,026 | 12.36 | 9.89 | 0.13 | 0.02 | 0.67 |
| Fuel Truck | 3,134,146 | 9.02 | 9.02 | 0.10 | 0.02 | 0.49 |
| Service Truck | 171,440 | 0.49 | 0.06 | 0.003 | 0.001 | 0.03 |
| Mobile Crane | 214,301 | 0.62 | 0.07 | 0.004 | 0.001 | 0.03 |
| Low Boy Truck | 1,000,069 | 2.88 | 0.33 | 0.02 | 0.01 | 0.16 |
| Tire Handler | 1,428,671 | 4.11 | 0.47 | 0.02 | 0.01 | 0.22 |
| Light Plant | 3,428,810 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | | **2,042.39** | **1,977.77** | **22.92** | **3.86** | **110.87** |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 2 | OF: 4 | SHEET: Machines |
| AIR EMISSION CALCULATIONS | SUBJECT: Mobile Machinery Tailpipes | DATE: October 14, 2021 | | |

Calculations for LOM: 16

**Mobile Machinery**
**Machinery Specifications**

APP_C4_23
_FuelCons
_Units

| | Make and Model [1] | Type | Engine | Rating (*hp*) [1] | Units [1] |
|---|---|---|---|---|---|
| Eqp | Komatsu PC8000 | Hydraulic Shovel | 2 X Komatsu SDA16V160 | 4,020 | 1 |
| Eqp | LeTourneau L2350 | Front-End Loader | MTU/DD 16V4000 | 2,300 | 2 |
| Eqp | Caterpillar 994F | Front-End Loader | Cat 3516B | 1,577 | 1 |
| Eqp | Liebherr T282C | Haul Truck | MTU/DD 20V4000 | 3,755 | 69 |
| Eqp | Caterpillar 785C | Haul Truck | Cat 3512B | 1,450 | 8 |
| Eqp | Atlas Copco PV 275 | Drill | Cat C32 ACERT | 950 | 7 |
| Eqp | Atlas Copco DML | Drill | Cat C27 ACERT | 800 | 14 |
| Eqp | Atlas Copco L8 | Drill | | 540 | 5 |
| Eqp | Caterpillar D11T | Track Dozer | Cat C27 ACERT | 850 | 6 |
| Eqp | Caterpillar D10T | Track Dozer | Cat C32 ACERT | 646 | 4 |
| Eqp | Caterpillar 854G | Wheel Dozer | Cat C32 ACERT | 904 | 6 |
| Eqp | Caterpillar 24H | Grader | Cat C13 ACERT | 533 | 3 |
| Eqp | Caterpillar 16H | Grader | Cat C18 ACERT | 297 | 7 |
| Eqp | Caterpillar 785C | Water Truck | Cat 3512B | 1,450 | 4 |
| Eqp | Caterpillar 390DL | Hydraulic Excavator | Cat C18 ATAAC | 523 | 1 |
| Eqp | Komatsu PC2000 | Hydraulic Excavator | | 976 | 2 |
| Eqp | Caterpillar 777F | Fuel Truck | Cat C32 ACERT | 1,016 | 3 |
| Eqp | QTE Body on Peterbilt Chassis | Service Truck | | 300 | 1 |
| Eqp | Grove GMK6350 (200T) | Mobile Crane | Benz OM906LA | 563 | 1 |
| Eqp | QTE Body on Peterbilt Chassis | Low Boy Truck | | 300 | 1 |
| Eqp | Caterpillar 988 | Tire Handler | | 501 | 2 |
| Eqp | Terex LT7000 | Light Plant | | 25 | 20 |

[1] *Donlin*

Operation 365 *day/yr*
24 *hr/day*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
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| AIR EMISSION CALCULATIONS | SUBJECT: Mobile Machinery Tailpipes | DATE: October 14, 2021 | | |

Calculations for LOM: 16

**Machinery Operation, Fuel, and Output** — **Applicable Tier 4 Emission Standards (*g/kW-hr*)**

| | Make and Model | EF Lookup ID | Operation (*hr*) [1] | Fuel (*L/hr*) [1] | Output (*hp-hr*) [2] | Output (*kW-hr*) | PM | NOx | NMHC | CO | SO2 [3] | Fuel (*gal/yr*) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Eqr | Komatsu PC8000 | 5 | 3,687 | 550 | 9,961,449 | 7,428,263 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 535,698 |
| Eqr | LeTourneau L2350 | 5 | 10,796 | 213 | 11,296,541 | 8,423,842 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 607,495 |
| Eqr | Caterpillar 994F | 5 | 1,694 | 165 | 1,372,907 | 1,023,778 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 73,831 |
| Eqr | Liebherr T282C | 5 | 400,077 | 294 | 577,354,468 | 430,533,823 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 31,048,432 |
| Eqr | Caterpillar 785C | 5 | 16,190 | 138 | 10,951,950 | 8,166,881 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 588,964 |
| Eqr | Atlas Copco PV 275 | 5 | 33,963 | 75 | 12,512,926 | 9,330,902 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 672,908 |
| Eqr | Atlas Copco DML | 5 | 47,182 | 75 | 17,383,037 | 12,962,548 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 934,809 |
| Eqr | Atlas Copco L8 | 4 | 14,204 | 34 | 2,372,394 | 1,769,097 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 127,580 |
| Eqr | Caterpillar D11T | 5 | 28,841 | 130 | 18,417,946 | 13,734,281 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 990,463 |
| Eqr | Caterpillar D10T | 4 | 18,662 | 98 | 8,983,957 | 6,699,346 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 483,131 |
| Eqr | Caterpillar 854G | 5 | 27,993 | 87 | 11,963,331 | 8,921,068 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 643,353 |
| Eqr | Caterpillar 24H | 4 | 10,034 | 76 | 3,745,974 | 2,793,377 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 201,448 |
| Eqr | Caterpillar 16H | 4 | 35,620 | 37 | 6,474,128 | 4,827,764 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 348,160 |
| Eqr | Caterpillar 785C | 5 | 13,986 | 100 | 6,870,588 | 5,123,404 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 369,480 |
| Eqr | Caterpillar 390DL | 4 | 2,633 | 75 | 970,009 | 723,337 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 52,164 |
| Eqr | Komatsu PC2000 | 5 | 5,644 | 120 | 3,327,017 | 2,480,960 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 178,917 |
| Eqr | Caterpillar 777F | 5 | 9,816 | 65 | 3,134,146 | 2,337,136 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 168,545 |
| Eqr | QTE Body on Peterbilt Chassis | 4 | 2,181 | 16 | 171,440 | 127,843 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 9,220 |
| Eqr | Grove GMK6350 (200T) | 4 | 2,181 | 20 | 214,301 | 159,804 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 11,524 |
| Eqr | QTE Body on Peterbilt Chassis | 4 | 1,454 | 140 | 1,000,069 | 745,753 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 53,781 |
| Eqr | Caterpillar 988 | 4 | 3,635 | 80 | 1,428,671 | 1,065,361 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 76,830 |
| Eqr | Terex LT7000 | 1 | 58,166 | 12 | 3,428,810 | 2,556,867 | 0.4 | 7.5 | 7.5 | 6.6 | 0.00661 | 184,391 |

(1) *Donlin*

(2) *Based on: Fuel heating value of:* 130,167 *Btu/gal* — *Donlin*
*Diesel engine efficiency of:* 7,000 *Btu/hp-hr* — *AP-42 Default*

(3) *Not a 40 CFR 1039 standard. Calculated from fuel use and sulfur content, provided on next page.*

**Tier 4 Emission Standards (*g/kW-hr*)** — *40 CFR 1039, Table 1 of § 1039.101, current as of 03/07/13*

| Engine Rating | | | Lookup ID | PM | NOx | NMHC | CO |
|---|---|---|---|---|---|---|---|
| 1 | ≤ hp < | 25.5 | 1 | 0.40 | 7.50 | 7.50 | 6.60 |
| 25.5 | ≤ hp < | 75.1 | 2 | 0.03 | 4.70 | 4.70 | 5.00 |
| 75.1 | ≤ hp < | 174.3 | 3 | 0.02 | 0.40 | 0.19 | 5.00 |
| 174.3 | ≤ hp < | 751 | 4 | 0.02 | 0.40 | 0.19 | 3.50 |
| 751 | < hp | | 5 | 0.04 | 3.50 | 0.19 | 3.50 |

Total Machinery Fuel Consumption 145,212,582 *L/yr*
38,361,124 *gal/yr*

**Sample Calculations**
**SO2 Emission Factor**

| 15 ~~lb S~~ | 6.74 ~~lb Fuel~~ | ~~gal Fuel~~ | 7,000 ~~Btu~~ | 1.34102 ~~hp~~ | 453.592 ~~g~~ |
|---|---|---|---|---|---|
| 1.00E+06 ~~lb Fuel~~ | ~~gal Fuel~~ | 130,167 ~~Btu~~ | ~~hp~~ -hr | kW | ~~lb~~ |

* 2 *g SO2* / ~~g S~~ = 0.00661 *g SO2* / *kW-hr*

Conversion(s):
3.78541 *L/gal*
1.34102 *hp/kW*
453.592 *g/lb*
2,000 *lb/ton*
907,184 *g/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 4 | OF: 4 | SHEET: Machines |
| AIR EMISSION CALCULATIONS | SUBJECT: Mobile Machinery Tailpipes | DATE: October 14, 2021 | | |

Calculations for LOM: 16

**Machine-Specific Emissions** *(ton/yr)*

| Make and Model | PM | NOx | NMHC | CO | SO2 (1) | |
|---|---|---|---|---|---|---|
| Komatsu PC8000 | 0.33 | 28.66 | 1.56 | 28.66 | 0.05 | |
| LeTourneau L2350 | 0.37 | 32.50 | 1.76 | 32.50 | 0.06 | |
| Caterpillar 994F | 0.05 | 3.95 | 0.21 | 3.95 | 0.01 | |
| Liebherr T282C | 18.98 | 1,661.04 | 90.17 | 1,661.04 | 3.14 | |
| Caterpillar 785C | 0.36 | 31.51 | 1.71 | 31.51 | 0.06 | |
| Atlas Copco PV 275 | 0.41 | 36.00 | 1.95 | 36.00 | 0.07 | |
| Atlas Copco DML | 0.57 | 50.01 | 2.71 | 50.01 | 0.09 | |
| Atlas Copco L8 | 0.04 | 0.78 | 0.37 | 6.83 | 0.01 | |
| Caterpillar D11T | 0.61 | 52.99 | 2.88 | 52.99 | 0.10 | |
| Caterpillar D10T | 0.15 | 2.95 | 1.40 | 25.85 | 0.05 | |
| Caterpillar 854G | 0.39 | 34.42 | 1.87 | 34.42 | 0.07 | |
| Caterpillar 24H | 0.06 | 1.23 | 0.59 | 10.78 | 0.02 | |
| Caterpillar 16H | 0.11 | 2.13 | 1.01 | 18.63 | 0.04 | |
| Caterpillar 785C | 0.23 | 19.77 | 1.07 | 19.77 | 0.04 | |
| Caterpillar 390DL | 0.02 | 0.32 | 0.15 | 2.79 | 0.01 | |
| Komatsu PC2000 | 0.11 | 9.57 | 0.52 | 9.57 | 0.02 | |
| Caterpillar 777F | 0.10 | 9.02 | 0.49 | 9.02 | 0.02 | |
| QTE Body on Peterbilt Chassis | 0.003 | 0.06 | 0.03 | 0.49 | 0.001 | |
| Grove GMK6350 (200T) | 0.004 | 0.07 | 0.03 | 0.62 | 0.001 | |
| QTE Body on Peterbilt Chassis | 0.02 | 0.33 | 0.16 | 2.88 | 0.01 | |
| Caterpillar 988 | 0.02 | 0.47 | 0.22 | 4.11 | 0.01 | |
| Terex LT7000 | | | | | | *Set to zero per ADEC 3/16/2015* |
| **Total Emissions** | **22.92** | **1,977.77** | **110.87** | **2,042.39** | **3.86** | |

(1) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | | BY: E. Memon |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 1 | OF: 4 | SHEET: Power |
| AIR EMISSION CALCULATIONS | SUBJECT: Power Generation Emissions | DATE: October 14, 2021 | | |

**Power Generation Emissions Summary** *(ton/yr)*

| Source | Output | | CO | NOx | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|
| Power Plant Generators (12) | 204,912 | *kWe* | 350.11 | 1,030.89 | 564.07 | 11.51 | 1,122.74 |
| Airport Generators (2) | 400 | *kWe* | 16.90 | 1.93 | 0.10 | 0.03 | 0.92 |
| **Power Generation Total** | | | **367.01** | **1,032.82** | **564.17** | **11.54** | **1,123.66** |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
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| AIR EMISSION CALCULATIONS | SUBJECT: Power Generation Emissions | DATE: October 14, 2021 | | |

**Power Generation - Power Plant (EU ID: 1-12) W1 - W12**

| | | | | |
|---|---|---|---|---|
| Engine Make and Model | Wärtsilä 18V50DF | | | |
| Units | 12 | | | |
| Operation | 365 | *days/yr* | | |
| | 24 | *hr/day* | | |
| Control | SCR | | | |
| | Oxidation Catalyst | | | |
| | NG | ULSD | | |
| Engine Output (gross) | 17,076 | 16,786 | *kWe* | *Wärtsilä* |
| Heat Input Rate | 7,462 | 7,914 | *Btu/kWhe* | *Wärtsilä (LHV)* |
| | 8,283 | 8,547 | *Btu/kWhe* | *(HHV)* |
| | 141.4 | 143.5 | *MMBtu/hr* | *(HHV)* |

| **Fuel Consumption** | *(MMBtu/hr)* | *(Scf/hr)* [2] | *(MMScf/yr)* | *(gal/hr)* [3] | *(gal/yr)* |
|---|---|---|---|---|---|
| **Natural Gas Operation Mode** [1] | | | | | |
| Natural Gas | 140.0 | 137,278 | 1,203 | | |
| Diesel | 1.4 | | | 10.9 | 95,185 |
| **Diesel Operation Mode** [4] | | | | | |
| Diesel | 143.5 | | | 1,102 | 9,655,399 |

[1] *Based on* 99% *natural gas and* 1% *diesel heat input*
[2] *Based on* 1,020 *Btu/Scf footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98;*
[3] *Based on* 130,167 *Btu/gal Donlin*
[4] *Based on* 100% *diesel heat input*

| **Emission Factor(s)** | **NG** | **ULSD** | | |
|---|---|---|---|---|
| CO | 0.12 | 0.18 | *g/kWhe* | *Wärtsilä* |
| NOx | 0.08 | 0.53 | *g/kWhe* | *Wärtsilä* |
| PM2.5/PM10/PM[1] | 0.13 | 0.29 | *g/kWhe* | *Wärtsilä* |
| VOC (CH4) | 0.09 | 0.21 | *g/kWhe* | *Wärtsilä* |
| VOC (C3H8) | 0.25 | 0.58 | *g/kWhe* | (2) |
| SO2 (diesel) | 0.00006 | 0.00592 | *g/kWhe* | (3) |
| SO2 (natural gas) | 0.00223 | | *g/kWhe* | (4) |
| SO2 (total) | 0.00229 | 0.00592 | *g/kWhe* | |
| NH3 (SCR slip) | 9 | 9 | *ppmvd* | *Wärtsilä* |

[1] *Per NSPS IIII, the PM limit during ULSD firing is front half and condensable PM.*
[2] *Scaled by molecular weight:* CH4: 16 *g/mole* C3H8 44.1 *g/mole*
[3] *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal MSDS - Ultra Low Sulfur Diesel No. 1*
[4] *Based on* 6.00E-4 *lb/MMBtu 40 CFR 75, Appendix D, pipeline quality natural gas*

**Emissions - Natural Gas Operation Mode**

| **Emissions** | **(Single Engine)** | | | **(12 Engines)** | | |
|---|---|---|---|---|---|---|
| | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
| CO | 4.52 | 108.42 | 19.79 | 54.21 | 1,301.05 | 237.44 |
| NOx | 3.01 | 72.28 | 13.19 | 36.14 | 867.37 | 158.29 |
| PM2.5/PM10/PM | 4.89 | 117.46 | 21.44 | 58.73 | 1,409.47 | 257.23 |
| VOC (C3H8) | 9.31 | 223.51 | 40.79 | 111.76 | 2,682.12 | 489.49 |
| SO2 | 0.09 | 2.07 | 0.38 | 1.03 | 24.83 | 4.53 |
| NH3 (1) | 1.04 | 24.96 | 4.56 | 12.48 | 299.56 | 54.67 |

[1] *Based on mass exhaust rate of* 19.2 *Nm³/s, dry @ 0 °C Wärtsilä*
*and NH3 molecular weight of* 17 *g/g-mol*

| Conversion(s): | | | | |
|---|---|---|---|---|
| 0.022415 | *Nm³/g-mol* | 1.11 | *HHV/LHV, natural gas* |
| 453.592 | *g/lb* | 1.08 | *HHV/LHV, diesel* |
| 2,000 | *lb/ton* | | |
| 3,785.41 | *cc/gal* | | |
| 2.205 | *lb/kg* | | |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Emissions - Diesel Operation Mode**

| | (Single Engine) | | | (12 Engines) | | |
|---|---|---|---|---|---|---|
| | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 6.66 | 159.87 | 29.18 | 79.93 | 1,918.43 | 350.11 |
| NOx | 19.61 | 470.73 | 85.91 | 235.36 | 5,648.72 | 1,030.89 |
| PM2.5/PM10/PM | 10.73 | 257.57 | 47.01 | 128.78 | 3,090.81 | 564.07 |
| VOC (C3H8) | 21.36 | 512.67 | 93.56 | 256.33 | 6,152.01 | 1,122.74 |
| SO2 | 0.22 | 5.26 | 0.96 | 2.63 | 63.09 | 11.51 |
| NH3 (1) | 1.33 | 31.85 | 5.81 | 15.93 | 382.25 | 69.76 |

(1) *Based on mass exhaust rate of* 24.5 *$Nm^3$/s, dry @ 0 °C* *Wärtsilä*
*and NH3 molecular weight of* 17 *g/g-mol*

**Sample Calculations**
**NOx Emissions - Diesel Operation Mode**

| 19.61 *lb/hr* | 0.53 *g* | 16,786 *kWh* | *lb* |
|---|---|---|---|
| | *kWh* | *hr* | 453.6 *g* |

Conversion(s):

0.022415 *$Nm^3$/g-mol*
453.592 *g/lb*
2,000 *lb/ton*
3,785.41 *cc/gal*
2.205 *lb/kg*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | | BY: E. Memon |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 4 | OF: 4 | SHEET: Power |
| AIR EMISSION CALCULATIONS | SUBJECT: Power Generation Emissions | DATE: October 14, 2021 | | |

**Power Generation - Airport Generators (EU ID: 13-14) ADG1-2**

| | | | | |
|---|---|---|---|---|
| Engine Make and Model | Unknown | | | |
| Engine Output (gross) | 200 *kWe* | *Donlin* | | |
| Heat Input Rate | 9,387 *Btu/kWhe* | *Based on* | 7,000 *Btu/hp-hr* | *AP-42 Default* |
| | 1.9 *MMBtu/hr* | | | |
| Units | 2 | | | |
| Fuel Type | Diesel | | | |
| Fuel Consumption | 14.4 *gal/hr* | (1) | | |
| | 126,347 *gal/yr* | | | |

(1) *Based on* 130,167 *Btu/gal* *Donlin*

| | |
|---|---|
| Operation | 365 *days/yr* |
| | 24 *hr/day* |
| Control | None |

| Emission Factor(s) | | |
|---|---|---|
| CO | 4.38 *g/kWhe* | *§ 60.4204(b), § 60.4201(a), and 1039.101, Table 1 (1.25x per § 60.4204(d), § 60.4212(b), § 1039.101 (e)(2)&(3))* |
| NOx | 0.50 *g/kWhe* | *§ 60.4204(b), § 60.4201(a), and 1039.101, Table 1 (1.25x per § 60.4204(d), § 60.4212(b), § 1039.101 (e)(2)&(3))* |
| PM2.5/PM10/PM | 0.03 *g/kWhe* | *§ 60.4204(b), § 60.4201(a), and 1039.101, Table 1 (1.25x per § 60.4204(d), § 60.4212(b), § 1039.101 (e)(2)&(3))* |
| VOC | 0.24 *g/kWhe* | *§ 60.4204(b), § 60.4201(a), and 1039.101, Table 1 (1.25x per § 60.4204(d), § 60.4212(b), § 1039.101 (e)(2)&(3))* |
| SO2 | 0.00661 *g/kWhe* | (1) |

(1) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*

| | (Single Engine) | | | (2 Engines) | | |
|---|---|---|---|---|---|---|
| **Emissions** | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 1.9 | 46.3 | 8.4 | 3.9 | 92.6 | 16.9 |
| NOx | 0.2 | 5.3 | 1.0 | 0.4 | 10.6 | 1.9 |
| PM2.5/PM10/PM | 0.01 | 0.265 | 0.05 | 0.02 | 0.5 | 0.1 |
| VOC | 0.1 | 2.5 | 0.5 | 0.2 | 5.0 | 0.9 |
| SO2 | 0.003 | 0.1 | 0.01 | 0.01 | 0.1 | 0.03 |

**Sample Calculations**

**SO2 Emission Factor**

0.00661 *g/kWh* = (15 ~~lb-S~~ / 1.00E+06 ~~lb-Fuel~~) × (14.4 ~~gal-Fuel~~ / ~~hr~~) × (6.74 ~~lb-Fuel~~ / ~~gal-Fuel~~) × (~~hr~~ / 200 *kWh*) × (2 ~~lb~~-SO2 / ~~lb-S~~) × (453.6 *g* / ~~lb~~)

**NOx Emissions**

0.2 *lb/hr* = (0.50 ~~g~~ / ~~kWh~~) × (200 ~~kWh~~ / *hr*) × (*lb* / 453.6 ~~g~~)

Conversion(s):

453.6 *g/lb*
2,000 *lb/ton*
1.34 *hp/kW*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 1 | OF: 18 | SHEET: Mill |
| AIR EMISSION CALCULATIONS | SUBJECT: Processing Emissions | DATE: October 14, 2021 | | |

**Process and Refining Emissions Summary**

**Particulate Emissions**

| | | | PM2.5 | | | PM10 | | | PM |
|---|---|---|---|---|---|---|---|---|---|
| **Source/Activity** | | | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(ton/yr)* |
| ROM Ore Discharge and Crushing | 5,100 | *ton/hr* | 2.49 | 59.81 | 10.92 | 4.44 | 106.61 | 19.46 | 30.67 |
| Coarse Ore Transfer | 5,100 | *ton/hr* | 2.11 | 50.73 | 9.26 | 3.21 | 77.15 | 14.08 | 20.41 |
| Pebble Crushers and Recycle | 660 | *ton/hr* | 2.69 | 64.45 | 11.76 | 3.32 | 79.61 | 14.53 | 18.16 |
| Reagents Handling and Mixing | | | 2.88 | 69.11 | 12.61 | 2.88 | 69.11 | 12.61 | 12.61 |
| Refinery Sources | | | 2.45 | 58.71 | 10.71 | 2.45 | 58.71 | 10.71 | 10.71 |
| Laboratories | | | 1.85 | 44.46 | 8.11 | 1.85 | 44.46 | 8.11 | 8.11 |
| Water Treatment Plant | | | 0.26 | 6.17 | 1.13 | 0.26 | 6.17 | 1.13 | 1.13 |
| **Total** | | | **14.73** | **353.44** | **64.50** | **18.41** | **441.83** | **80.63** | **101.81** |

**Other Emissions**

| | CO | NOx | SO2 | VOC | H2S |
|---|---|---|---|---|---|
| **Source/Activity** | *(ton/yr)* | *(ton/yr)* | *(ton/yr)* | *(ton/yr)* | *(ton/yr)* |
| Autoclaves | 771 | | 9.8 | 0.4 | 2.8 |
| Carbon Regeneration Kiln | 3.8 | 0.1 | | 1.9 | |
| EW Circuit | | | | | |
| Mercury Retort | | | | | |
| Induction Smelting Furnace | | | | | |
| Assay Furnaces | | | | | |
| **Total** | **774.88** | **0.08** | **9.79** | **2.30** | **2.78** |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**ROM Ore Discharge and Crushing (EU ID: 38-44)**

**Activity Information**

| | | | |
|---|---|---|---|
| Gyratory Crusher (GC) Design Throughput | 5,100 | *ton/hr* | *Donlin* |
| | 122,400 | *ton/day* | |
| | 44,676,000 | *ton/yr* | |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| GC Dump Pocket 11-BIN-100 | 38 | Enclosure | | |
| GC Circuit | 39 | 81-DCL-100 | Dust Collector | 40 |
| GC 11-CRU-100, Surge Pocket 11-BIN-150, Apron Feeder 11-FEE-150 | 41, 42, 43 | | | |
| GC Discharge Conveyor 11-CVB-100 | 44 | Enclosure | | |

**Material Transfer - Run-of-Mine Ore Discharge to GC Dump Pocket and GC Discharge Conveyor**

**Emission Factor(s)**

| | | | | |
|---|---|---|---|---|
| Emission Factor Equation | $E = 0.0032k(U/5)^{1.3}/(M/2)^{1.4}$ | | | *AP-42, Sec. 13.2.4, Eq. 1, 11/06* |
| U = Mean wind speed | 1.3 *mph* | | | *Minimum applicable wind speed to account for enclosure* |
| M = Material moisture content | 1.8 % | | | *Donlin* |
| | PM2.5 | PM10 | PM | |
| k = Particle size multiplier | 0.053 | 0.35 | 0.74 | *AP-42, Sec. 13.2.4, Pg. 4, 11/06* |
| E = Emission factor | 0.000034 | 0.00023 | 0.00048 | *lb/ton* |

**GC Dump Pocket 11-BIN-100**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.17 | 4.2 | 0.8 |
| PM10 | 1.15 | 27.6 | 5.0 |
| PM | 2.43 | 58.3 | 10.6 |

**GC Discharge Conveyor 11-CVB-100**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.17 | 4.2 | 0.8 |
| PM10 | 1.15 | 27.6 | 5.0 |
| PM | 2.43 | 58.3 | 10.6 |

**GC Circuit**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 2.14 | 51.5 | 9.4 |

| | | | |
|---|---|---|---|
| *Based on:* | 0.01 *gr/ACF* | | *Vendor performance guarantee* |
| | 25,015 *ACFM* | 42,500 *Am³/hr* | *Man. Spec. Sheet* |

**Sample Calculation**

**GC Circuit (exhaust through 81-DCL-100)**

| **PM2.5/PM10/PM** | (Dust Collector performance) | (Rated flow) | (Conversion) | (Conversion) |
|---|---|---|---|---|
| 2.1 *lb/hr* | 0.01 *~~gr~~* / *~~ACF~~* | 25,015 *~~ACF~~* / *~~min~~* | 60 *~~min~~* / *hr* | *lb* / 7,000 *~~gr~~* |

| | | |
|---|---|---|
| Conversion(s): | 3.2808 | *ft/m* |
| | 2,000 | *lb/ton* |
| | 1.1023 | *ton/t* |
| | 7,000 | *gr/lb* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 3 | OF: 18 | SHEET: Mill |
| AIR EMISSION CALCULATIONS | SUBJECT: Processing Emissions | DATE: October 14, 2021 | | |

**Coarse Ore Transfer to Stockpile (EU ID: 45)**
**Activity Information**

| | | | |
|---|---|---|---|
| Coarse Ore Throughput | 5,100 | *ton/hr* | *Gyratory crusher design rate* |
| | 122,400 | *ton/day* | *Gyratory crusher throughput* |
| | 44,676,000 | *ton/yr* | *Gyratory crusher throughput* |
| Stockpile Total Capacity | 192,000 | *ton* | *Donlin* |
| Stockpile Live Capacity | 42,000 | *ton* | *Donlin* |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |

| Emission Sources | EU ID | Control Equipment |
|---|---|---|
| Stockpile Feed Conveyor 14-CVB-200 | 45 | Enclosure |

**Emission Factor(s)**

| | | | | | |
|---|---|---|---|---|---|
| Emission Factor Equation | $E = 0.0032k(U/5)^{1.3}/(M/2)^{1.4}$ | | | | *AP-42, Sec. 13.2.4, Eq. 1, 11/06* |
| U = Mean wind speed | 1.3 | *mph* | | | *Minimum applicable wind speed to account for cover* |
| M = Material moisture content | 1.8 | *%* | | | *Donlin* |
| | PM2.5 | PM10 | PM | | |
| k = Particle size multiplier | 0.053 | 0.35 | 0.74 | | *AP-42, Sec. 13.2.4, Pg. 4, 11/06* |
| E = Emission factor | 0.000034 | 0.00023 | 0.00048 | *lb/ton* | |

**Stockpile Feed Conveyor 14-CVB-200**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.17 | 4.2 | 0.8 |
| PM10 | 1.15 | 27.6 | 5.0 |
| PM | 2.43 | 58.3 | 10.6 |

**Sample Calculation**
**Stockpile Feed Conveyor 14-CVB-200**
**PM10**

$$1.15\ lb/hr = \frac{0.00023\ lb}{\cancel{ton}} \times \frac{5{,}100\ \cancel{ton}}{hr}$$

$$27.6\ lb/day = \frac{0.00023\ lb}{\cancel{ton}} \times \frac{122{,}400\ \cancel{ton}}{day}$$

$$5.0\ ton/yr = \frac{0.00023\ \cancel{lb}}{\cancel{ton}} \times \frac{44{,}676{,}000\ \cancel{ton}}{yr} \times \frac{ton}{2000\ \cancel{lb}}$$

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 4 | OF: 18 | SHEET: Mill |
| AIR EMISSION CALCULATIONS | SUBJECT: Processing Emissions | DATE: October 14, 2021 | | |

**Coarse Ore Stockpile Reclaim and Transfer to SAG Mill (EU ID: 46-54)**
**Activity Information**

| | | | |
|---|---|---|---|
| SAG Mill Feed Conveyor Throughput | 3,303 | *ton/hr* | *Includes pebble recycling* |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| Apron Feeder 14-FEE-200 | 46 | 81-DCL-200 | Dust Collector | 47 |
| Apron Feeder 14-FEE-210 | 48 | 81-DCL-300 | Dust Collector | 49 |
| Apron Feeder 14-FEE-220 | 50 | 81-DCL-400 | Dust Collector | 51 |
| Apron Feeder 14-FEE-230 | 52 | 81-DCL-500 | Dust Collector | 53 |
| SAG Mill Feed Conveyor 16-CVB-300 | 54 | Enclosure | | |

**Apron Feeder 14-FEE-200**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.5 | 11.5 | 2.1 |

*Based on:* 0.01 *gr/ACF* — *Vendor performance guarantee*
5,591 *ACFM* 9,500 *Am$^3$/hr* — *Man. Spec. Sheet*

**Apron Feeder 14-FEE-210**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.5 | 11.5 | 2.1 |

*Based on:* 0.01 *gr/ACF* — *Vendor performance guarantee*
5,591 *ACFM* 9,500 *Am$^3$/hr* — *Man. Spec. Sheet*

**Apron Feeder 14-FEE-220**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.5 | 11.5 | 2.1 |

*Based on:* 0.01 *gr/ACF* — *Vendor performance guarantee*
5,591 *ACFM* 9,500 *Am$^3$/hr* — *Man. Spec. Sheet*

**Apron Feeder 14-FEE-230**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.5 | 11.5 | 2.1 |

*Based on:* 0.01 *gr/ACF* — *Vendor performance guarantee*
5,591 *ACFM* 9,500 *Am$^3$/hr* — *Man. Spec. Sheet*

Conversion(s): 3.2808 *ft/m*
2,000 *lb/ton*
7,000 *gr/lb*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Coarse Ore Stockpile Reclaim and Transfer to SAG Mill (EU ID: 46-54) - continued**
**SAG Mill Feed Conveyor 16-CVB-300**
**Emission Factor(s)**

| | | | | |
|---|---|---|---|---|
| Emission Factor Equation | $E = 0.0032k(U/5)^{1.3}/(M/2)^{1.4}$ | | | *AP-42, Sec. 13.2.4, Eq. 1, 11/06* |
| U = Mean wind speed | 1.3 *mph* | | | *Minimum applicable wind speed to account for enclosure* |
| M = Material moisture content | 1.8 % | | | *Donlin* |
| | PM2.5 | PM10 | PM | |
| k = Particle size multiplier | 0.053 | 0.35 | 0.74 | *AP-42, Sec. 13.2.4, Pg. 4, 11/06* |
| E = Emission factor | 0.000034 | 0.00023 | 0.00048 | *lb/ton* |

**SAG Mill Feed Conveyor 16-CVB-300**

| **Emissions** | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.11 | 2.7 | 0.5 |
| PM10 | 0.74 | 17.9 | 3.3 |
| PM | 1.57 | 37.8 | 6.9 |

**Sample Calculation**
**Apron Feeder 14-FEE-200 (exhaust through 81-DCL-200)**

| **PM2.5/PM10/PM** | (Dust Collector performance) | (Rated flow) | (Conversion) | (Conversion) |
|---|---|---|---|---|
| 0.5 *lb/hr* | 0.01 ~~*gr*~~ / ~~*ACF*~~ | 5,591 ~~*ACF*~~ / ~~*min*~~ | 60 ~~*min*~~ / *hr* | *lb* / 7,000 ~~*gr*~~ |

Conversion(s):
3.2808 *ft/m*
2,000 *lb/ton*
7,000 *gr/lb*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Pebble Crushers and Recycle (EU ID: 55-58)**
**Activity Information**

| | | | |
|---|---|---|---|
| SAG Mill Throughput | 3,303 | *ton/hr* | *Donlin* |
| Pebble Crusher Design Throughput | 660 | *ton/hr* | *Donlin* |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| Pebble Crushers 16-CRU-200, 300 | 55, 56 | 81-DCL-600 | Dust Collector | 57 |
| Pebble Discharge Conveyor 16-CVB-480 | 58 | Enclosure | | |

**Pebble Crushers 16-CRU-200, 300**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 2.6 | 61.8 | 11.3 |

*Based on:* 0.01 *gr/ACF* — *Vendor performance guarantee*
30,017 *ACFM* 51,000 *Am*$^3$*/hr* — *Man. Spec. Sheet*

**Pebble Discharge Conveyor 16-CVB-480**

**Emission Factor(s)**

| | PM2.5 | PM10 | PM | |
|---|---|---|---|---|
| Emission Factor Equation | $E = 0.0032k(U/5)^{1.3}/(M/2)^{1.4}$ | | | *AP-42, Sec. 13.2.4, Eq. 1, 11/06* |
| U = Mean wind speed | 1.3 *mph* | | | *Minimum applicable wind speed to account for enclosure* |
| M = Material moisture content | 1.8 % | | | *Donlin* |
| k = Particle size multiplier | 0.053 | 0.35 | 0.74 | *AP-42, Sec. 13.2.4, Pg. 4, 11/06* |
| E = Emission factor | 0.000034 | 0.00023 | 0.00048 | *lb/ton* |

**Pebble Discharge Conveyor 16-CVB-480**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.02 | 0.5 | 0.1 |
| PM10 | 0.15 | 3.6 | 0.7 |
| PM | 0.31 | 7.5 | 1.4 |

**Sample Calculation**
**Pebble Crushers 16-CRU-200, 300 (exhaust through 81-DCL-600)**

| **PM2.5/PM10/PM** | (Dust Collector performance) | (Rated flow) | (Conversion) | (Conversion) |
|---|---|---|---|---|
| 2.6 *lb/hr* | 0.01 ~~*gr*~~ / ~~*ACF*~~ | 30,017 ~~*ACF*~~ / ~~*min*~~ | 60 ~~*min*~~ / *hr* | *lb* / 7,000 ~~*gr*~~ |

| | | |
|---|---|---|
| Conversion(s): | 3.2808 | *ft/m* |
| | 2,000 | *lb/ton* |
| | 7,000 | *gr/lb* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| **Air Sciences Inc.** | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 7 | OF: 18 | SHEET: Mill |
| **AIR EMISSION CALCULATIONS** | SUBJECT: Processing Emissions | DATE: October 14, 2021 | | |

**Reagents (EU ID: 59-76)**
**Lime**

| | | | |
|---|---|---|---|
| Lime Consumption | 28,386 | *t/yr* | *Donlin* |
| | 31,290 | *ton/yr* | |
| Lime Equipment Design Rating | | | |
| Lime Hopper 15-HOP-535 | 110 | *t* | *Donlin* |
| Lime Silo 15-BIN-800 | 122 | *t* | *Man. Spec. Sheet* |
| Lime Slaker 15-MIL-400 | | | |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| Lime Hopper 15-HOP-535 | 59 | 15-FIL-535 | Dust Collector | 60 |
| Lime Silo 15-BIN-800 | 61 | 15-DCL-700 | Dust Collector | 62 |
| Lime Slaker 15-MIL-400 | 63 | 15-SBW-550 | Wet Scrubber | 64 |

**Lime Hopper 15-HOP-535**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | |
|---|---|---|---|---|
| PM2.5/PM10/PM | 0.26 | 6.17 | 1.13 | |
| *Based on:* | 0.02 *gr/ACF* | | | *Vendor performance guarantee* |
| | 1,500 *ACFM* | | | *Estimate* |

**Lime Silo 15-BIN-800**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | |
|---|---|---|---|---|
| PM2.5/PM10/PM | 0.26 | 6.17 | 1.13 | |
| *Based on:* | 0.02 *gr/ACF* | | | *Vendor performance guarantee* |
| | 1,500 *ACFM* | | | *Proposal Document* |

**Lime Slaker 15-MIL-400**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | |
|---|---|---|---|---|
| PM2.5/PM10/PM | 0.11 | 2.58 | 0.47 | |
| *Based on:* | 0.02 *gr/ACF* | | | *Vendor performance guarantee* |
| | 628 *ACFM* | 1,067 *Am³/hr* | | *Proposal Document* |

**Sample Calculation**
**Lime Hopper 15-HOP-535 (exhaust through 15-FIL-535)**

**PM2.5/PM10/PM**

$$0.26\ lb/hr = \frac{0.02\ gr}{ACF} \times \frac{1{,}500\ ACF}{min} \times \frac{60\ min}{hr} \times \frac{lb}{7{,}000\ gr}$$

(Dust Collector performance) (Rated flow) (Conversion) (Conversion)

| Conversion(s): | | |
|---|---|---|
| | 2,000 | *lb/ton* |
| | 1.1023 | *ton/t* |
| | 7,000 | *gr/lb* |
| | 3.2808 | *ft/m* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Reagents (EU ID: 59-76) - continued**
**Flocculants**

| | | | |
|---|---|---|---|
| Flocculant 1 Consumption | 1,269 | *t/yr* | *Donlin* |
| | 1,399 | *ton/yr* | |
| Flocculant 2 Consumption | 920 | *t/yr* | *Donlin* |
| | 1,014 | *ton/yr* | |
| Flocculant 3 Consumption | 1,133 | *t/yr* | *Donlin* |
| | 1,249 | *ton/yr* | |
| Total Flocculant Consumption | 3,662 | *ton/yr* | |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| Flocculant Handling and Mixing 15-FLOC | 65 | 15-DCL-XFL | Dust Collector | 66 |

**Flocculant Handling and Mixing 15-FLOC**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.14 | 3.46 | 0.63 |

*Based on:* 0.02 *gr/ACF* *Vendor performance guarantee*
840 *ACFM* *Donlin*

**Sample Calculation**
**Flocculant Handling and Mixing (exhaust through 15-DCL-XFL)**

| **PM2.5/PM10/PM** | (Dust Collector performance) | (Rated flow) | (Conversion) | (Conversion) |
|---|---|---|---|---|
| 0.14 *lb/hr* | 0.02 ~~gr~~ / ~~ACF~~ | 840 ~~ACF~~ / ~~min~~ | 60 ~~min~~ / *hr* | *lb* / 7,000 ~~gr~~ |

Conversion(s): 2,000 *lb/ton*
1.1023 *ton/t*
7,000 *gr/lb*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Reagents (EU ID: 59-76) - continued**
**Caustic Soda (NaOH)**

| | | | |
|---|---|---|---|
| NaOH Consumption | 276 | *t/yr* | *Donlin* |
| | 304 | *ton/yr* | |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| Caustic Soda Handling and Mixing 15-NAOH | 67 | 15-DCL-100 | Dust Collector | 68 |

**Caustic Soda Handling and Mixing 15-NAOH**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.23 | 5.45 | 0.99 |

*Based on:* 0.02 *gr/ACF* — *Vendor performance guarantee*
1,324 *ACFM* 2,250 *Am³/hr* — *Donlin*

**Sample Calculation**
**Caustic Soda Handling and Mixing (exhaust through 15-DCL-100)**

| **PM2.5/PM10/PM** | (Dust Collector performance) | (Rated flow) | (Conversion) | (Conversion) |
|---|---|---|---|---|
| 0.23 *lb/hr* | 0.02 ~~gr~~ / ~~ACF~~ | 1,324 ~~ACF~~ / ~~min~~ | 60 ~~min~~ / *hr* | *lb* / 7,000 ~~gr~~ |

**Copper Sulfate**
Copper Sulfate Consumption

| | | | |
|---|---|---|---|
| Flotation | 1,953 | *t/yr* | *Donlin* |
| CN Destruction | 257 | *t/yr* | *Donlin* |
| Total | 2,210 | *t/yr* | |
| | 2,436 | *ton/yr* | |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| Copper Sulfate Handling and Mixing 15-CUSO4 | 69 | 15-DCL-105 | Dust Collector | 70 |

**Copper Sulfate Handling and Mixing 15-CUSO4**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.51 | 12.35 | 2.25 |

*Based on:* 0.02 *gr/ACF* — *Vendor performance guarantee*
3,002 *ACFM* 5,100 *Am³/hr* — *Donlin*

**Sample Calculation**
**Copper Sulfate Handling and Mixing (exhaust through 15-DCL-105)**

| **PM2.5/PM10/PM** | (Dust Collector performance) | (Rated flow) | (Conversion) | (Conversion) |
|---|---|---|---|---|
| 0.51 *lb/hr* | 0.02 ~~gr~~ / ~~ACF~~ | 3,002 ~~ACF~~ / ~~min~~ | 60 ~~min~~ / *hr* | *lb* / 7,000 ~~gr~~ |

Conversion(s):
2,000 *lb/ton*
1.1023 *ton/t*
7,000 *gr/lb*
3.2808 *ft/m*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Reagents (EU ID: 59-76) - continued**

**Xanthate (PAX)**

| | | | |
|---|---|---|---|
| PAX Consumption | 3,906 | t/yr | Donlin |
| | 4,306 | ton/yr | |
| Operation | 365 | days/yr | |
| | 24 | hr/day | |

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| PAX Handling and Mixing 15-PAX | 71 | 15-DCL-110 | Dust Collector | 72 |

**PAX Handling and Mixing 15-PAX**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5/PM10/PM | 0.51 | 12.35 | 2.25 |

*Based on:* 0.02 *gr/ACF* — *Vendor performance guarantee*

3,002 *ACFM* 5,100 *Am³/hr* — *Donlin*

**Sample Calculation**

**PAX Handling and Mixing (exhaust through 15-DCL-110)**

**PM2.5/PM10/PM**

$$0.51\ lb/hr = \frac{0.02\ \cancel{gr}}{\cancel{ACF}} \times \frac{3{,}002\ \cancel{ACF}}{\cancel{min}} \times \frac{60\ \cancel{min}}{hr} \times \frac{lb}{7{,}000\ \cancel{gr}}$$

(Dust Collector performance) (Rated flow) (Conversion) (Conversion)

**Soda Ash**

| | | | |
|---|---|---|---|
| Soda Ash Consumption | 976 | t/yr | Donlin |
| | 1,076 | ton/yr | |
| Operation | 365 | days/yr | |
| | 24 | hr/day | |

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| Soda Ash Handling 15-SODA1 | 73 | 15-DCL-520 | Dust Collector | 74 |
| Soda Ash Mixing 15-SODA2 | 75 | 15-DCL-115 | Dust Collector | 76 |

**Soda Ash Handling 15-SODA1**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5/PM10/PM | 0.34 | 8.23 | 1.50 |

*Based on:* 0.02 *gr/ACF* — *Vendor performance guarantee*

2,000 *ACFM* — *Estimate*

**Soda Ash Mixing 15-SODA2**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5/PM10/PM | 0.51 | 12.35 | 2.25 |

*Based on:* 0.02 *gr/ACF* — *Vendor performance guarantee*

3,002 *ACFM* 5,100 *Am³/hr* — *Donlin*

**Sample Calculation**

**Soda Ash Mixing (exhaust through 15-DCL-115)**

**PM2.5/PM10/PM**

$$0.51\ lb/hr = \frac{0.02\ \cancel{gr}}{\cancel{ACF}} \times \frac{3{,}002\ \cancel{ACF}}{\cancel{min}} \times \frac{60\ \cancel{min}}{hr} \times \frac{lb}{7{,}000\ \cancel{gr}}$$

(Dust Collector performance) (Rated flow) (Conversion) (Conversion)

Conversion(s):

| | |
|---|---|
| 3.2808 | ft/m |
| 2,000 | lb/ton |
| 1.1023 | ton/t |
| 7,000 | gr/lb |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Autoclaves (EU ID: 77-84)**
**Activity Information**

| | | | |
|---|---|---|---|
| Autoclave Design Ore Rating (dry) | 190.5 | *t/hr/autoclave* | *Donlin* |
| | 210 | *ton/hr/autoclave* | |
| No. of Autoclaves | 2 | | |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| Autoclave 17-AUT-101 | 77 | 17-VEA-103 | Condenser | 78 |
| | | 17-SBW-101 | Venturi Scrubber | 79 |
| | | 17-VEA-104 | VOC/Hg Carbon Filter | 80 |
| **Emission Sources** | **EU ID** | **Control Equipment** | | **EU ID** |
| Autoclave 17-AUT-201 | 81 | 17-VEA-203 | Condenser | 82 |
| | | 17-SBW-201 | Venturi Scrubber | 83 |
| | | 17-VEA-204 | VOC/Hg Carbon Filter | 84 |

**Autoclave 17-AUT-101**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.22 | 5.29 | 0.97 |
| SO2 | 1.12 | 26.83 | 4.90 |
| H2S | 0.32 | 7.6 | 1.39 |
| VOC | 0.04 | 1.02 | 0.19 |
| CO | 88.02 | 2,112 | 385.5 |

**Autoclave 17-AUT-201**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.22 | 5.29 | 0.97 |
| SO2 | 1.12 | 26.83 | 4.90 |
| H2S | 0.32 | 7.6 | 1.39 |
| VOC | 0.04 | 1.02 | 0.19 |
| CO | 88.02 | 2,112 | 385.5 |

| | | | | | |
|---|---|---|---|---|---|
| *Based on:* | | 100 | *g/hr* | *PM* | *Hatch, Hg Emissions Controls Summary, 5/27/2014 (10x safety factor)* |
| | | 507 | *g/hr* | *SO2* | *Hatch, Hg Emissions Controls Summary, 5/27/2014 (10x safety factor)* |
| | | 144 | *g/hr* | *H2S* | *Hatch, Hg Emissions Controls Summary, 5/27/2014 (10x safety factor)* |
| | | 19 | *g/hr* | *VOC* | *Hatch, Hg Emissions Controls Summary, 5/27/2014 (10x safety factor)* |
| 1.1E-03 | *gr/SCF* | 2,600 | *ppm* | *CO* | *Email T. Krumins, Hatch, 10/9/2013* |
| | | 40.0 | *C, stack* | | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| 7,550 | *SCFM,dry* | 2.8% | *moisture* | | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| 7,764 | *SCFM,wet* | 14,584 | *Am$^3$/hr* | | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| | | 8,584 | *ACFM* | | |

**Sample Calculation**
**Autoclave 17-AUT-101 (exhaust through 17-VEA-104A)**
**CO**

| | (Pollutant concentration) | (Rated flow) | (Conversion) | (Conversion) | |
|---|---|---|---|---|---|
| 88.02 *lb/hr* | 2,600 ~~*SCF*~~ CO | 7,764 ~~*SCF*~~ | 60 ~~*min*~~ | ~~*lb-mole*~~ | 28 *lb CO* |
| | 1.0E+06 ~~*SCF*~~ | ~~*min*~~ | *hr* | 385.32 ~~*SCF*~~ | ~~*lb-mole*~~ |

| | | | | | | |
|---|---|---|---|---|---|---|
| Conversion(s): | 64,799 | *µg/gr* | 1.1023 | *ton/t* | 20 | *C, standard temperature* |
| | 35.315 | *ft$^3$/m$^3$* | 7,000 | *gr/lb* | 385.32 | *scf/lb-mole (20C)* |
| | 2,000 | *lb/ton* | 453.59 | *g/lb* | 14.696 | *psia, standard presure* |
| | | | | | 14.2 | *psia, actual pressure* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Pressure Oxidation Hot Cure Tanks (EU ID: 85-87)**
**Activity Information**

Operation 365 *days/yr*
24 *hr/day*

| Emission Sources | | EU ID | Control Equipment |
|---|---|---|---|
| Hot Cure Tanks | 17-TNK-302, 303, 304 | 85, 86, 87 | Steam Vent Only |

| **Hot Cure Tanks** | **17-TNK-302, 303, 304** | | |
|---|---|---|---|
| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
| PM2.5/PM10/PM | 0.40 | 9.58 | 1.75 |

*Based on:* 181 *g/hr* *PM* *Hatch, Hg Emissions Controls Summary, 5/27/2014*

100.0 *C, stack* *Hatch, Hg Emissions Controls Summary, 5/27/2014*
232 *Am*$^3$*/hr* *Hatch, Hg Emissions Controls Summary, 5/27/2014*
137 ACFM

**Sample Calculation**
**Hot Cure Tanks (common exhaust)**
**PM2.5/PM10/PM**

| | (Pollutant concentration) | (Conversion) |
|---|---|---|
| 0.40 *lb/hr* | 181 *g* / *hr* | *lb* / 453.59 *g* |

Conversion(s): 2,000 *lb/ton*
453.59 *g/lb*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Carbon Regeneration Kiln (EU ID: 88-90)** **(Electric)**

**Activity Information**

| | | | |
|---|---|---|---|
| Kiln Design Throughput | 1.5 | *t/hr* | *Donlin* |
| | 1.65 | *ton/hr* | |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| Carbon Regeneration Kiln 56-KLN-100 | 88 | 56-CDO-30( | Off Gas Cooler | 89 |
| | | 56-FIL-205 | Carbon Filter | 90 |

**Carbon Regeneration Kiln 56-KLN-100**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.44 | 10.5 | 1.9 |
| CO | 0.88 | 21.1 | 3.8 |
| NOx | 0.018 | 0.42 | 0.08 |
| VOC | 0.44 | 10.5 | 1.9 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Based on:* | 0.0218 | *gr/dscf* | 50,000 | *µg/Nm³* | *PM* | *Based on Barrick Goldstrike 2006-2012 test data (Method 29, 5/202, Kiln 2)* |
| | 0.0437 | *gr/dscf* | 100,000 | *µg/Nm³* | *CO* | *Based on Barrick Goldstrike 2006-2011 test data (Method 10, Kiln 2)* |
| | 0.0009 | *gr/dscf* | 2,000 | *µg/Nm³* | *NOx* | *Based on Barrick Goldstrike 2006-2007 test data (Method 7E, Kiln 2)* |
| | 0.0218 | *gr/dscf* | 50,000 | *µg/Nm³* | *VOC* | *Based on Barrick Goldstrike 2006-2011 test data (Method 25A, Kiln 2)* |
| | | | 39 | *C, stack temperature* | | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| | 2,346 | *SCFM,dry* | 3.7% | *moisture* | | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| | 2,437 | *SCFM,wet* | 4,563 | *Am³/hr* | | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| | | | 2,686 | *ACFM* | | |

**Sample Calculation**

**Carbon Regeneration Kiln 56-KLN-100 (exhaust through 56-FIL-205)**

| **PM2.5/PM10/PM** | (Pollutant concentration) | (Rated flow) | (Conversion) | (Conversion) |
|---|---|---|---|---|
| 0.44 *lb/hr* | 0.0218 ~~*gr*~~ / ~~*SCF*~~ | 2,346 ~~*SCF*~~ / ~~*min*~~ | 60 ~~*min*~~ / *hr* | *lb* / 7,000 ~~*gr*~~ |

| | | | | |
|---|---|---|---|---|
| Conversion(s): | 20 | *C, standard temperature* | 14.696 | *psia, standard presure* |
| | 64,799 | *µg/gr* | 14.2 | *psia, actual pressure* |
| | 35.315 | *ft³/m³* | | |
| | 2,000 | *lb/ton* | | |
| | 1.1023 | *ton/t* | | |
| | 7,000 | *gr/lb* | | |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | | BY: E. Memon |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 14 | OF: 18 | SHEET: Mill |
| AIR EMISSION CALCULATIONS | SUBJECT: Processing Emissions | DATE: October 14, 2021 | | |

**Electrowinning Circuit (EU ID: 91-96 (EW)**
**Activity Information**

| | | | |
|---|---|---|---|
| EW Circuit Design Throughput | 211 | *gpm* | *Donlin* |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |

| Emission Sources | EU ID | Control Equipment | EU ID |
|---|---|---|---|
| EW Cells 37-EWN-100, 200, 300, 400 | 91, 92, 93, 94 | 37-DEM-XEW (Demister), 37-FIL-110 (Carbon Filter) | 95, 96 |
| Pregnant Solution Tank 56-TNK-518 | -- | | |
| Barren Solution Tanks 56-TNK-512, 19-TNK-520 | -- | | |

**EW Circuit**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.19 | 4.5 | 0.82 |

| | | | | |
|---|---|---|---|---|
| *Based on:* | 0.00524 *gr/dscf* | 12,000 *µg/Nm³* | *PM* | *Based on Barrick Goldstrike 2008-2012 test data (Method 29, EW)* |
| | | 83 *C, stack temperature* | | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| | 4,189 *SCFM,dry* | 48% *moisture* | | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| | 8,118 *SCFM,wet* | 17,341 *Am³/hr* | | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| | | 10,207 *ACFM* | | |

**Sample Calculation**
**EW Circuit (exhaust through 37-FIL-110)**

| **PM2.5/PM10/PM** | (Pollutant concentration) | (Rated flow) | (Conversion) | (Conversion) |
|---|---|---|---|---|
| 0.19 *lb/hr* | 0.0052 ~~*gr*~~ / ~~*SCF*~~ | 4,189 ~~*SCF*~~ / ~~*min*~~ | 60 ~~*min*~~ / *hr* | *lb* / 7,000 ~~*gr*~~ |

| Conversion(s): | | | | |
|---|---|---|---|---|
| | 20 | *C, standard temperature* | 14.696 | *psia, standard presure* |
| | 64,799 | *µg/gr* | 14.2 | *psia, actual pressure* |
| | 35.315 | *ft³/m³* | | |
| | 2,000 | *lb/ton* | | |
| | 1.1023 | *ton/t* | | |
| | 7,000 | *gr/lb* | | |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Mercury Retort (EU ID: 97-99)** **(Electric)**
**Activity Information**

Operation 365 *days/yr*
24 *hr/day*

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| Mercury Retort 19-VEZ-100 | 97 | 19-CDO-100 | Condenser | 98 |
| | | 19-COL-100 | Carbon Filter | 99 |

**Mercury Retort 19-VEZ-100**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.03 | 0.73 | 0.13 |

*Based on:* 0.01748 *gr/dscf* 40,000 *μg/Nm³* *PM* *Based on Barrick Goldstrike 2008-2012 test data (Method 29, retort)*

| | | |
|---|---|---|
| | 41 *C, stack temperature* | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| 203 *SCFM,dry* | 7% *moisture* | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| 218 *SCFM,wet* | 411 *Am³/hr* | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| | 242 *ACFM* | |

**Sample Calculation**
**Mercury Retort (exhaust through 19-COL-100)**

| **PM2.5/PM10/PM** | (Pollutant concentration) | (Rated flow) | (Conversion) | (Conversion) |
|---|---|---|---|---|
| 0.03 *lb/hr* | 0.0175 ~~gr~~ / ~~SCF~~ | 203 ~~SCF~~ / ~~min~~ | 60 ~~min~~ / *hr* | *lb* / 7,000 ~~gr~~ |

Conversion(s):

| | |
|---|---|
| 20 *C, standard temperature* | 14.696 *psia, standard presure* |
| 64,799 *μg/gr* | 14.2 *psia, actual pressure* |
| 35.315 *ft³/m³* | |
| 2,000 *lb/ton* | |
| 1.1023 *ton/t* | |
| 7,000 *gr/lb* | |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Induction Smelting Furnace (EU ID: 100-102)** **(Electric)**
**Activity Information**

Operation 365 *days/yr*
24 *hr/day*

| Emission Sources | EU ID | Control Equipment | | EU ID |
|---|---|---|---|---|
| Induction Smelting Furnace 19-FUR-1 | 100 | 19-DCL-XFU | Dust Collector | 101 |
| | | 19-FIL-XFU | Carbon Filter | 102 |

**Induction Smelting Furnace 19-FUR-100**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.95 | 22.8 | 4.2 |

| | | | |
|---|---|---|---|
| *Based on:* 0.00503 *gr/dscf* | 11,500 *µg/Nm*$^3$ | *PM* | *Based on Barrick Goldstrike 2004-2012 test data (Methods 29, 5/202, Furnace)* |
| | 80 *C, stack temperature* | | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| 22,006 *SCFM,dry* | 3.2% *moisture* | | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| 22,744 *SCFM,wet* | 48,177 *Am*$^3$*/hr* | | *Hatch, Hg Emissions Controls Summary, 5/27/2014* |
| | 28,356 *ACFM* | | |

**Sample Calculation**
**Induction Smelting Furnace (exhaust through 19-FIL-XFU)**

| **PM2.5/PM10/PM** | (Pollutant concentration) | (Rated flow) | (Conversion) | (Conversion) |
|---|---|---|---|---|
| 0.95 *lb/hr* | 0.0050 ~~*gr*~~ / ~~*SCF*~~ | 22,006 ~~*SCF*~~ / ~~*min*~~ | 60 ~~*min*~~ / *hr* | *lb* / 7,000 ~~*gr*~~ |

Conversion(s):

| | |
|---|---|
| 20 *C, standard temperature* | 14.696 *psia, standard presure* |
| 64,799 *µg/gr* | 14.2 *psia, actual pressure* |
| 35.315 *ft*$^3$*/m*$^3$ | |
| 2,000 *lb/ton* | |
| 1.1023 *ton/t* | |
| 7,000 *gr/lb* | |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Laboratories (EU ID: 103-110)**
**Activity Information**

| | | | | |
|---|---|---|---|---|
| Sample Preparation | 11 *lb/sample* | 325 *sample/day* | *Donlin* | |
| Operation | 365 *days/yr* | | | |
| | 24 *hr/day* | | | |

| Emission Sources | EU ID | Control Equipment | EU ID |
|---|---|---|---|
| 24-LAB1 - Sample Receiving and Preparation Drying Ovens (2 Grieve 350 Dryers) | 103 | Electric | -- |
| 24-LAB1 - Sample Receiving and Preparation (Crushers, Pulverizers, Splitters, Screens) | 104 | 24-DCL-XL1 Dust Collector | 105 |
| 24-LAB2 - Assay Furnaces | 106 | 24-DCL-XL2 Dust Collector | 107 |
| 24-LAB3 - Metallurgical Drying Oven (Grieve 350 Dryer) | 108 | Electric | -- |
| 24-LAB3 - Metallurgical Material Testing (Grinding Rollers, Screens) | 109 | 24-DCL-XL3 Dust Collector | 110 |

**Sample Receiving and Preparation Laboratory 24-LAB1**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.45 | 10.9 | 2.0 |

| | | | | |
|---|---|---|---|---|
| *Based on:* | 0.009 *gr/SCF* | 20,000 *μg/Nm³* | *PM* | *Based on Barrick Goldstrike 2011 test data (Method 5/202, Met. Sample Prep.)* |
| | | 20 *C, stack temperature* | | *Estimate* |
| | 5,886 *SCFM* | 10,000 *Am³/hr* | | *Based on Barrick Goldstrike 2011 test data (Method 5/202, Met. Sample Prep.)* |
| | | 5,886 *ACFM* | | |

**Assay Laboratory 24-LAB2**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.94 | 22.7 | 4.1 |

| | | | | |
|---|---|---|---|---|
| *Based on:* | 0.004 *gr/SCF* | 9,200 *μg/Nm³* | *PM* | *Based on Barrick Goldstrike 2008-2012 test data (Method 29, Fire Assay)* |
| | | 40 *C, stack temperature* | | *Estimate* |
| | 27,550 *SCFM* | 50,000 *Am³/hr* | | *Based on Barrick Goldstrike 2008-2012 test data (Method 29, Fire Assay)* |
| | | 29,429 *ACFM* | | |

**Metallurgical Laboratory 24-LAB3**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.45 | 10.9 | 2.0 |

| | | | | |
|---|---|---|---|---|
| *Based on:* | 0.009 *gr/SCF* | 20,000 *μg/Nm³* | *PM* | *Based on Barrick Goldstrike 2011 test data (Method 5/202, Met. Sample Prep.)* |
| | | 20 *C, stack temperature* | | *Estimate* |
| | 5,886 *SCFM* | 10,000 *Am³/hr* | | *Based on Barrick Goldstrike 2011 test data (Method 5/202, Met. Sample Prep.)* |
| | | 5,886 *ACFM* | | |

| | |
|---|---|
| Conversion(s): | 20 *C, standard temperature* |
| | 64,799 *μg/gr* |
| | 35.315 *ft³/m³* |
| | 2,000 *lb/ton* |
| | 1.1023 *ton/t* |
| | 7,000 *gr/lb* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| **Air Sciences Inc.** | **PROJECT TITLE:** Donlin Gold | | **BY:** E. Memon | |
|---|---|---|---|---|
| | **PROJECT NO:** 281-1-2 | **PAGE:** 18 | **OF:** 18 | **SHEET:** Mill |
| **AIR EMISSION CALCULATIONS** | **SUBJECT:** Processing Emissions | **DATE:** October 14, 2021 | | |

**Water Treatment Plant (EU ID: 111-112)** **(WTP)**

**Water Conditioning**

Conditioner Consumption Unknown *t/yr*

*Emissions are not based on throughput rate. Instead, emissions are conservatively based on the maximum control system exhaust fan flow rate and the maximum estimated particulate concentration in the exhaust.*

Operation 365 *days/yr*

24 *hr/day*

| Emission Sources | EU ID | Control Equipment | EU ID |
|---|---|---|---|
| WTP Water Coinditioning (61-COND) | 111 | 54-DCL-710 Dust Collector | 112 |

**WTP Water Coinditioning (61-COND)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5/PM10/PM | 0.26 | 6.17 | 1.13 |

*Based on:* 0.02 *gr/scf* — *Vendor performance guarantee*

1,500 *SCFM* — *Estimate*

**Sample Calculation**

**WTP Water Coinditioning (61-COND)**

**PM2.5/PM10/PM**

| | (Dust Collector performance) | (Rated flow) | (Conversion) | (Conversion) |
|---|---|---|---|---|
| 0.26 *lb/hr* | 0.02 ~~*gr*~~ / ~~*scf*~~ | 1,500 ~~*scf*~~ / ~~*min*~~ | 60 ~~*min*~~ / *hr* | *lb* / 7,000 ~~*gr*~~ |

Conversion(s): 2,000 *lb/ton*

1.1023 *ton/t*

7,000 *gr/lb*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 1 | OF: 13 | SHEET: Boilers |
| AIR EMISSION CALCULATIONS | SUBJECT: Boiler/Heater Emissions | DATE: October 14, 2021 | | |

**Boilers and Heaters Emissions Summary** *(ton/yr)*

| Boiler/Heater | Rate | | CO | NOx | PM2.5 | PM10 | PM | SO2 | VOC | Fuel |
|---|---|---|---|---|---|---|---|---|---|---|
| POX Boilers (2) | 58.58 | *MMBtu/hr* | 21.13 | 39.42 | 1.91 | 1.97 | 6.50 | 0.40 | 1.38 | *NG or ULSD* |
| Oxygen Plant Boiler | 20.66 | *MMBtu/hr* | 7.45 | 13.91 | 0.67 | 0.70 | 2.29 | 0.14 | 0.49 | *NG or ULSD* |
| Carbon Elution Heater | 16 | *MMBtu/hr* | 5.77 | 10.77 | 0.52 | 0.54 | 1.78 | 0.11 | 0.38 | *NG or ULSD* |
| Power Plant Auxiliary Heaters (2) | 33 | *MMBtu/hr* | 11.90 | 22.21 | 1.08 | 1.11 | 3.66 | 0.22 | 0.78 | *NG or ULSD* |
| SO2 Burner | 2 | *MMBtu/hr* | 0.72 | 0.86 | 0.07 | 0.07 | 0.07 | 0.01 | 0.05 | *NG* |
| Auxiliary SO2 Burner | 2 | *MMBtu/hr* | 0.34 | 1.35 | 0.02 | 0.07 | 0.22 | 0.01 | 0.02 | *ULSD* |
| Building Heaters (138) | 24.15 | *MMBtu/hr* | 4.15 | 9.75 | 0.79 | 0.79 | 0.79 | 0.06 | 0.57 | *NG* |
| Air Handlers (19) | 95 | *MMBtu/hr* | 34.27 | 40.79 | 3.10 | 3.10 | 3.10 | 0.24 | 2.24 | *NG* |
| Air Handlers (7) | 17.5 | *MMBtu/hr* | 6.31 | 7.51 | 0.57 | 0.57 | 0.57 | 0.05 | 0.41 | *NG* |
| Portable Heaters (20) | 17.2 | *MMBtu/hr* | 2.89 | 11.58 | 0.14 | 0.58 | 1.91 | 0.12 | 0.20 | *ULSD* |
| **Total** | | | **94.94** | **158.14** | **8.87** | **9.49** | **20.90** | **1.36** | **6.52** | |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 2 | OF: 13 | SHEET: Boilers |
| AIR EMISSION CALCULATIONS | SUBJECT: Boiler/Heater Emissions | DATE: October 14, 2021 | | |

**Pressure Oxidation Boilers (EU ID: 15-16)**
**POX Boiler No. 1 - 17-BLR-301**

| | | | |
|---|---|---|---|
| Make and Model | Clayton Industries, E704 | | |
| Rating | 29.29 *MMBtu/hr* | | *Man. Spec. Sheet* |
| Fuel | NG or ULSD | | |
| Operation | 365 *days/yr* | | |
| | 24 *hr/day* | | |
| | NG [1] | ULSD [2] | |
| Fuel Consumption | 28,716 *Scf/hr* | 225.0 *gal/hr* | |
| | 252 *MMScf/yr* | 1,971,205 *gal/yr* | |

(1) *Based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98*
(2) *Based on* 130,167 *Btu/gal* *Donlin*

| Emission Factor(s) | | NG | ULSD | NG | ULSD |
|---|---|---|---|---|---|
| CO | (2), (5) | 84 *lb/MMScf* | 0.005 *lb/gal* | 0.0824 | 0.0384 *lb/MMBtu* (1) |
| NOx | (2), (5) | 100 *lb/MMScf* | 0.020 *lb/gal* | 0.0980 | 0.1536 *lb/MMBtu* (1) |
| PM2.5 | (3), (4), (6) | 7.6 *lb/MMScf* | 0.00025 *lb/gal* | 0.0075 | 0.00192 *lb/MMBtu* (1) |
| PM10 | (3), (4), (6) | 7.6 *lb/MMScf* | 0.001 *lb/gal* | 0.0075 | 0.0077 *lb/MMBtu* (1) |
| PM | (3), (4), (7) | 7.6 *lb/MMScf* | 0.003 *lb/gal* | 0.0075 | 0.0254 *lb/MMBtu* (1) |
| SO2 | (3), (8) | 0.6 *lb/MMScf* | | 0.0006 | 0.0016 *lb/MMBtu* (1) |
| VOC | (3), (9) | 5.5 *lb/MMScf* | 0.0002 *lb/gal* | 0.0054 | 0.00154 *lb/MMBtu* (1) |

(1) *NG based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98* *No. 1* 130,167 *Btu/gal*
(2) *AP-42, Tab. 1.4-1, 07/98 (boilers < 100 MMBtu/hr)*
(3) *AP-42, Tab. 1.4-2, 07/98*
(4) *Assumed PM2.5 = PM10 = PM*
(5) *AP-42, Tab. 1.3-1, 05/10 (distillate oil, < 100 MMBtu/hr)*
(6) *AP-42, Tab. 1.3-6, 05/10 (distillate oil, industrial boilers)*
(7) *AP-42, Tabs. 1.3-1 (filterable, distillate oil, < 100 MMBtu/hr) & 1.3-2 (condensable, No. 2 oil), 05/10*
(8) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*
(9) *AP-42, Tab. 1.3-3, 05/10 (distillate oil, industrial boilers)*

**POX Boiler No. 1 - 17-BLR-301**

| | NG | | | ULSD | | | Maximum | | |
|---|---|---|---|---|---|---|---|---|---|
| **Emissions** | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 2.41 | 57.9 | 10.6 | 1.13 | 27.00 | 4.93 | 2.41 | 57.89 | 10.57 |
| NOx | 2.87 | 68.9 | 12.6 | 4.50 | 108.01 | 19.71 | 4.50 | 108.01 | 19.71 |
| PM2.5 | 0.22 | 5.24 | 0.96 | 0.056 | 1.35 | 0.246 | 0.22 | 5.24 | 0.96 |
| PM10 | 0.22 | 5.24 | 0.96 | 0.225 | 5.40 | 0.99 | 0.23 | 5.40 | 0.99 |
| PM | 0.22 | 5.24 | 0.96 | 0.74 | 17.82 | 3.25 | 0.74 | 17.82 | 3.25 |
| SO2 | 0.02 | 0.41 | 0.08 | 0.05 | 1.09 | 0.20 | 0.05 | 1.09 | 0.20 |
| VOC | 0.16 | 3.79 | 0.69 | 0.045 | 1.08 | 0.197 | 0.16 | 3.79 | 0.69 |

**Sample Calculation - POX Boiler No. 1 - 17-BLR-301**
**CO (NG Combustion)**

2.41 *lb/hr* = 0.0824 *lb* / ~~*MMBtu*~~ × 29 ~~*MMBtu*~~ / *hr*

**NOx (NG Combustion)**

2.87 *lb/hr* = 0.0980 *lb* / ~~*MMBtu*~~ × 29 ~~*MMBtu*~~ / *hr*

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Pressure Oxidation Boilers (EU ID: 15-16) - continued**
**POX Boiler No. 2 - 17-BLR-302**

| | | | |
|---|---|---|---|
| Make and Model | Clayton Industries, E704 | | |
| Rating | 29.29 *MMBtu/hr* | | *Man. Spec. Sheet* |
| Fuel | NG or ULSD | | |
| Operation | 365 *days/yr* | | |
| | 24 *hr/day* | | |
| | NG [1] | ULSD [2] | |
| Fuel Consumption | 28,716 *Scf/hr* | 225.0 *gal/hr* | |
| | 252 *MMScf/yr* | 1,971,205 *gal/yr* | |

[1] *Based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98*
[2] *Based on* 130,167 *Btu/gal* *Donlin*

| Emission Factor(s) | | NG | ULSD | NG | ULSD |
|---|---|---|---|---|---|
| CO | (2), (5) | 84 *lb/MMScf* | 0.005 *lb/gal* | 0.0824 | 0.0384 *lb/MMBtu* (1) |
| NOx | (2), (5) | 100 *lb/MMScf* | 0.020 *lb/gal* | 0.0980 | 0.1536 *lb/MMBtu* (1) |
| PM2.5 | (3), (4), (6) | 7.6 *lb/MMScf* | 0.00025 *lb/gal* | 0.0075 | 0.00192 *lb/MMBtu* (1) |
| PM10 | (3), (4), (6) | 7.6 *lb/MMScf* | 0.001 *lb/gal* | 0.0075 | 0.0077 *lb/MMBtu* (1) |
| PM | (3), (4), (7) | 7.6 *lb/MMScf* | 0.003 *lb/gal* | 0.0075 | 0.0254 *lb/MMBtu* (1) |
| SO2 | (3), (8) | 0.6 *lb/MMScf* | | 0.0006 | 0.0016 *lb/MMBtu* (1) |
| VOC | (3), (9) | 5.5 *lb/MMScf* | 0.0002 *lb/gal* | 0.0054 | 0.00154 *lb/MMBtu* (1) |

(1) *NG based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98* *No. 1* 130,167 *Btu/gal*
(2) *AP-42, Tab. 1.4-1, 07/98 (boilers < 100 MMBtu/hr)*
(3) *AP-42, Tab. 1.4-2, 07/98*
(4) *Assumed PM2.5 = PM10 = PM*
(5) *AP-42, Tab. 1.3-1, 05/10 (distillate oil, < 100 MMBtu/hr)*
(6) *AP-42, Tab. 1.3-6, 05/10 (distillate oil, industrial boilers)*
(7) *AP-42, Tabs. 1.3-1 (filterable, distillate oil, < 100 MMBtu/hr) & 1.3-2 (condensable, No. 2 oil), 05/10*
(8) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*
(9) *AP-42, Tab. 1.3-3, 05/10 (distillate oil, industrial boilers)*

**POX Boiler No. 2 - 17-BLR-302**

| | NG | | | ULSD | | | Maximum | | |
|---|---|---|---|---|---|---|---|---|---|
| **Emissions** | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 2.41 | 57.9 | 10.6 | 1.13 | 27.00 | 4.93 | 2.41 | 57.89 | 10.57 |
| NOx | 2.87 | 68.9 | 12.6 | 4.50 | 108.01 | 19.71 | 4.50 | 108.01 | 19.71 |
| PM2.5 | 0.22 | 5.24 | 0.96 | 0.056 | 1.35 | 0.246 | 0.22 | 5.24 | 0.96 |
| PM10 | 0.22 | 5.24 | 0.96 | 0.225 | 5.40 | 0.99 | 0.23 | 5.40 | 0.99 |
| PM | 0.22 | 5.24 | 0.96 | 0.74 | 17.82 | 3.25 | 0.74 | 17.82 | 3.25 |
| SO2 | 0.02 | 0.41 | 0.08 | 0.05 | 1.09 | 0.20 | 0.05 | 1.09 | 0.20 |
| VOC | 0.16 | 3.79 | 0.69 | 0.045 | 1.08 | 0.197 | 0.16 | 3.79 | 0.69 |

**Sample Calculation**
**CO**

2.41 *lb/hr* = 0.0824 *lb* / ~~*MMBtu*~~ × 29 ~~*MMBtu*~~ / *hr*

**NOx**

2.87 *lb/hr* = 0.0980 *lb* / ~~*MMBtu*~~ × 29 ~~*MMBtu*~~ / *hr*

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Oxygen Plant Boiler (EU ID: 17)**
**Oxygen Plant Boiler - 33-BLR-001**

| | | | |
|---|---|---|---|
| Make and Model | Clayton Industries, E504 | | |
| Rating | 20.66 *MMBtu/hr* | *Man. Spec. Sheet* | |
| Fuel | NG or ULSD | | |
| Operation | 365 *days/yr* | | |
| | 24 *hr/day* | | |
| | NG (1) | ULSD (2) | |
| Fuel Consumption | 20,258 *Scf/hr* | 158.7 *gal/hr* | |
| | 177 *MMScf/yr* | 1,390,621 *gal/yr* | |

(1) *Based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98*
(2) *Based on* 130,167 *Btu/gal* *Donlin*

| Emission Factor(s) | | NG | ULSD | NG | ULSD |
|---|---|---|---|---|---|
| CO | (2), (5) | 84 *lb/MMScf* | 0.005 *lb/gal* | 0.0824 | 0.0384 *lb/MMBtu* (1) |
| NOx | (2), (5) | 100 *lb/MMScf* | 0.020 *lb/gal* | 0.0980 | 0.1536 *lb/MMBtu* (1) |
| PM2.5 | (3), (4), (6) | 7.6 *lb/MMScf* | 0.00025 *lb/gal* | 0.0075 | 0.00192 *lb/MMBtu* (1) |
| PM10 | (3), (4), (6) | 7.6 *lb/MMScf* | 0.001 *lb/gal* | 0.0075 | 0.0077 *lb/MMBtu* (1) |
| PM | (3), (4), (7) | 7.6 *lb/MMScf* | 0.003 *lb/gal* | 0.0075 | 0.0254 *lb/MMBtu* (1) |
| SO2 | (3), (8) | 0.6 *lb/MMScf* | | 0.0006 | 0.0016 *lb/MMBtu* (1) |
| VOC | (3), (9) | 5.5 *lb/MMScf* | 0.0002 *lb/gal* | 0.0054 | 0.00154 *lb/MMBtu* (1) |

(1) *NG based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98* *No. 1* 130,167 *Btu/gal*
(2) *AP-42, Tab. 1.4-1, 07/98 (boilers < 100 MMBtu/hr)*
(3) *AP-42, Tab. 1.4-2, 07/98*
(4) *Assumed PM2.5 = PM10 = PM*
(5) *AP-42, Tab. 1.3-1, 05/10 (distillate oil, < 100 MMBtu/hr)*
(6) *AP-42, Tab. 1.3-6, 05/10 (distillate oil, industrial boilers)*
(7) *AP-42, Tabs. 1.3-1 (filterable, distillate oil, < 100 MMBtu/hr) & 1.3-2 (condensable, No. 2 oil), 05/10*
(8) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*
(9) *AP-42, Tab. 1.3-3, 05/10 (distillate oil, industrial boilers)*

**Oxygen Plant Boiler - 33-BLR-001**

| | NG | | | ULSD | | | Maximum | | |
|---|---|---|---|---|---|---|---|---|---|
| **Emissions** | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 1.70 | 40.8 | 7.5 | 0.79 | 19.05 | 3.48 | 1.70 | 40.84 | 7.45 |
| NOx | 2.03 | 48.6 | 8.9 | 3.17 | 76.20 | 13.91 | 3.17 | 76.20 | 13.91 |
| PM2.5 | 0.15 | 3.70 | 0.67 | 0.040 | 0.95 | 0.174 | 0.15 | 3.70 | 0.67 |
| PM10 | 0.15 | 3.70 | 0.67 | 0.159 | 3.81 | 0.70 | 0.16 | 3.81 | 0.70 |
| PM | 0.15 | 3.70 | 0.67 | 0.52 | 12.57 | 2.29 | 0.52 | 12.57 | 2.29 |
| SO2 | 0.01 | 0.29 | 0.05 | 0.03 | 0.77 | 0.14 | 0.03 | 0.77 | 0.14 |
| VOC | 0.11 | 2.67 | 0.49 | 0.032 | 0.76 | 0.139 | 0.11 | 2.67 | 0.49 |

**Sample Calculation**

**CO**

1.70 *lb/hr* = 0.0824 *lb* / ~~*MMBtu*~~ × 21 ~~*MMBtu*~~ / *hr*

**NOx**

2.03 *lb/hr* = 0.0980 *lb* / ~~*MMBtu*~~ × 21 ~~*MMBtu*~~ / *hr*

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Carbon Elution Heater (EU ID: 18)**
**Carbon Elution Heater - 56-BLR-200**

| | | | | |
|---|---|---|---|---|
| Make and Model | Sigma Thermal, BBC-18 | | | |
| Rating | 16 | *MMBtu/hr* | | |
| Fuel | NG or ULSD | | | |
| Operation | 365 | *days/yr* | | |
| | 24 | *hr/day* | | |
| | NG [(1)] | | ULSD [(2)] | |
| Fuel Consumption | 15,686 | *Scf/hr* | 122.9 | *gal/hr* |
| | 137 | *MMScf/yr* | 1,076,771 | *gal/yr* |

(1) *Based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98*
(2) *Based on* 130,167 *Btu/gal* *Donlin*

| Emission Factor(s) | | NG | | ULSD | | NG | ULSD | |
|---|---|---|---|---|---|---|---|---|
| CO | (2), (5) | 84 | *lb/MMScf* | 0.005 | *lb/gal* | 0.0824 | 0.0384 | *lb/MMBtu* (1) |
| NOx | (2), (5) | 100 | *lb/MMScf* | 0.020 | *lb/gal* | 0.0980 | 0.1536 | *lb/MMBtu* (1) |
| PM2.5 | (3), (4), (6) | 7.6 | *lb/MMScf* | 0.00025 | *lb/gal* | 0.0075 | 0.00192 | *lb/MMBtu* (1) |
| PM10 | (3), (4), (6) | 7.6 | *lb/MMScf* | 0.001 | *lb/gal* | 0.0075 | 0.0077 | *lb/MMBtu* (1) |
| PM | (3), (4), (7) | 7.6 | *lb/MMScf* | 0.003 | *lb/gal* | 0.0075 | 0.0254 | *lb/MMBtu* (1) |
| SO2 | (3), (8) | 0.6 | *lb/MMScf* | | | 0.0006 | 0.0016 | *lb/MMBtu* (1) |
| VOC | (3), (9) | 5.5 | *lb/MMScf* | 0.0002 | *lb/gal* | 0.0054 | 0.00154 | *lb/MMBtu* (1) |

(1) *NG based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98* *No. 1* 130,167 *Btu/gal*
(2) *AP-42, Tab. 1.4-1, 07/98 (boilers < 100 MMBtu/hr)*
(3) *AP-42, Tab. 1.4-2, 07/98*
(4) *Assumed PM2.5 = PM10 = PM*
(5) *AP-42, Tab. 1.3-1, 05/10 (distillate oil, < 100 MMBtu/hr)*
(6) *AP-42, Tab. 1.3-6, 05/10 (distillate oil, industrial boilers)*
(7) *AP-42, Tabs. 1.3-1 (filterable, distillate oil, < 100 MMBtu/hr) & 1.3-2 (condensable, No. 2 oil), 05/10*
(8) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*
(9) *AP-42, Tab. 1.3-3, 05/10 (distillate oil, industrial boilers)*

**Carbon Elution Heater - 56-BLR-200**

| | NG | | | ULSD | | | Maximum | | |
|---|---|---|---|---|---|---|---|---|---|
| **Emissions** | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 1.32 | 31.6 | 5.8 | 0.61 | 14.75 | 2.69 | 1.32 | 31.62 | 5.77 |
| NOx | 1.57 | 37.6 | 6.9 | 2.46 | 59.00 | 10.77 | 2.46 | 59.00 | 10.77 |
| PM2.5 | 0.12 | 2.86 | 0.52 | 0.0307 | 0.74 | 0.135 | 0.12 | 2.86 | 0.52 |
| PM10 | 0.12 | 2.86 | 0.52 | 0.123 | 2.95 | 0.54 | 0.12 | 2.95 | 0.54 |
| PM | 0.12 | 2.86 | 0.52 | 0.41 | 9.74 | 1.78 | 0.41 | 9.74 | 1.78 |
| SO2 | 0.01 | 0.23 | 0.04 | 0.02 | 0.60 | 0.11 | 0.02 | 0.60 | 0.11 |
| VOC | 0.09 | 2.07 | 0.38 | 0.0246 | 0.59 | 0.108 | 0.09 | 2.07 | 0.38 |

**Sample Calculation**
**CO**

1.32 *lb/hr* = 0.0824 *lb* / ~~*MMBtu*~~ × 16 ~~*MMBtu*~~ / *hr*

**NOx**

1.57 *lb/hr* = 0.0980 *lb* / ~~*MMBtu*~~ × 16 ~~*MMBtu*~~ / *hr*

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: Boiler/Heater Emissions | DATE: October 14, 2021 | | |

**Power Plant Auxiliary Heaters (EU ID: 19-20)**
**Power Plant Auxiliary Heaters No. 1 - PP-HEU-100**

| | | | | |
|---|---|---|---|---|
| Make and Model | Unknown | | | |
| Rating | 16.5 *MMBtu/hr* | | *Wärtsilä* | |
| Fuel | NG or ULSD | | | |
| Operation | 365 *days/yr* | | | |
| | 24 *hr/day* | | | |
| | NG [1] | | ULSD [2] | |
| Fuel Consumption | 16,176 *Scf/hr* | | 126.8 *gal/hr* | |
| | 142 *MMScf/yr* | | 1,110,420 *gal/yr* | |

[1] *Based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98*
[2] *Based on* 130,167 *Btu/gal* *Donlin*

| Emission Factor(s) | | NG | ULSD | NG | ULSD |
|---|---|---|---|---|---|
| CO | (2), (5) | 84 *lb/MMScf* | 0.005 *lb/gal* | 0.0824 | 0.0384 *lb/MMBtu* [1] |
| NOx | (2), (5) | 50 *lb/MMScf* | 0.020 *lb/gal* | 0.0490 | 0.1536 *lb/MMBtu* [1] |
| PM2.5 | (3), (4), (6) | 7.6 *lb/MMScf* | 0.00025 *lb/gal* | 0.0075 | 0.00192 *lb/MMBtu* [1] |
| PM10 | (3), (4), (6) | 7.6 *lb/MMScf* | 0.001 *lb/gal* | 0.0075 | 0.0077 *lb/MMBtu* [1] |
| PM | (3), (4), (7) | 7.6 *lb/MMScf* | 0.003 *lb/gal* | 0.0075 | 0.0254 *lb/MMBtu* [1] |
| SO2 | (3), (8) | 0.6 *lb/MMScf* | | 0.0006 | 0.0016 *lb/MMBtu* [1] |
| VOC | (3), (9) | 5.5 *lb/MMScf* | 0.0002 *lb/gal* | 0.0054 | 0.00154 *lb/MMBtu* [1] |

[1] *NG based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98* *No. 1* 130,167 *Btu/gal*
[2] *AP-42, Tab. 1.4-1, 07/98, (boilers < 100 MMBtu/hr, Low-NOx)*
[3] *AP-42, Tab. 1.4-2, 07/98*
[4] *Assumed PM2.5 = PM10 = PM*
[5] *AP-42, Tab. 1.3-1, 05/10 (distillate oil, < 100 MMBtu/hr)*
[6] *AP-42, Tab. 1.3-6, 05/10 (distillate oil, industrial boilers)*
[7] *AP-42, Tabs. 1.3-1 (filterable, distillate oil, < 100 MMBtu/hr) & 1.3-2 (condensable, No. 2 oil), 05/10*
[8] *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*
[9] *AP-42, Tab. 1.3-3, 05/10 (distillate oil, industrial boilers)*

**Power Plant Auxiliary Heaters No. 1 - PP-HEU-100**

| | NG | | | ULSD | | | Maximum | | |
|---|---|---|---|---|---|---|---|---|---|
| **Emissions** | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 1.36 | 32.6 | 6.0 | 0.63 | 15.21 | 2.78 | 1.36 | 32.61 | 5.95 |
| NOx | 0.81 | 19.4 | 3.5 | 2.54 | 60.84 | 11.10 | 2.54 | 60.84 | 11.10 |
| PM2.5 | 0.12 | 2.95 | 0.54 | 0.0317 | 0.76 | 0.139 | 0.12 | 2.95 | 0.54 |
| PM10 | 0.12 | 2.95 | 0.54 | 0.127 | 3.04 | 0.56 | 0.13 | 3.04 | 0.56 |
| PM | 0.12 | 2.95 | 0.54 | 0.42 | 10.04 | 1.83 | 0.42 | 10.04 | 1.83 |
| SO2 | 0.01 | 0.23 | 0.04 | 0.03 | 0.62 | 0.11 | 0.03 | 0.62 | 0.11 |
| VOC | 0.09 | 2.14 | 0.39 | 0.0254 | 0.61 | 0.111 | 0.09 | 2.14 | 0.39 |

**Sample Calculation - NG**
**CO**

1.36 *lb/hr* = 0.0824 *lb* / ~~*MMBtu*~~ × 16.5 ~~*MMBtu*~~ / *hr*

**NOx**

0.81 *lb/hr* = 0.0490 *lb* / ~~*MMBtu*~~ × 16.5 ~~*MMBtu*~~ / *hr*

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Power Plant Auxiliary Heaters (EU ID: 19-20) - continued**
**Power Plant Auxiliary Heater No. 2 - PP-HEU-200**

| | | | | |
|---|---|---|---|---|
| Make and Model | Unknown | | | |
| Rating | 16.5 *MMBtu/hr* | | *Wärtsilä* | |
| Fuel | NG or ULSD | | | |
| Operation | 365 *days/yr* | | | |
| | 24 *hr/day* | | | |
| | NG [1] | | ULSD [2] | |
| Fuel Consumption | 16,176 *Scf/hr* | | 126.8 *gal/hr* | |
| | 142 *MMScf/yr* | | 1,110,420 *gal/yr* | |

(1) *Based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98*
(2) *Based on* 130,167 *Btu/gal* *Donlin*

| Emission Factor(s) | | NG | ULSD | NG | ULSD |
|---|---|---|---|---|---|
| CO | (2), (5) | 84 *lb/MMScf* | 0.005 *lb/gal* | 0.0824 | 0.0384 *lb/MMBtu* [1] |
| NOx | (2), (5) | 50 *lb/MMScf* | 0.020 *lb/gal* | 0.0490 | 0.1536 *lb/MMBtu* [1] |
| PM2.5 | (3), (4), (6) | 7.6 *lb/MMScf* | 0.00025 *lb/gal* | 0.0075 | 0.00192 *lb/MMBtu* [1] |
| PM10 | (3), (4), (6) | 7.6 *lb/MMScf* | 0.001 *lb/gal* | 0.0075 | 0.0077 *lb/MMBtu* [1] |
| PM | (3), (4), (7) | 7.6 *lb/MMScf* | 0.003 *lb/gal* | 0.0075 | 0.0254 *lb/MMBtu* [1] |
| SO2 | (3), (8) | 0.6 *lb/MMScf* | | 0.0006 | 0.0016 *lb/MMBtu* [1] |
| VOC | (3), (9) | 5.5 *lb/MMScf* | 0.0002 *lb/gal* | 0.0054 | 0.00154 *lb/MMBtu* [1] |

(1) *NG based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98* *No. 1* 130,167 *Btu/gal*
(2) *AP-42, Tab. 1.4-1, 07/98, (boilers < 100 MMBtu/hr, Low-NOx)*
(3) *AP-42, Tab. 1.4-2, 07/98*
(4) *Assumed PM2.5 = PM10 = PM*
(5) *AP-42, Tab. 1.3-1, 05/10 (distillate oil, < 100 MMBtu/hr)*
(6) *AP-42, Tab. 1.3-6, 05/10 (distillate oil, industrial boilers)*
(7) *AP-42, Tabs. 1.3-1 (filterable, distillate oil, < 100 MMBtu/hr) & 1.3-2 (condensable, No. 2 oil), 05/10*
(8) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*
(9) *AP-42, Tab. 1.3-3, 05/10 (distillate oil, industrial boilers)*

**Power Plant Auxiliary Heater No. 2 - PP-HEU-200**

| | NG | | | ULSD | | | Maximum | | |
|---|---|---|---|---|---|---|---|---|---|
| **Emissions** | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 1.36 | 32.6 | 6.0 | 0.63 | 15.21 | 2.78 | 1.36 | 32.61 | 5.95 |
| NOx | 0.81 | 19.4 | 3.5 | 2.54 | 60.84 | 11.10 | 2.54 | 60.84 | 11.10 |
| PM2.5 | 0.12 | 2.95 | 0.54 | 0.0317 | 0.76 | 0.139 | 0.12 | 2.95 | 0.54 |
| PM10 | 0.12 | 2.95 | 0.54 | 0.127 | 3.04 | 0.56 | 0.13 | 3.04 | 0.56 |
| PM | 0.12 | 2.95 | 0.54 | 0.42 | 10.04 | 1.83 | 0.42 | 10.04 | 1.83 |
| SO2 | 0.01 | 0.23 | 0.04 | 0.03 | 0.62 | 0.11 | 0.03 | 0.62 | 0.11 |
| VOC | 0.09 | 2.14 | 0.39 | 0.0254 | 0.61 | 0.111 | 0.09 | 2.14 | 0.39 |

**Sample Calculation**

**CO**

$$1.36\ lb/hr = \frac{0.0824\ lb}{\cancel{MMBtu}} \times \frac{16.5\ \cancel{MMBtu}}{hr}$$

**NOx**

$$0.81\ lb/hr = \frac{0.0490\ lb}{\cancel{MMBtu}} \times \frac{16.5\ \cancel{MMBtu}}{hr}$$

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**SO2 Burner (EU ID: 21)**
**SO2 Burner - 15-BRN-100**

Make and Model — A. H. Lundberg Associates, Inc., Item No. 11, Auxiliary Natural Gas Burner

Rating — 2 *MMBtu/hr* — *Man. Spec. Sheet*

Fuel — NG

Operation — 365 *days/yr*; 24 *hr/day*

Fuel Consumption — 1,961 *Scf/hr*; 17.2 *MMScf/yr* — *Based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98*

| Emission Factor(s) | *(lb/MMScf)* | *(lb/MMBtu)* [1] | |
|---|---|---|---|
| CO | 84.0 | 0.0824 | *AP-42* [2] |
| NOx | 100.0 | 0.0980 | *AP-42* [2] |
| PM2.5/PM10/PM (Total) | 7.6 | 0.0075 | *AP-42* [3] |
| SO2 | 0.6 | 0.0006 | *AP-42* [3] |
| VOC | 5.5 | 0.0054 | *AP-42* [3] |

(1) *Based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98*

(2) *AP-42, Tab. 1.4-1, 07/98 (boilers < 100 MMBtu/hr)*

(3) *AP-42, Tab. 1.4-2, 07/98*

**SO2 Burner - 15-BRN-100**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| CO | 0.16 | 4.0 | 0.72 |
| NOx | 0.20 | 4.7 | 0.86 |
| PM2.5/PM10/PM (Total) | 0.01 | 0.4 | 0.07 |
| SO2 | 0.001 | 0.03 | 0.01 |
| VOC | 0.01 | 0.3 | 0.05 |

**Sample Calculation**

**CO**

0.16 *lb/hr* = 0.0824 *lb* / ~~*MMBtu*~~ × 2 ~~*MMBtu*~~ / *hr*

**NOx**

0.20 *lb/hr* = 0.0980 *lb* / ~~*MMBtu*~~ × 2 ~~*MMBtu*~~ / *hr*

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
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**Auxiliary SO2 Burner (EU ID: 22)** **1-15-BRN-100**
Make and Model Unknown
Rating 2 *MMBtu/hr* *Donlin*

Fuel ULSD

Operation 365 *days/yr*
24 *hr/day*

Fuel Consumption 15.4 *gal/hr* *Based on* 130,167 *Btu/gal* *Donlin*
134,596 *gal/yr*

| Emission Factor(s) | *(lb/gal)* | *(lb/MMBtu)* (1) | |
|---|---|---|---|
| CO | 0.005 | 0.0384 | *AP-42* (2) |
| NOx | 0.020 | 0.1536 | *AP-42* (2) |
| PM2.5 | 0.00025 | 0.0019 | *AP-42* (3) |
| PM10 | 0.00100 | 0.0077 | *AP-42* (3) |
| PM | 0.003 | 0.0254 | *AP-42* (4) |
| SO2 | | 0.0016 | (5) |
| VOC | 0.00034 | 0.0026 | *AP-42* (6) |

(1) *Based on* 130,167 *Btu/gal*
(2) *AP-42, Tab. 1.3-1, 05/10 (distillate oil, < 100 MMBtu/hr)*
(3) *AP-42, Tab. 1.3-6, 05/10 (distillate oil, industrial boilers)*
(4) *AP-42, Tabs. 1.3-1 (filterable, distillate oil, < 100 MMBtu/hr) & 1.3-2 (condensable, No. 2 oil), 05/10*
(5) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*
(6) *AP-42, Tab. 1.3-3, 05/10 (distillate oil, industrial boilers)*

**Auxiliary SO2 Burner (EU ID: 22) - 1-15-BRN-100**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| CO | 0.08 | 1.8 | 0.34 |
| NOx | 0.31 | 7.4 | 1.35 |
| PM2.5 | 0.004 | 0.1 | 0.02 |
| PM10 | 0.02 | 0.4 | 0.07 |
| PM | 0.05 | 1.2 | 0.22 |
| SO2 | 0.003 | 0.07 | 0.01 |
| VOC | 0.005 | 0.1 | 0.02 |

**Sample Calculation**
**CO**

0.08 *lb/hr* = 0.0384 *lb* / *~~MMBtu~~* × 2.0 *~~MMBtu~~* / *hr*

**NOx**

0.31 *lb/hr* = 0.1536 *lb* / *~~MMBtu~~* × 2.0 *~~MMBtu~~* / *hr*

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Building Heaters (EU ID: 23)**
**Building Heaters - 81-HEU-1 to 138**

| | | | |
|---|---|---|---|
| Make and Model | TRANE, GAND017AEG | | |
| Units | 138 | | *Proposal Document* |
| Rating | 0.175 | *MMBtu/hr* | *Proposal Document* |
| Fuel | NG | | |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |
| Fuel Consumption | 172 | *Scf/hr* | *Based on* 1,020 *Btu/Scf* |
| | 1.5 | *MMScf/yr* | *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98* |

| Emission Factor(s) | *(lb/MMScf)* | *(lb/MMBtu)* [1] | |
|---|---|---|---|
| CO | 40.0 | 0.0392 | *AP-42* [2] |
| NOx | 94.0 | 0.0922 | *AP-42* [2] |
| PM2.5/PM10/PM (Total) | 7.6 | 0.0075 | *AP-42* [3] |
| SO2 | 0.6 | 0.0006 | *AP-42* [3] |
| VOC | 5.5 | 0.0054 | *AP-42* [3] |

(1) *Based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98*
(2) *AP-42, Tab. 1.4-1, 07/98 (residential furnaces, < 0.3 MMBtu/hr)*
(3) *AP-42, Tab. 1.4-2, 07/98*

**Building Heaters - 81-HEU-1 to 138**

| Emissions | (Single Unit) | | | (138 Units) | | |
|---|---|---|---|---|---|---|
| | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 0.01 | 0.2 | 0.03 | 0.95 | 22.73 | 4.15 |
| NOx | 0.02 | 0.4 | 0.07 | 2.23 | 53.41 | 9.75 |
| PM2.5/PM10/PM (Total) | 0.001 | 0.03 | 0.006 | 0.18 | 4.32 | 0.79 |
| SO2 | 0.0001 | 0.002 | 0.0005 | 0.01 | 0.34 | 0.06 |
| VOC | 0.001 | 0.02 | 0.004 | 0.13 | 3.13 | 0.57 |

**Sample Calculation**

**CO**

0.01 *lb/hr* = (0.0392 *lb* / ~~*MMBtu*~~) × (0.175 ~~*MMBtu*~~ / *hr*)

**NOx**

0.02 *lb/hr* = (0.0922 *lb* / ~~*MMBtu*~~) × (0.175 ~~*MMBtu*~~ / *hr*)

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
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**Air Handler Heaters (EU ID: 24)**

**Air Handler Heaters - 81-HVA-104 to 107, 109, 111 to 113, 126, 127, 201 to 207, 220, 230**

| | | |
|---|---|---|
| Make and Model | Bousquet, HDG(H)-400 | |
| Units | 19 | *Proposal Document* |
| Rating | 5 *MMBtu/hr* | |
| Fuel | NG | |
| Operation | 365 *days/yr* | |
| | 24 *hr/day* | |
| Fuel Consumption | 4,902 *Scf/hr* | *Based on* 1,020 *Btu/Scf* |
| | 43 *MMScf/yr* | *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98* |

| Emission Factor(s) | *(lb/MMScf)* | *(lb/MMBtu)* [(1)] | |
|---|---|---|---|
| CO | 84.0 | 0.0824 | *AP-42* [(2)] |
| NOx | 100.0 | 0.0980 | *AP-42* [(2)] |
| PM2.5/PM10/PM (Total) | 7.6 | 0.0075 | *AP-42* [(3)] |
| SO2 | 0.6 | 0.0006 | *AP-42* [(3)] |
| VOC | 5.5 | 0.0054 | *AP-42* [(3)] |

(1) *Based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98*

(2) *AP-42, Tab. 1.4-1, 07/98 (boilers < 100 MMBtu/hr)*

(3) *AP-42, Tab. 1.4-2, 07/98*

**Air Handler Heaters (5 MMBtu/hr)**

| Emissions | (Single Unit) | | | (19 Units) | | |
|---|---|---|---|---|---|---|
| | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 0.41 | 9.9 | 1.8 | 7.82 | 187.76 | 34.27 |
| NOx | 0.49 | 11.8 | 2.1 | 9.31 | 223.53 | 40.79 |
| PM2.5/PM10/PM (Total) | 0.04 | 0.9 | 0.2 | 0.71 | 16.99 | 3.10 |
| SO2 | 0.00 | 0.1 | 0.0 | 0.06 | 1.34 | 0.24 |
| VOC | 0.03 | 0.6 | 0.1 | 0.51 | 12.29 | 2.24 |

**Sample Calculation**

**CO**

0.41 *lb/hr* = 0.0824 *lb* / ~~*MMBtu*~~ × 5 ~~*MMBtu*~~ / *hr*

**NOx**

0.49 *lb/hr* = 0.0980 *lb* / ~~*MMBtu*~~ × 5 ~~*MMBtu*~~ / *hr*

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | | BY: E. Memon |
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**Air Handler Heaters (EU ID: 25)**
**Air Handler Heaters - 81-HVA-108, 119, 231, 233, 234, 253, 257**

| | | | |
|---|---|---|---|
| Make and Model | Bousquet, HDG(H)-200 | | |
| Units | 7 | | *Proposal Document* |
| Rating | 2.5 | *MMBtu/hr* | |
| Fuel | NG | | |
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |
| Fuel Consumption | 2,451 | *Scf/hr* | *Based on* 1,020 *Btu/Scf* |
| | 21 | *MMScf/yr* | *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98* |

| Emission Factor(s) | *(lb/MMScf)* | *(lb/MMBtu)* [(1)] | |
|---|---|---|---|
| CO | 84.0 | 0.0824 | *AP-42* [(2)] |
| NOx | 100.0 | 0.0980 | *AP-42* [(2)] |
| PM2.5/PM10/PM (Total) | 7.6 | 0.0075 | *AP-42* [(3)] |
| SO2 | 0.6 | 0.0006 | *AP-42* [(3)] |
| VOC | 5.5 | 0.0054 | *AP-42* [(3)] |

(1) *Based on* 1,020 *Btu/Scf* *footnote to AP-42, Tab. 1.4-1 and 1.4-2, 07/98*
(2) *AP-42, Tab. 1.4-1, 07/98 (boilers < 100 MMBtu/hr)*
(3) *AP-42, Tab. 1.4-2, 07/98*

**Air Handler Heaters - 81-HVA-108, 119, 231, 233, 234, 253, 257**

| Emissions | (Single Unit) | | | (7 Units) | | |
|---|---|---|---|---|---|---|
| | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 0.21 | 4.9 | 0.90 | 1.44 | 34.59 | 6.31 |
| NOx | 0.25 | 5.9 | 1.07 | 1.72 | 41.18 | 7.51 |
| PM2.5/PM10/PM (Total) | 0.02 | 0.4 | 0.08 | 0.13 | 3.13 | 0.57 |
| SO2 | 0.001 | 0.04 | 0.01 | 0.01 | 0.25 | 0.05 |
| VOC | 0.01 | 0.3 | 0.06 | 0.09 | 2.26 | 0.41 |

**Sample Calculation**
**CO**

$$0.21\ lb/hr = \frac{0.0824\ lb}{\cancel{MMBtu}} \times \frac{2.5\ \cancel{MMBtu}}{hr}$$

**NOx**

$$0.25\ lb/hr = \frac{0.0980\ lb}{\cancel{MMBtu}} \times \frac{2.5\ \cancel{MMBtu}}{hr}$$

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Portable Heaters (EU ID: 26)**

| | | | |
|---|---|---|---|
| **Portable Heaters** | **PBH1-20** | | |
| Make and Model | Wacker Neuson Pureheat | | |
| Units | 20 | | *Donlin* |
| Rating | 0.86 | *MMBtu/hr* | *Man. Spec. Sheet* |
| Fuel | ULSD | | |
| Fuel Consumption | 6.6 | *gal/hr* | (1) |
| | 57,876 | *gal/yr* | |

(1) *Based on* 130,167 *Btu/gal* *Donlin*

| | | |
|---|---|---|
| Operation | 365 | *days/yr* |
| | 24 | *hr/day* |
| | 8,760 | *hr/yr* |

| **Emission Factor(s)** | ***(lb/gal)*** | ***(lb/MMBtu)*** (1) | |
|---|---|---|---|
| CO | 0.005 | 0.0384 | *AP-42* (2) |
| NOx | 0.020 | 0.1536 | *AP-42* (2) |
| PM2.5 | 0.00025 | 0.0019 | *AP-42* (3) |
| PM10 | 0.00100 | 0.0077 | *AP-42* (3) |
| PM | 0.003 | 0.0254 | *AP-42* (4) |
| SO2 | | 0.0016 | (5) |
| VOC | 0.00034 | 0.0026 | *AP-42* (6) |

(1) *Based on* 130,167 *Btu/gal* *AP-42, Tab. 1.3-2, footnote d, 05/10*

(2) *AP-42, Tab. 1.3-1, 05/10 (distillate oil, < 100 MMBtu/hr)*

(3) *AP-42, Tab. 1.3-6, 05/10 (distillate oil, industrial boilers)*

(4) *AP-42, Tabs. 1.3-1 (filterable, distillate oil, < 100 MMBtu/hr) & 1.3-2 (condensable, No. 2 oil), 05/10*

(5) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*

(6) *AP-42, Tab. 1.3-3, 05/10 (distillate oil)*

| **Emissions** | **(Single Unit)** | | | **(20 Units)** | | |
|---|---|---|---|---|---|---|
| | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
| CO | 0.03 | 0.8 | 0.145 | 0.66 | 15.86 | 2.89 |
| NOx | 0.13 | 3.2 | 0.579 | 2.64 | 63.43 | 11.58 |
| PM2.5 | 0.002 | 0.04 | 0.0072 | 0.03 | 0.79 | 0.14 |
| PM10 | 0.01 | 0.2 | 0.029 | 0.13 | 3.17 | 0.58 |
| PM | 0.02 | 0.5 | 0.095 | 0.44 | 10.47 | 1.91 |
| SO2 | 0.001 | 0.03 | 0.0059 | 0.03 | 0.64 | 0.12 |
| VOC | 0.002 | 0.1 | 0.010 | 0.04 | 1.08 | 0.20 |

**Sample Calculation**

**CO**

$$0.03\ lb/hr = \frac{0.0384\ lb}{\cancel{MMBtu}} \times \frac{0.9\ \cancel{MMBtu}}{hr}$$

**NOx**

$$0.13\ lb/hr = \frac{0.1536\ lb}{\cancel{MMBtu}} \times \frac{0.9\ \cancel{MMBtu}}{hr}$$

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| **Air Sciences Inc.** | PROJECT TITLE: Donlin Gold | | | BY: E. Memon |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 1 | OF: 5 | SHEET: Incinerator |
| **AIR EMISSION CALCULATIONS** | SUBJECT: Incinerator Emissions | DATE: October 14, 2021 | | |

**Incinerators Emissions Summary** *(ton/yr)*

| **Source** | **Throughput** | | **CO** | **NOx** | **PM** | **SO2** |
|---|---|---|---|---|---|---|
| Camp Waste Incinerator (EU ID: 27) | 0.495 | *ton/hr* | 0.351 | 0.780 | 0.319 | 0.5197 |
| Sewage Sludge Incinerator (EU ID: 28 | 0.007 | *ton/hr* | 0.010 | 0.064 | 0.009 | 0.0110 |
| **Incinerators Total** | | | **0.361** | **0.844** | **0.328** | **0.531** |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Camp Waste Incinerator (EU ID: 27) CWI**

| | | | | | | |
|---|---|---|---|---|---|---|
| Population | 600 *people* | | *Donlin* | | | |
| Waste Generation | 5 *lb of waste per person per day* | | *Donlin* | | | |
| | 11.88 *ton/day* | 0.495 *ton/hr* | *Based on maximum capacity* | 990 *lb/hr* | | |
| | 106.92 *MMBtu/day* | 4.455 *MMBtu/hr* | | | | |
| | 112,796 *MJ/day* | 4,700 *MJ/hr* | | | | |
| Operation | 365 *days/yr* | | | | | |
| | 24 *hr/day* | | | | | |

Controls — As needed to meet 40 CFR 60 Subpart CCCC

| **Emission Factor(s)**[(1)] | | | |
|---|---|---|---|
| CO | 17 *ppmvd @ 7% O2* | 28.01 *g/mol* | 7.74E-03 *g/MJ* |
| NOx | 23 *ppmvd @ 7% O2* | 46.005 *g/mol* | 1.72E-02 *g/MJ* |
| PM (filterable) | 18 *mg/Nm³ @ 7% O2, dry* | | 7.04E-03 *g/MJ* |
| SO2 | 11 *ppmvd @ 7% O2* | 64.063 *g/mol* | 1.15E-02 *g/MJ* |
| Cd | 0.0023 *mg/Nm³ @ 7% O2, dry* | | 8.99E-07 *g/MJ* |
| Dioxins/furans (total mass) | 1 *nano-g/Nm³ @ 7% O2, dry* | | 2.27E-10 *g/MJ* |
| Dioxins/furans (toxic equi. basis) | 0.13 *nano-g/Nm³ @ 7% O2, dry* | | 5.08E-11 *g/MJ* |
| HCl (2) | 0.091 *ppmvd @ 7% O2* | 36.461 *g/mol* | 5.39E-05 *g/MJ* |
| Pb | 0.015 *mg/Nm³ @ 7% O2, dry* | | 5.86E-06 *g/MJ* |
| Hg | 0.00084 *mg/Nm³ @ 7% O2, dry* | | 3.28E-07 *g/MJ* |

(1) *Vendor performance guarantee to meet or exceed 40 CFR 60 Subpart CCCC, Table 5 [84 FR 15853, Apr. 16, 2019]*

(2) *Emission test results for identical incinerator, 10/09; average of the three test runs plus 2.2 × safety factor.*

**Sample Calculation**

**Cd** 8.99E-07 *g/MJ* = (0.0023 ~~mg~~ / ~~Nm³~~) × (0.26 ~~Nm³~~ / MJ) × (( 20.9% - 0.0% ) / ( 20.9% - 7.0% )) × (g / 1,000 ~~mg~~)

**CO** 7.74E-03 *g/MJ* = (17 ~~Nm³ CO~~ / 1.00E+06 ~~Nm³~~) × (0.26 ~~Nm³~~ / MJ) × (( 20.9% - 0.0% ) / ( 20.9% - 7.0% )) × (~~mol~~ / 0.02406 ~~Nm³~~) × (28.01 g / ~~mol~~)

**Dioxins/furans (total mass)** 2.27E-10 *g/MJ* = (1 ~~nano-g~~ / ~~Nm³~~) × (0.26 ~~Nm³~~ / MJ) × (( 20.9% - 0.0% ) / ( 20.9% - 7.0% )) × (g / 1.0E+09 ~~nano-g~~)

(Average test result @ 11% $O_2$)

**HCl @ 7% $O_2$** 11.7 *ppmvd* = (12.63 ~~mg~~ / Nm³) × (( 20.9% - 7.0% ) / ( 20.9% - 11.0% )) × (g / 1,000 ~~mg~~) × (~~mol~~ / 36.461 g) × (0.024057 Nm³ / ~~mol~~)

| Conversion(s): | | | |
|---|---|---|---|
| 9,570 *dscf/MMBtu @ 0% O2* | 0.26 *Nm³/MJ @ 0% O2* | *AP-42, Tabs. 2.1-1 & -2, 10-96* | |
| 4,500 *Btu/lb solid waste* | 10,466 *J/g* | *AP-42, Tab. 2.1-2, 10-96* | |
| 0.022415 *Nm³/mol (0C)* | | | |
| 0.0240571 *Nm³/mol (20C)* | | | |
| 1.0E+09 *nano-g/g* | | | |
| 1,000 *mg/g* | | | |
| 453.592 *g/lb* | | | |
| 2,000 *lb/ton* | | | |
| 1,055 *J/Btu* | | | |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | | BY: E. Memon |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 3 | OF: 5 | SHEET: Incinerator |
| AIR EMISSION CALCULATIONS | SUBJECT: Incinerator Emissions | DATE: October 14, 2021 | | |

**Camp Waste Incinerator**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| CO | 0.080 | 1.924 | 0.351 |
| NOx | 0.178 | 4.276 | 0.78 |
| PM (filterable) | 0.073 | 1.750 | 0.32 |
| SO2 | 0.119 | 2.848 | 0.5197 |
| Cd | 9.32E-06 | 2.24E-04 | 4.08E-05 |
| Dioxins/furans (total mass) | 2.35E-09 | 5.64E-08 | 1.03E-08 |
| Dioxins/furans (toxic equi. basis) | 5.27E-10 | 1.26E-08 | 2.31E-09 |
| HCl | 5.59E-04 | 1.34E-02 | 2.45E-03 |
| Pb | 6.08E-05 | 1.46E-03 | 2.66E-04 |
| Hg | 3.40E-06 | 8.17E-05 | 1.49E-05 |

**Sample Calculation**

**CO**

| | (NSPS CCCC) | (Heat Input) | (Conversion) |
|---|---|---|---|
| 0.080 *lb/hr* | 7.74E-03 *g* / *MJ* | 4,700 *MJ* / *hr* | *lb* / 453.592 *g* |

Conversion(s): 453.592 g/lb
2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: Incinerator Emissions | DATE: October 14, 2021 | | |

**Sewage Sludge Incinerator (EU ID: 28)** **SSI**

| | | | | | | |
|---|---|---|---|---|---|---|
| 70.5 | *lb/year/person, dry sludge (1.5x)* | | | *EPA-822-R-96-003 p. 1-1, Donlin* | | |
| 600 | *people* | | | *Donlin* | | |
| 0.058 | *ton/day* | 0.0072 | *ton/hr* | *Maximum hourly base on:* | 8 | *hr/day* |
| 0.89 | *MMBtu/day* | 0.112 | *MMBtu/hr* | | | |
| 941.5 | *MJ/day* | 117.7 | *MJ/hr* | | | |

Operation 365 *days/yr*
24 *hr/day*

Controls As needed to meet 40 CFR 60 Subpart LLLL

| **Emission Factor(s)**(1) | | | | | | |
|---|---|---|---|---|---|---|
| CO | 52 | *ppmvd @ 7% O2* | 28.01 | *g/mol* | 2.54E-02 | *g/MJ* |
| NOX | 210 | *ppmvd @ 7% O2* | 46.005 | *g/mol* | 1.68E-01 | *g/MJ* |
| PM (filterable) | 60 | *mg/Nm$^3$ @ 7% O2, dry* | | | 2.35E-02 | *g/MJ* |
| SO2 | 26 | *ppmvd @ 7% O2* | 64.063 | *g/mol* | 2.91E-02 | *g/MJ* |
| Cd | 0.0024 | *mg/Nm$^3$ @ 7% O2, dry* | | | 9.38E-07 | *g/MJ* |
| Dioxins/furans (total mass) | 0.045 | *nano-g/Nm$^3$ @ 7% O2, dry* | | | 1.76E-11 | *g/MJ* |
| Dioxins/furans (toxic equi. basis) | 0.0022 | *nano-g/Nm$^3$ @ 7% O2, dry* | | | 8.60E-13 | *g/MJ* |
| HCl | 1.2 | *ppmvd @ 7% O2* | 36.461 | *g/mol* | 7.63E-04 | *g/MJ* |
| Pb | 0.0035 | *mg/Nm$^3$ @ 7% O2, dry* | | | 1.37E-06 | *g/MJ* |
| Hg | 0.15 | *mg/Nm$^3$ @ 7% O2, dry* | | | 5.86E-05 | *g/MJ* |

(1) *Vendor performance guarantee to meet or exceed 40 CFR 60 Subpart LLLL, Table 2*

**Sample Calculation**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Cd** | 9.38E-07 *g/MJ* | 0.0024 ~~mg~~ / ~~Nm$^3$~~ | 0.26 ~~Nm$^3$~~ / MJ | ( 20.9% - 0.0% ) / ( 20.9% - 7.0% ) | g / 1.00E+03 ~~mg~~ | |
| **CO** | 2.54E-02 *g/MJ* | 52 ~~Nm$^3$ CO~~ / 1.00E+06 ~~Nm$^3$~~ | 0.26 ~~Nm$^3$~~ / MJ | ( 20.9% - 0.0% ) / ( 20.9% - 7.0% ) | ~~mol~~ / 0.022415 ~~Nm$^3$~~ | 28.01 g / ~~mol~~ |
| **Dioxins/furans (total mass)** | 1.76E-11 *g/MJ* | 0.045 ~~nano-g~~ / ~~Nm3~~ | 0.26 ~~Nm$^3$~~ / MJ | ( 20.9% - 0.0% ) / ( 20.9% - 7.0% ) | g / 1.0E+09 ~~nano-g~~ | |

Conversion(s):

| | | | | |
|---|---|---|---|---|
| 9,570 | *dscf/MMBtu @ 0% O2* | 0.26 | *Nm$^3$/MJ @ 0% O2* | *AP-42, Tabs. 2.1-1 & -2, 10-96* |
| 7,700 | *Btu/lb dry sludge* | | | *EPA-625/4-78-012* |
| 0.022415 | *Nm$^3$/mol (0C)* | | | |
| 0.0240571 | *Nm$^3$/mol (20C)* | | | |
| 1.0E+09 | *nano-g/g* | | | |
| 1,000 | *mg/g* | | | |
| 453.592 | *g/lb* | | | |
| 2,000 | *lb/ton* | | | |
| 1,055 | *J/Btu* | | | |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon |
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| AIR EMISSION CALCULATIONS | SUBJECT: Incinerator Emissions | | DATE: October 14, 2021 |

**Sewage Sludge Incinerator**

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| CO | 6.59E-03 | 5.27E-02 | 0.0096 |
| NOx | 4.37E-02 | 3.50E-01 | 0.064 |
| PM (filterable) | 6.09E-03 | 4.87E-02 | 0.0089 |
| SO2 | 7.54E-03 | 6.03E-02 | 0.0110 |
| Cd | 2.43E-07 | 1.95E-06 | 3.55E-07 |
| Dioxins/furans (total mass) | 4.56E-12 | 3.65E-11 | 6.66E-12 |
| Dioxins/furans (toxic equi. basis) | 2.23E-13 | 1.79E-12 | 3.26E-13 |
| HCl | 1.980E-04 | 1.58E-03 | 2.89E-04 |
| Pb | 3.550E-07 | 2.84E-06 | 5.18E-07 |
| Hg | 1.522E-05 | 1.22E-04 | 2.22E-05 |

**Sample Calculation**

**CO**

| | (NSPS LLLL) | (Heat Input) | (Conversion) |
|---|---|---|---|
| 6.59E-03 *lb/hr* | 2.54E-02 *g* / *MJ* | 118 *MJ* / *hr* | *lb* / 453.592 *g* |

Conversion(s): 453.592 *g/lb*
2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | | |
|---|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | | PAGE: 1 | OF: 6 | SHEET: Emergency |
| AIR EMISSION CALCULATIONS | SUBJECT: Emergency Eqpt. Emissions | | DATE: October 14, 2021 | | |

**Emergency Equipment Emissions Summary** ***(ton/yr)***

| Engine Make and Model | Total Output | CO | NOx | PM | SO2 | VOC |
|---|---|---|---|---|---|---|
| Black Start Generators (2) | 1,200 *kWe* | 2.89 | 5.29 | 0.17 | 0.00 | 5.29 |
| Emergency Generators (4) | 6,000 *kWe* | 14.47 | 26.46 | 0.83 | 0.02 | 26.46 |
| Fire Pumps (3) | 756 *hp* | 1.38 | 1.54 | 0.08 | 0.002 | 1.54 |
| **Emergency Equipment Total** | | **18.74** | **33.29** | **1.07** | **0.03** | **33.29** |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
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**Black Start Generators (EU ID: 29-30)** **BEDG1-2**

| | | | | |
|---|---|---|---|---|
| Make and Model | Cummins, DQCA (Engine Model QSK23-G7 NR2) | | | |
| Output (gross) | 600 *kWe* | *Man. Spec. Sheet* | | |
| Heat Input Rate | 9,387 *Btu/kWhe* | *Based on* | 7,000 *Btu/hp-hr* | *AP-42 Default* |
| | 5.6 *MMBtu/hr* | | | |
| Units | 2 | | | |
| Fuel Type | Ultra Low Sulfur Diesel (ULSD) | | | |
| Fuel Consumption | 43.3 *gal/hr* | (1) | | |
| | 21,635 *gal/yr* | | | |

(1) *Based on* 130,167 *Btu/gal* *Donlin*

| | | |
|---|---|---|
| Operation | 24 *hr/day* | |
| | 500 *hr/yr* | (2) |

(2) *Seitz, J. S., Director OAQPS, Calculating Potential to Emit (PTE) for Emergency Generators, 09/06/95*

Control None

| **Emission Factor(s)** | | |
|---|---|---|
| CO | 4.38 *g/kWhe* | *§ 60.4205(b), § 60.4202(a)(2), and § 89.112, Table 1 (1.25x per § 60.4205(e), § 60.4212(c))* |
| NOx | 8.00 *g/kWhe* | *§ 60.4205(b), § 60.4202(a)(2), and § 89.112, Table 1 (1.25x per § 60.4205(e), § 60.4212(c))* |
| PM2.5/PM10/PM | 0.25 *g/kWhe* | *§ 60.4205(b), § 60.4202(a)(2), and § 89.112, Table 1 (1.25x per § 60.4205(e), § 60.4212(c))* |
| VOC | 8.00 *g/kWhe* | *§ 60.4205(b), § 60.4202(a)(2), and § 89.112, Table 1 (1.25x per § 60.4205(e), § 60.4212(c))* |
| SO2 | 0.00661 *g/kWhe* | (1) |

(1) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*

| Emissions | (Single Engine) | | | (2 Engines) | | |
|---|---|---|---|---|---|---|
| | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 5.79 | 138.89 | 1.45 | 11.57 | 277.78 | 2.89 |
| NOx | 10.58 | 253.97 | 2.65 | 21.16 | 507.95 | 5.29 |
| PM2.5/PM10/PM | 0.33 | 7.94 | 0.08 | 0.66 | 15.87 | 0.17 |
| VOC | 10.58 | 253.97 | 2.65 | 21.16 | 507.95 | 5.29 |
| SO2 | 0.01 | 0.21 | 0.002 | 0.02 | 0.42 | 0.004 |

**Sample Calculations**

**SO2 Emission Factor**

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.00661 *g/kWh* | 15 ~~*lb-S*~~ | 43.3 ~~*gal-Fuel*~~ | 6.74 ~~*lb-Fuel*~~ | ~~*hr*~~ | 2 ~~*lb*~~ *-SO2* | 453.6 *g* |
| | 1.00E+06 ~~*lb-Fuel*~~ | ~~*hr*~~ | ~~*gal-Fuel*~~ | 600 *kWh* | ~~*lb-S*~~ | ~~*lb*~~ |

**NOx Emissions**

| | | | |
|---|---|---|---|
| 10.6 *lb/hr* | 8.00 ~~*g*~~ | 600 ~~*kWh*~~ | *lb* |
| | ~~*kWh*~~ | *hr* | 453.6 ~~*g*~~ |

Conversion(s): 453.6 *g/lb*
2,000 *lb/ton*
1.34 *hp/kW*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
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| AIR EMISSION CALCULATIONS | SUBJECT: Emergency Eqpt. Emissions | DATE: October 14, 2021 | | |

| | | | |
|---|---|---|---|
| **Emergency Generators (EU ID: 31-34)** | **Camp Site - CEDG1-4** | | |
| Make and Model | Cummins, DQGAB (Engine Model QSK50-G4 NR2) | | |
| Output (gross) | 1,500 *kWe* | *Man. Spec. Sheet* | |
| Heat Input Rate | 9,494 *Btu/kWhe* | *Based on* | *130,167 Btu/gal Donlin* |
| | 14.2 *MMBtu/hr* | | |
| Units | 4 | | |
| Fuel Type | ULSD | | |
| Fuel Consumption | 109.4 *gal/hr* | *Man. Spec. Sheet* | |
| | 54,700 *gal/yr* | | |
| Operation | 24 *hr/day* | | |
| | 500 *hr/yr* | [1] | |

[1] *Seitz, J. S., Director OAQPS, Calculating Potential to Emit (PTE) for Emergency Generators, 09/06/95*

| Control | None | |
|---|---|---|
| **Emission Factor(s)** | | |
| CO | 4.38 *g/kWhe* | *§ 60.4205(b), § 60.4202(a)(2), and § 89.112, Table 1 (1.25x per § 60.4205(e), § 60.4212(c))* |
| NOx | 8.00 *g/kWhe* | *§ 60.4205(b), § 60.4202(a)(2), and § 89.112, Table 1 (1.25x per § 60.4205(e), § 60.4212(c))* |
| PM2.5/PM10/PM | 0.25 *g/kWhe* | *§ 60.4205(b), § 60.4202(a)(2), and § 89.112, Table 1 (1.25x per § 60.4205(e), § 60.4212(c))* |
| VOC | 8.00 *g/kWhe* | *§ 60.4205(b), § 60.4202(a)(2), and § 89.112, Table 1 (1.25x per § 60.4205(e), § 60.4212(c))* |
| SO2 | 0.00669 *g/kWhe* | [1] |

[1] *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*

| **Emissions** | **(Single Engine)** | | | **(4 Engines)** | | |
|---|---|---|---|---|---|---|
| | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| CO | 14.47 | 347.23 | 3.62 | 57.87 | 1388.91 | 14.47 |
| NOx | 26.46 | 634.93 | 6.61 | 105.82 | 2539.73 | 26.46 |
| PM2.5/PM10/PM | 0.83 | 19.84 | 0.21 | 3.31 | 79.37 | 0.83 |
| VOC | 26.46 | 634.93 | 6.61 | 105.82 | 2539.73 | 26.46 |
| SO2 | 0.022 | 0.53 | 0.006 | 0.09 | 2.12 | 0.02 |

**Sample Calculations**

**SO2 Emission Factor**

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.00669 *g/kWh* | 15 ~~lb-S~~ | 109.4 ~~gal-Fuel~~ | 6.74 ~~lb-Fuel~~ | ~~hr~~ | 2 ~~lb~~ -SO2 | 453.6 *g* |
| | 1.00E+06 ~~lb-Fuel~~ | ~~hr~~ | ~~gal-Fuel~~ | 1,500 *kWh* | ~~lb-S~~ | ~~lb~~ |

**NOx Emissions**

| | | | |
|---|---|---|---|
| 26.5 *lb/hr* | 8.00 ~~g~~ | 1,500 ~~kWh~~ | *lb* |
| | ~~kWh~~ | *hr* | 453.6 ~~g~~ |

Conversion(s):

453.6 *g/lb*
2,000 *lb/ton*
1.34 *hp/kW*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| **Air Sciences Inc.** | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
|---|---|---|---|---|
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| **AIR EMISSION CALCULATIONS** | SUBJECT: Emergency Eqpt. Emissions | DATE: October 14, 2021 | | |

**Fire Pumps (EU ID: 35-37)** **Mine Site Tank Farm Fire Pump - FP1**

| | | | |
|---|---|---|---|
| Make and Model | Aurora Model 6-481-18C (Engine Model Clarke JW6H-UF38) | | |
| Output (gross) | 252 | *hp* | *Man. Spec. Sheet* |
| Heat Input Rate | 7,000 | *Btu/hph* | *AP-42 Default* |
| | 1.8 | *MMBtu/hr* | |
| Units | 1 | | |
| Fuel Type | ULSD | | |
| Fuel Consumption | 13.6 | *gal/hr* | (1) |
| | 6,776 | *gal/yr* | |

(1) *Based on* 130,167 *Btu/gal* *Donlin*

| | | | |
|---|---|---|---|
| Operation | 24 | *hr/day* | |
| | 500 | *hr/yr* | (2) |

(2) *Seitz, J. S., Director OAQPS, Calculating Potential to Emit (PTE) for Emergency Generators, 09/06/95*

Control None

| **Emission Factor(s)** | | | | | |
|---|---|---|---|---|---|
| CO | 4.375 | *g/kWhe* | 3.30 | *g/hp-hr* | *§ 60.4205(c), Table 4 (1.25x per § 60.4205(e), § 60.4212(d))* |
| NOx | 5 | *g/kWhe* | 3.70 | *g/hp-hr* | *§ 60.4205(c), Table 4 (1.25x per § 60.4205(e), § 60.4212(d))* |
| PM2.5/PM10/PM | 0.25 | *g/kWhe* | 0.19 | *g/hp-hr* | *§ 60.4205(c), Table 4 (1.25x per § 60.4205(e), § 60.4212(d))* |
| VOC | 5 | *g/kWhe* | 3.70 | *g/hp-hr* | *§ 60.4205(c), Table 4 (1.25x per § 60.4205(e), § 60.4212(d))* |
| SO2 | | | 0.00493 | *g/hp-hr* | (1) |

(1) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| CO | 1.8 | 44.0 | 0.5 |
| NOx | 2.1 | 49.3 | 0.5 |
| PM2.5/PM10/PM | 0.1 | 2.5 | 0.03 |
| VOC | 2.1 | 49.3 | 0.5 |
| SO2 | 0.003 | 0.1 | 0.001 |

**Sample Calculations**

**SO2 Emission Factor**

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.00493 *g/kWh* | 15 ~~*lb-S*~~ | 13.6 ~~*gal-Fuel*~~ | 6.74 ~~*lb-Fuel*~~ | ~~*hr*~~ | 2 ~~*lb*~~ *-SO2* | 453.6 *g* |
| | 1.00E+06 ~~*lb-Fuel*~~ | ~~*hr*~~ | ~~*gal-Fuel*~~ | 252 *kWh* | ~~*lb-S*~~ | ~~*lb*~~ |

**NOx Emissions**

| | | | |
|---|---|---|---|
| 2.1 *lb/hr* | 3.70 ~~*g*~~ | 252 ~~*hp-hr*~~ | *lb* |
| | ~~*hp-hr*~~ | *hr* | 453.6 ~~*g*~~ |

Conversion(s):

| | | |
|---|---|---|
| | 453.6 | *g/lb* |
| | 2,000 | *lb/ton* |
| | 1.34102 | *hp/kW* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 5 | OF: 6 | SHEET: Emergency |
| AIR EMISSION CALCULATIONS | SUBJECT: Emergency Eqpt. Emissions | DATE: October 14, 2021 | | |

**Fire Pumps (EU ID: 35-37) - continued** **Mine Site Mill Fire Pump - FP2**

| | | | |
|---|---|---|---|
| Make and Model | Aurora Model 6-481-18C (Engine Model Clarke JW6H-UF38) | | |
| Output (gross) | 252 | *hp* | *Man. Spec. Sheet* |
| Heat Input Rate | 7,000 | *Btu/hph* | *AP-42 Default* |
| | 1.8 | *MMBtu/hr* | |
| Units | 1 | | |
| Fuel Type | ULSD | | |
| Fuel Consumption | 13.6 | *gal/hr* | (1) |
| | 6,776 | *gal/yr* | |

(1) *Based on* 130,167 *Btu/gal* *Donlin*

| | | | |
|---|---|---|---|
| Operation | 24 | *hr/day* | |
| | 500 | *hr/yr* | (2) |

(2) *Seitz, J. S., Director OAQPS, Calculating Potential to Emit (PTE) for Emergency Generators, 09/06/95*

Control None

| Emission Factor(s) | | | | | |
|---|---|---|---|---|---|
| CO | 4.375 | *g/kWhe* | 3.30 | *g/hp-hr* | *§ 60.4205(c), Table 4 (1.25x per § 60.4205(e), § 60.4212(d))* |
| NOx | 5 | *g/kWhe* | 3.70 | *g/hp-hr* | *§ 60.4205(c), Table 4 (1.25x per § 60.4205(e), § 60.4212(d))* |
| PM2.5/PM10/PM | 0.25 | *g/kWhe* | 0.19 | *g/hp-hr* | *§ 60.4205(c), Table 4 (1.25x per § 60.4205(e), § 60.4212(d))* |
| VOC | 5 | *g/kWhe* | 3.70 | *g/hp-hr* | *§ 60.4205(c), Table 4 (1.25x per § 60.4205(e), § 60.4212(d))* |
| SO2 | | | 0.00493 | *g/hp-hr* | (1) |

(1) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| CO | 1.8 | 44.0 | 0.5 |
| NOx | 2.1 | 49.3 | 0.5 |
| PM2.5/PM10/PM | 0.1 | 2.5 | 0.03 |
| VOC | 2.1 | 49.3 | 0.5 |
| SO2 | 0.003 | 0.1 | 0.001 |

**Sample Calculations**

**SO2 Emission Factor**

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.00493 *g/kWh* | 15 ~~*lb-S*~~ | 13.6 ~~*gal-Fuel*~~ | 6.74 ~~*lb-Fuel*~~ | ~~*hr*~~ | 2 ~~*lb*~~ *-SO2* | 453.6 *g* |
| | 1.00E+06 ~~*lb-Fuel*~~ | ~~*hr*~~ | ~~*gal-Fuel*~~ | 252 *kWh* | ~~*lb-S*~~ | ~~*lb*~~ |

**NOx Emissions**

| | | | |
|---|---|---|---|
| 2.1 *lb/hr* | 3.70 ~~*g*~~ | 252 ~~*hp-hr*~~ | *lb* |
| | ~~*hp-hr*~~ | *hr* | 453.6 ~~*g*~~ |

Conversion(s):

| | | |
|---|---|---|
| | 453.6 | *g/lb* |
| | 2,000 | *lb/ton* |
| | 1.34 | *hp/kW* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 6 | OF: 6 | SHEET: Emergency |
| AIR EMISSION CALCULATIONS | SUBJECT: Emergency Eqpt. Emissions | DATE: October 14, 2021 | | |

**Fire Pumps (EU ID: 35-37) - continued** **Camp Site Fire Pump - FP3**

| | | | |
|---|---|---|---|
| Make and Model | Aurora Model 6-481-18C (Engine Model Clarke JW6H-UF38) | | |
| Output (gross) | 252 | *hp* | *Man. Spec. Sheet* |
| Heat Input Rate | 7,000 | *Btu/hph* | *AP-42 Default* |
| | 1.8 | *MMBtu/hr* | |
| Units | 1 | | |
| Fuel Type | ULSD | | |
| Fuel Consumption | 13.6 | *gal/hr* | (1) |
| | 6,776 | *gal/yr* | |

(1) *Based on* 130,167 *Btu/gal* *Donlin*

| | | | |
|---|---|---|---|
| Operation | 24 | *hr/day* | |
| | 500 | *hr/yr* | (2) |

(2) *Seitz, J. S., Director OAQPS, Calculating Potential to Emit (PTE) for Emergency Generators, 09/06/95*

Control None

| Emission Factor(s) | | | | | |
|---|---|---|---|---|---|
| CO | 4.375 | *g/kWhe* | 3.30 | *g/hp-hr* | *§ 60.4205(c), Table 4 (1.25x per § 60.4205(e), § 60.4212(d))* |
| NOx | 5 | *g/kWhe* | 3.70 | *g/hp-hr* | *§ 60.4205(c), Table 4 (1.25x per § 60.4205(e), § 60.4212(d))* |
| PM2.5/PM10/PM | 0.25 | *g/kWhe* | 0.19 | *g/hp-hr* | *§ 60.4205(c), Table 4 (1.25x per § 60.4205(e), § 60.4212(d))* |
| VOC | 5 | *g/kWhe* | 3.70 | *g/hp-hr* | *§ 60.4205(c), Table 4 (1.25x per § 60.4205(e), § 60.4212(d))* |
| SO2 | | | 0.00493 | *g/hp-hr* | (1) |

(1) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| CO | 1.8 | 44.0 | 0.5 |
| NOx | 2.1 | 49.3 | 0.5 |
| PM2.5/PM10/PM | 0.1 | 2.5 | 0.03 |
| VOC | 2.1 | 49.3 | 0.5 |
| SO2 | 0.003 | 0.1 | 0.001 |

**Sample Calculations**

**SO2 Emission Factor**

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.00493 *g/kWh* | 15 ~~*lb-S*~~ / 1.00E+06 ~~*lb-Fuel*~~ | 13.6 ~~*gal-Fuel*~~ / ~~*hr*~~ | 6.74 ~~*lb-Fuel*~~ / ~~*gal-Fuel*~~ | ~~*hr*~~ / 252 *kWh* | 2 ~~*lb*~~ *-SO2* / ~~*lb-S*~~ | 453.6 *g* / ~~*lb*~~ |

**NOx Emissions**

| | | | |
|---|---|---|---|
| 2.1 *lb/hr* | 3.70 ~~*g*~~ / ~~*hp-hr*~~ | 252 ~~*hp-hr*~~ / *hr* | *lb* / 453.6 ~~*g*~~ |

Conversion(s):

453.6 *g/lb*
2,000 *lb/ton*
1.34 *hp/kW*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-1 | PAGE: 1 | OF: 2 | SHEET: Tanks |
| AIR EMISSION CALCULATIONS | SUBJECT: Tanks Emissions | DATE: October 14, 2021 | | |

**Tanks Emissions Summary** ***(ton/yr)***

| Source | VOC |
|---|---|
| Mine Site Tanks | 1.572 |
| Power Plant Tanks | 0.018 |
| Camp Site Tanks | 0.002 |
| Airport Tanks | 0.249 |
| **Tanks Total** | **1.840** |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-1 | PAGE: 2 | OF: 2 | SHEET: Tanks |
| AIR EMISSION CALCULATIONS | SUBJECT: Tanks Emissions | DATE: October 14, 2021 | | |

**Tanks Specifications and Emissions (EU ID: 126-157)**

**Total ULSD Consumption** 42,300,000 *gal/yr* *Donlin*

*Maximum annual fuel use plus Wärtsilä usage of 500 hr/yr*

| Tank ID | Description | Capacity *(gal)* | Throughput *(gal/yr)* | Type | Dia. *(m)* | H/L *(m)* | Content | Turns | VOC *(lb/yr)* | EU ID |
|---|---|---|---|---|---|---|---|---|---|---|
| **Mine Site** | | | | | | | | | | |
| 36-TNK-870 | Tank Farm Tank 1 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 126 |
| 36-TNK-871 | Tank Farm Tank 2 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 127 |
| 36-TNK-872 | Tank Farm Tank 3 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 128 |
| 36-TNK-873 | Tank Farm Tank 4 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 129 |
| 36-TNK-874 | Tank Farm Tank 5 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 130 |
| 36-TNK-875 | Tank Farm Tank 6 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 131 |
| 36-TNK-876 | Tank Farm Tank 7 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 132 |
| 36-TNK-877 | Tank Farm Tank 8 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 133 |
| 36-TNK-878 | Tank Farm Tank 9 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 134 |
| 36-TNK-879 | Tank Farm Tank 10 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 135 |
| 36-TNK-880 | Tank Farm Tank 11 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 136 |
| 36-TNK-881 | Tank Farm Tank 12 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 137 |
| 36-TNK-885 | Tank Farm Tank 13 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 138 |
| 36-TNK-886 | Tank Farm Tank 14 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 139 |
| 36-TNK-887 | Tank Farm Tank 15 | 2,500,000 | 7,500,000 | Vertical | 42.7 | 7.8 | ULSD | 3 | 202.97 | 140 |
| 36-TNK-896 | Fuel Station 1 Tank | 25,000 | 19,035,000 | Horizontal | 3.0 | 13.0 | ULSD | 761 | 39.06 | 141 |
| 36-TNK-897 | Fuel Station 2 Tank | 25,000 | 19,035,000 | Horizontal | 3.0 | 13.0 | ULSD | 761 | 39.06 | 142 |
| ANFOTNK1 | ANFO Mixing Plant Tank | 10,000 | 1,106,184 | Horizontal | 2.4 | 8.2 | ULSD | 111 | 4.72 | 143 |
| FPTNK2 | Mill Fire Pump Tank | 270 | 6,776 | Horizontal | 1.0 | 1.8 | ULSD | 25 | 0.09 | 144 |
| FPTNK1 | Tank Farm Fire Pump Tank | 270 | 6,776 | Horizontal | 1.0 | 1.8 | ULSD | 25 | 0.09 | 145 |
| POXTNK | POX Boilers Tank | 5,000 | 3,942,411 | Horizontal | 1.8 | 7.2 | ULSD | 788 | 8.03 | 146 |
| O2TNK | Oxygen Plant Boiler Tank | 5,000 | 1,390,621 | Horizontal | 1.8 | 7.2 | ULSD | 278 | 3.95 | 147 |
| CETNK | Carbon Elution Heater Tank | 5,000 | 1,076,771 | Horizontal | 1.8 | 7.2 | ULSD | 215 | 3.12 | 148 |
| AUXTNK | Auxiliary SO2 Burner Tank | 500 | 134,596 | Horizontal | 1.2 | 1.8 | ULSD | 269 | 0.39 | 149 |
| **Power Plant** | | | | | | | | | | |
| 36-TNK-903 | Power Plant A Tank | 33,000 | 3,899,388 | Horizontal | 3.7 | 14.4 | ULSD | 118 | 17.52 | 150 |
| 36-TNK-904 | Power Plant B Tank | 33,000 | 3,899,388 | Horizontal | 3.7 | 14.4 | ULSD | 118 | 17.52 | 151 |
| **Camp Site** | | | | | | | | | | |
| 36-TNK-913 | Camp Emergency Generators Tank | 25,000 | 218,800 | Horizontal | 3.0 | 13.0 | ULSD | 9 | 3.52 | 152 |
| FPTNK3 | Camp Fire Pump Tank | 270 | 6,776 | Horizontal | 1.0 | 1.8 | ULSD | 25 | 0.09 | 153 |
| **Airport** | | | | | | | | | | |
| AJTNK1 | Jet Fuel Tank 1 | 9,900 | 55,000 | Horizontal | 2.4 | 8.2 | Jet A | 6 | 160.41 | 154 |
| AJTNK2 | Jet Fuel Tank 2 | 9,900 | 55,000 | Horizontal | 2.4 | 8.2 | Jet A | 6 | 160.41 | 155 |
| AGTNK1 | Aviation Gasoline Tank | 5,000 | 10,000 | Horizontal | 2.4 | 4.9 | 100 LL | 2 | 174.59 | 156 |
| ADTNK1 | Airport Generators Tank | 9,900 | 252,695 | Horizontal | 2.4 | 8.2 | ULSD | 26 | 2.99 | 157 |
| **Tanks Total** | | | | | | | | | **3,680** | |

**ULSD Consumption**

| | | | | |
|---|---|---|---|---|
| Mine | 42,300,000 *gal/yr* | | | |
| Wärtsilä engines | 6,613,287 *gal/yr* | *Based on:* | 500 *hr/yr* | |

**ANFO Tank Throughput** 1,106,184 *gal/yr* *Based on:* 6.50% *ULSD in emulsion and ULSD density of:* 6.74 *lb/gal* *Donlin*

Conversion(s): 3.2808 *ft/m*

264.1720 *gal/m*$^3$

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon |
|---|---|---|---|
| | PROJECT NO: 281-1-1 | PAGE: 1 OF: 9 | SHEET: Access Rds |
| AIR EMISSION CALCULATIONS | SUBJECT: Access Roads Emissions | | DATE: October 14, 2021 |

Calculations for LOM: 16

**Access Road Emissions Summary** *(ton/yr)*

| Route | Length (km) | CO | NOx | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|---|
| Camp to Mine Site (EU ID: 158) | 6.7 | 0.34 | 0.11 | 0.322 | 3.218 | 13.09 | 0.0007 | 0.012 |
| Airport to Camp (EU ID: 159) | 10.1 | 0.30 | 0.05 | 0.186 | 1.879 | 7.55 | 0.0004 | 0.011 |
| Jungjuk Port to Mine Site | 47.4 | 3.83 | 2.13 | 3.794 | 38.078 | 153.51 | 0.008 | 0.16 |
| **Access Road Total** | | **4.47** | **2.29** | **4.30** | **43.18** | **174.15** | **0.009** | **0.18** |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon |
|---|---|---|---|
| | PROJECT NO: 281-1-1 | PAGE: 2 | OF: 9 | SHEET: Access Rds |
| AIR EMISSION CALCULATIONS | SUBJECT: Access Roads Emissions | DATE: October 14, 2021 | |

Calculations for LOM: 16

**Camp to Mine Site (EU ID: 158)**

| | | | |
|---|---|---|---|
| Route Length | 6.7 | *km* | *Donlin* |
| Road Width | 9 | *m* | *Donlin* |
| Operation | 365 | *day/yr* | |
| | 24 | *hr/day* | |

**Traffic** *Donlin*

| Vehicle Type | Make and Model | Rating (hp) | Roundtrips (daily) | Speed (mph) | VMT (annual) | GVW (ton) |
|---|---|---|---|---|---|---|
| Bus | Blue Bird GSA | 300 | 12 | 30 | 36,702 | 18.1 |
| Light Vehicle | Ford F-150 | 411 | 20 | 30 | 61,170 | 5.6 |
| Water Truck | Caterpillar T660 | 550 | 1 | 15 | 3,058 | 41.4 (1) |
| Grader | Caterpillar 16H | 297 | 1/week | 3 | 437 | N/A |

(1) *Includes vehicle weight of* 12.2 *ton loaded with* 7,000 *gallon water tank*

**Grader Use**

**Emission Factor(s)**

| | | |
|---|---|---|
| Emission Factor Equation | TSP (lb/VMT) = 0.04 $(S)^{2.5}$ | *AP-42, Tab. 11.9-1, 07/98, (grading)* |
| | PM15 (lb/VMT) = 0.051 $(S)^{2}$ | *AP-42, Tab. 11.9-1, 07/98, (grading)* |
| S = Mean vehicle speed | 3 *mph* | *Donlin* |

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.031 | *AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)* |
| PM10 | 0.6 | *AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)* |

**Estimated Emission Factors**

| | | |
|---|---|---|
| PM2.5 | 0.02 | *lb/VMT* |
| PM10 | 0.28 | *lb/VMT* |
| PM | 0.62 | *lb/VMT* |

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.001 | 0.02 | 0.004 |
| PM10 | 0.01 | 0.3 | 0.06 |
| PM | 0.03 | 0.7 | 0.14 |

Eqp: Fuel Use 37 *L/hr* *Donlin* APP_C4_23

9.8 *gal/hr*

3.9 *gal/day* *Based on* 1.2 *mi/day*

| Tailpipe Emissions (1) | | (g/kW-hr) | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|---|---|
| CO | (2) | 3.5 | 0.0174 | 0.417 | 0.0762 |
| NOx | (2) | 0.4 | 0.0020 | 0.048 | 0.0087 |
| PM | (2) | 0.02 | 0.0001 | 0.002 | 0.0004 |
| SO2 | (3) | 0.004 | 0.00002 | 0.0005 | 0.0001 |
| VOC | (2) | 0.19 | 0.0009 | 0.023 | 0.0041 |

(1) *Based on: Fuel heating value of:* 130,167 *Btu/gal* *Donlin*

*Diesel engine efficiency of:* 7,000 *Btu/hp-hr* *AP-42 Default*

(2) *40 CFR 1039, Table 1 of § 1039.101, current as of 03/07/13*

(3) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Bus, Light Vehicle, and Water Truck**

**Emission Factor(s)**

| | | | | | |
|---|---|---|---|---|---|
| Emission Factor Equation | $E = k(s/12)^a (W/3)^b [(365-P)/365]$ | | | | *AP-42, Sec. 13.2.2, Eqs. 1a and 2, 11/06* |
| s = Surface material silt content | 3.8 % | | | | *AP-42, Chapter 13.2-2, Related Information "r13s0202_dec03.xls"* *http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html* |
| W = Mean vehicle weight | 11.2 *ton* | | | | *Mean fleet weight* |
| P = Days/year with ≥0.01 in precip. | 129 | | | | *American Ridge, 2007-08, 2010-12* |
| | PM2.5 | PM10 | PM | | |
| k = Size-specific empirical constant | 0.15 | 1.5 | 4.9 | *lb/VMT* | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| a = Size-specific empirical constant | 0.9 | 0.9 | 0.7 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| b = Size-specific empirical constant | 0.45 | 0.45 | 0.45 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| E = Size-specific emission factor | 0.06 | 0.62 | 2.57 | *lb/VMT* | |

| | | |
|---|---|---|
| Control Type | Water/Chemical Application | |
| Control Efficiency | 90% | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06.* |

| **Emissions** | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.07 | 1.7 | 0.31 |
| PM10 | 0.72 | 17.3 | 3.15 |
| PM | 2.96 | 71.0 | 12.95 |

**Tailpipe Emissions**

| **Bus** | *(g/mi)* (1) | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|---|
| CO | 1.1048375 | 0.01021 | 0.24492 | 0.04470 |
| NOx | 2.367584 | 0.02187 | 0.52485 | 0.09579 |
| PM2.5 | 0.0445051 | 0.00041 | 0.00987 | 0.00180 |
| PM10 | 0.1342863 | 0.00124 | 0.02977 | 0.00543 |
| SO2 | 0.0111821 | 0.00010 | 0.00248 | 0.00045 |
| VOC | 0.0346486 | 0.00032 | 0.00768 | 0.00140 |

| **Light Vehicle** | *(g/mi)* (1) | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|---|
| CO | 3.215 | 0.04949 | 1.18773 | 0.21676 |
| NOx | 0.020959 | 0.00032 | 0.00774 | 0.00141 |
| PM2.5 | 0.0068926 | 0.00011 | 0.00255 | 0.00046 |
| PM10 | 0.0338767 | 0.00052 | 0.01252 | 0.00228 |
| SO2 | 0.0018013 | 0.00003 | 0.00067 | 0.00012 |
| VOC | 0.0905307 | 0.00139 | 0.03345 | 0.00610 |

| **Water Truck** | *(g/mi)* (1) | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|---|
| CO | 1.853 | 0.00143 | 0.03423 | 0.00625 |
| NOx | 2.109 | 0.00162 | 0.03895 | 0.00711 |
| PM2.5 | 0.026 | 0.00002 | 0.00049 | 0.00009 |
| PM10 | 0.101 | 0.00008 | 0.00187 | 0.00034 |
| SO2 | 0.010 | 0.00001 | 0.00018 | 0.00003 |
| VOC | 0.042 | 0.00003 | 0.00078 | 0.00014 |

(1) *Calculated from MOVES*

| Conversion(s): | | |
|---|---|---|
| | 2,000 | *lb/ton* |
| | 1.609 | *km/mi* |
| | 8.345 | *lb/gal water* |
| | 3.78541 | *L/gal* |
| | 1.34102 | *hp/kW* |
| | 453.592 | *g/lb* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-1 | PAGE: 4 | OF: 9 | SHEET: Access Rds |
| AIR EMISSION CALCULATIONS | SUBJECT: Access Roads Emissions | | DATE: October 14, 2021 | |

Calculations for LOM: 16

**Airport to Camp (EU ID: 159)**

| | | | |
|---|---|---|---|
| Route Length | 10.1 | *km* | *Donlin* |
| Road Width | 9 | *m* | *Donlin* |
| Operation | 365 | *day/yr* | |
| | 24 | *hr/day* | |

**Traffic** *Donlin*

| Vehicle Type | Make and Model | Rating (hp) | Roundtrips (daily) | Speed (mph) | VMT (annual) | GVW (ton) |
|---|---|---|---|---|---|---|
| Bus | Blue Bird GSA | 300 | 2 | 30 | 9,157 | 18.1 |
| Light Vehicle | Ford F-150 | 411 | 10 | 30 | 45,784 | 5.6 |
| Water Truck | Caterpillar T660 | 550 | 1 | 15 | 4,578 | 41.4 (1) |
| (1) Grader | Caterpillar 16H | 297 | 1/week | 3 | 654 | N/A |

*Includes vehicle weight of* 12.2 *ton, and* 7,000 *gallon water tank*

**Grader Use**

**Emission Factor(s)**

Emission Factor Equation: $TSP\ (lb/VMT) = 0.04\ (S)^{2.5}$ — *AP-42, Tab. 11.9-1, 07/98, (grading)*

$PM15\ (lb/VMT) = 0.051\ (S)^{2}$ — *AP-42, Tab. 11.9-1, 07/98, (grading)*

S = Mean vehicle speed 3 *mph* — *Donlin*

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.031 | *AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)* |
| PM10 | 0.6 | *AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)* |

**Estimated Emission Factors**

| | | |
|---|---|---|
| PM2.5 | 0.02 | *lb/VMT* |
| PM10 | 0.28 | *lb/VMT* |
| PM | 0.62 | *lb/VMT* |

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.001 | 0.03 | 0.006 |
| PM10 | 0.02 | 0.5 | 0.09 |
| PM | 0.05 | 1.1 | 0.20 |

Eqp: Fuel Use 37 *L/hr* — *Donlin* APP_C4_23

9.8 *gal/hr*

5.8 *gal/day* — *Based on* 1.8 *mi/day*

| Tailpipe Emissions (1) | | (g/kW-hr) | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|---|---|
| CO | (2) | 3.5 | 0.0260 | 0.625 | 0.1140 |
| NOX | (2) | 0.4 | 0.0030 | 0.071 | 0.0130 |
| PM | (2) | 0.02 | 0.0001 | 0.004 | 0.0007 |
| SO2 | (3) | 0.004 | 0.00003 | 0.001 | 0.0001 |
| VOC | (2) | 0.19 | 0.0014 | 0.034 | 0.0062 |

(1) *Based on: Fuel heating value of:* 130,167 *Btu/gal* — *Donlin*

*Diesel engine efficiency of:* 7,000 *Btu/hp-hr* — *AP-42 Default*

(2) *40 CFR 1039, Table 1 of § 1039.101, current as of 03/07/13*

(3) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* — *MSDS - Ultra Low Sulfur Diesel No. 1*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Bus, Light Vehicle, and Water Truck**

**Emission Factor(s)**

| | | | | | |
|---|---|---|---|---|---|
| Emission Factor Equation | $E = k(s/12)^a (W/3)^b [(365\text{-}P)/365]$ | | | | *AP-42, Sec. 13.2.2, Eqs. 1a and 2, 11/06* |
| s = Surface material silt content | 3.8 | *%* | | | *AP-42, Chapter 13.2-2, Related Information "r13s0202_dec03.xls"* *http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html* |
| W = Mean vehicle weight | 10.3 | *ton* | | | *Mean fleet weight* |
| P = Days/year with ≥0.01 in precip. | 129 | | | | *American Ridge, 2007-08, 2010-12* |
| | PM2.5 | PM10 | PM | | |
| k = Size-specific empirical constant | 0.15 | 1.5 | 4.9 | *lb/VMT* | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| a = Size-specific empirical constant | 0.9 | 0.9 | 0.7 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| b = Size-specific empirical constant | 0.45 | 0.45 | 0.45 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| E = Size-specific emission factor | 0.06 | 0.60 | 2.47 | *lb/VMT* | |

| | | |
|---|---|---|
| Control Type | Water/Chemical Application | |
| Control Efficiency | 90% | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06.* |

| **Emissions** | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.04 | 1.0 | 0.18 |
| PM10 | 0.41 | 9.8 | 1.78 |
| PM | 1.68 | 40.2 | 7.34 |

**Tailpipe Emissions**

| **Bus** | *(g/mi)* (1) | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|---|
| CO | 1.1048375 | 0.00255 | 0.06111 | 0.01115 |
| NOx | 2.367584 | 0.00546 | 0.13095 | 0.02390 |
| PM2.5 | 0.0445051 | 0.00010 | 0.00246 | 0.00045 |
| PM10 | 0.1342863 | 0.00031 | 0.00743 | 0.00136 |
| SO2 | 0.0111821 | 0.00003 | 0.00062 | 0.00011 |
| VOC | 0.0346486 | 0.00008 | 0.00192 | 0.00035 |

| **Light Vehicle** | *(g/mi)* (1) | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|---|
| CO | 3.215 | 0.03704 | 0.88898 | 0.16224 |
| NOx | 0.021 | 0.00024 | 0.00580 | 0.00106 |
| PM2.5 | 0.007 | 0.00008 | 0.00191 | 0.00035 |
| PM10 | 0.034 | 0.00039 | 0.00937 | 0.00171 |
| SO2 | 0.002 | 0.00002 | 0.00050 | 0.00009 |
| VOC | 0.091 | 0.00104 | 0.02504 | 0.00457 |

| **Water Truck** | *(g/mi)* (1) | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|---|
| CO | 1.853 | 0.00214 | 0.05124 | 0.00935 |
| NOx | 2.109 | 0.00243 | 0.05831 | 0.01064 |
| PM2.5 | 0.026 | 0.00003 | 0.00073 | 0.00013 |
| PM10 | 0.101 | 0.00012 | 0.00280 | 0.00051 |
| SO2 | 0.010 | 0.00001 | 0.00026 | 0.00005 |
| VOC | 0.042 | 0.00005 | 0.00117 | 0.00021 |

(1) *Calculated from MOVES*

| Conversion(s): | | |
|---|---|---|
| | 2,000 | *lb/ton* |
| | 1.609 | *km/mi* |
| | 8.345 | *lb/gal water* |
| | 3.78541 | *L/gal* |
| | 1.34102 | *hp/kW* |
| | 453.592 | *g/lb* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 16

**Jungjuk Port to Mine Site**

| | | | |
|---|---|---|---|
| Route Length | 47.4 | *km* | *Donlin* |
| Road Width | 9 | *m* | *Donlin* |
| Operation | 365 | *day/yr* | |
| | 24 | *hr/day* | |
| | 120 | *day/yr* | *Tanker/Container Trucks* |
| | 12 | *hr/day* | *Tanker/Container Trucks* |

**Traffic** *Donlin*

| Vehicle Type | Make and Model | Rating (hp) | Roundtrips (daily) | Speed (mph) | VMT (annual) | GVW (ton) |
|---|---|---|---|---|---|---|
| Tanker Truck | Caterpillar T660 | 550 | 27 | 30 | 191,025 | 57.7 (1) |
| Container Truck | Caterpillar T660 | 550 | 27 | 30 | 191,025 | 70.3 (2) |
| Light Vehicle | Ford F-150 | 411 | 10 | 30 | 215,198 | 5.6 |
| Water Truck | Caterpillar T660 | 550 | 2 | 15 | 43,040 | 41.4 (3) |
| Grader | Caterpillar 16H | 297 | 1/2-day | 3 | 10,760 | N/A |

(1) *Includes vehicle weight of* 12.2 *ton, and* 13,500 *gallon diesel tank*
(2) *Includes vehicle weight of* 12.2 *ton, and* 58.1 *ton cargo*
(3) *Includes vehicle weight of* 12.2 *ton, and* 7,000 *gallon water tank*

**Grader Use**

**Emission Factor(s)**

Emission Factor Equation: $TSP\ (lb/VMT) = 0.04\ (S)^{2.5}$ — *AP-42, Tab. 11.9-1, 07/98, (grading)*

$PM15\ (lb/VMT) = 0.051\ (S)^{2}$ — *AP-42, Tab. 11.9-1, 07/98, (grading)*

S = Mean vehicle speed: 3 *mph* — *Donlin*

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.031 | *AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)* |
| PM10 | 0.6 | *AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)* |

**Estimated Emission Factors**

| | | |
|---|---|---|
| PM2.5 | 0.02 | *lb/VMT* |
| PM10 | 0.28 | *lb/VMT* |
| PM | 0.62 | *lb/VMT* |

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.02 | 0.6 | 0.10 |
| PM10 | 0.34 | 8.1 | 1.48 |
| PM | 0.77 | 18.4 | 3.35 |

| | | | | | |
|---|---|---|---|---|---|
| Eqp: Fuel Use | 37 | *L/hr* | *Donlin* | | APP_C4_23 |
| | 9.8 | *gal/hr* | | | |
| | 96.0 | *gal/day* | *Based on* | 29.5 *mi/day* | |

| Tailpipe Emissions (1) | | (g/kW-hr) | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|---|---|
| CO | (2) | 3.5 | 0.4282 | 10.277 | 1.8755 |
| NOx | (2) | 0.4 | 0.0489 | 1.174 | 0.2143 |
| PM | (2) | 0.02 | 0.0024 | 0.059 | 0.0107 |
| SO2 | (3) | 0.004 | 0.0005 | 0.012 | 0.0022 |
| VOC | (2) | 0.19 | 0.0232 | 0.558 | 0.1018 |

(1) *Based on: Fuel heating value of:* 130,167 *Btu/gal* — *Donlin*
*Diesel engine efficiency of:* 7,000 *Btu/hp-hr* — *AP-42 Default*
(2) *40 CFR 1039, Table 1 of § 1039.101, current as of 03/07/13*
(3) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | | |
|---|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: Access Roads Emissions | | DATE: October 14, 2021 | | |

**Light Vehicle and Truck**
**Emission Factor(s)**

| | | | | | |
|---|---|---|---|---|---|
| Emission Factor Equation | $E = k(s/12)^a (W/3)^b [(365-P)/365]$ | | | | *AP-42, Sec. 13.2.2, Eqs. 1a and 2, 11/06* |
| s = Surface material silt content | 3.8 % | | | | *AP-42, Chapter 13.2-2, Related Information "r13s0202_dec03.xls"* *http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html* |
| W = Mean vehicle weight | 42.9 *ton* | | | | *Mean fleet weight* |
| P = Days/year with ≥0.01 in precip. | 129 | | | | *American Ridge, 2007-08, 2010-12* |
| | PM2.5 | PM10 | PM | | |
| k = Size-specific empirical constant | 0.15 | 1.5 | 4.9 | *lb/VMT* | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| a = Size-specific empirical constant | 0.9 | 0.9 | 0.7 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| b = Size-specific empirical constant | 0.45 | 0.45 | 0.45 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| E = Size-specific emission factor | 0.11 | 1.14 | 4.69 | *lb/VMT* | |

| | | |
|---|---|---|
| Control Type | Water/Chemical Application | |
| Control Efficiency | 90% | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06.* |

| **Emissions** | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.83 | 20.0 | 3.65 |
| PM10 | 8.33 | 200.0 | 36.50 |
| PM | 34.26 | 822.2 | 150.06 |

**Tailpipe Emissions**

| **Tanker Truck** | *(g/mi)* [(1)] | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|---|
| CO | 1.8530852 | 0.08909 | 2.13809 | 0.39020 |
| NOx | 2.1085414 | 0.10137 | 2.43284 | 0.44399 |
| PM2.5 | 0.0263018 | 0.00126 | 0.03035 | 0.00554 |
| PM10 | 0.1012956 | 0.00487 | 0.11688 | 0.02133 |
| SO2 | 0.0095071 | 0.00046 | 0.01097 | 0.00200 |
| VOC | 0.04213 | 0.00203 | 0.04861 | 0.00887 |

| **Container Truck** | *(g/mi)* [(1)] | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|---|
| CO | 3.3757642 | 0.16229 | 3.89496 | 0.71083 |
| NOx | 6.46921 | 0.31101 | 7.46419 | 1.36221 |
| PM2.5 | 0.0976937 | 0.00470 | 0.11272 | 0.02057 |
| PM10 | 0.250175 | 0.01203 | 0.28865 | 0.05268 |
| SO2 | 0.0140916 | 0.00068 | 0.01626 | 0.00297 |
| VOC | 0.1236533 | 0.00594 | 0.14267 | 0.02604 |

(1) *Calculated from MOVES*

| Conversion(s): | | |
|---|---|---|
| | 2,000 | *lb/ton* |
| | 1.609 | *km/mi* |
| | 8.345 | *lb/gal water* |
| | 3.78541 | *L/gal* |
| | 6.74 | *lb/gal ULSD* |
| | 1.34102 | *hp/kW* |
| | 453.592 | *g/lb* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: Access Roads Emissions | DATE: October 14, 2021 | | |

| **Light Vehicle** | *(g/mi)* [1] | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|---|
| CO | 3.215 | 0.17410 | 4.17847 | 0.76257 |
| NOx | 0.021 | 0.00114 | 0.02724 | 0.00497 |
| PM2.5 | 0.007 | 0.00037 | 0.00896 | 0.00164 |
| PM10 | 0.034 | 0.00183 | 0.04403 | 0.00804 |
| SO2 | 0.002 | 0.00010 | 0.00234 | 0.00043 |
| VOC | 0.091 | 0.00490 | 0.11767 | 0.02148 |

| **Water Truck** | *(g/mi)* [1] | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|---|
| CO | 1.853 | 0.02007 | 0.48173 | 0.08792 |
| NOx | 2.109 | 0.02284 | 0.54814 | 0.10004 |
| PM2.5 | 0.026 | 0.00028 | 0.00684 | 0.00125 |
| PM10 | 0.101 | 0.00110 | 0.02633 | 0.00481 |
| SO2 | 0.010 | 0.00010 | 0.00247 | 0.00045 |
| VOC | 0.042 | 0.00046 | 0.01095 | 0.00200 |

(1) *Calculated from MOVES*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon |
|---|---|---|---|
| | PROJECT NO: 281-1-1 | PAGE: 9 | OF: 9 | SHEET: Access Rds |
| AIR EMISSION CALCULATIONS | SUBJECT: Access Roads Emissions | | DATE: October 14, 2021 |

**MOVES Emission Factors** [1]

| Vehicle Type | MOVES Vehicle Category | RunID | Emission Factors (*g/mi*) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | CO | NOx | PM2.5 | PM10 | SO2 | VOC |
| Tanker Truck | Single Unit Long-Haul truck | 353 | 1.853 | 2.109 | 0.026 | 0.101 | 0.010 | 0.042 |
| Container Truck | Combination Unit Long-Haul truck | 362 | 3.376 | 6.469 | 0.098 | 0.250 | 0.014 | 0.124 |
| Light Vehicle | Passenger truck | 331 | 3.215 | 0.021 | 0.007 | 0.034 | 0.002 | 0.091 |
| Water Truck | Single Unit Short-Haul truck (range < 200 miles) | 552 | 1.853 | 2.109 | 0.026 | 0.101 | 0.010 | 0.042 |
| Bus | Bus | 343 | 1.105 | 2.368 | 0.045 | 0.134 | 0.011 | 0.035 |

(1) *EPA MOVES3. Run 10/14/2021.*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: GHG Emissions | DATE: October 14, 2021 | | |

Calculations for LOM: 16

**Greenhouse Gas Emissions Summary** *(ton/yr)*

| **Combustion Source** | | **CO2** | **CH4** | **N2O** | **CO2e** |
|---|---|---|---|---|---|
| Power Plant Generators (12) | | 1,229,570 | 49.874 | 9.975 | 1,233,790 |
| Airport Generators (2) | | 2,682 | 0.109 | 0.022 | 2,691 |
| Black Start Generators (EU ID: 29-30) | | 459 | 0.019 | 0.004 | 461 |
| Emergency Generators (EU ID: 31-34) | | 2,322 | 0.094 | 0.019 | 2,330 |
| Fire Pumps (EU ID: 35-37) | | 216 | 0.009 | 0.002 | 216 |
| Portable Heaters (20) | | 12,284 | 0.498 | 0.100 | 12,326 |
| POX Boilers (2) | | 41,837 | 1.697 | 0.339 | 41,981 |
| Oxygen Plant Boiler | | 14,757 | 0.599 | 0.120 | 14,808 |
| Carbon Elution Heater | | 11,427 | 0.463 | 0.093 | 11,466 |
| Power Plant Auxiliary Heaters (2) | | 23,568 | 0.956 | 0.191 | 23,649 |
| SO2 Burner | | 1,025 | 0.019 | 0.002 | 1,026 |
| Auxiliary SO2 Burner | | 1,428 | 0.058 | 0.012 | 1,433 |
| Building Heaters (138) | | 12,374 | 0.233 | 0.023 | 12,386 |
| Air Handlers (19) | | 48,674 | 0.917 | 0.092 | 48,725 |
| Air Handlers (7) | | 8,966 | 0.169 | 0.017 | 8,976 |
| Blasting | | 11,739 | 0.476 | 0.095 | 11,779 |
| Mobile Machinery | | 407,093 | 16.513 | 3.303 | 408,490 |
| Incinerators | | 3,934 | 1.388 | 0.182 | 4,023 |
| Autoclaves | (1) | 37,659 | | | 37,659 |
| Acidulation Tanks | (2) | 83,816 | | | 83,816 |
| Neutralization Tanks | (3) | 189,359 | | | 189,359 |
| Impacted Wetlands | | 19,270 | | | 21,366 |
| **Total** | | **2,164,460** | **74.1** | **14.6** | **2,172,755** |

(1) *Based on* 1.95 *t/hr/autoclave of CO2* *Donlin*
(2) *Based on* 8.68 *t/hr, of CO2 total* *Donlin*
(3) *Based on* 19.61 *t/hr, of CO2 total* *Donlin*
(4) *CH4+N2O as CO2e*

**Sample Calculations**

**Power Plant Generators (12)**

**CO2** 1,229,570 *ton/yr* = 15,081,772 ~~MMBtu~~ / *yr* × 73.96 ~~kg~~ / ~~MMBtu~~ × *ton* / 907.2 ~~kg~~

**CH4 (diesel)** 49.87 *ton/yr* = 15,081,772 ~~MMBtu~~ / *yr* × 0.003 ~~kg~~ / ~~MMBtu~~ × *ton* / 907.2 ~~kg~~

**CO2e** 1,233,790 *ton/yr* = 1,229,570 *CO2 ton* / *yr* + 49.87 *CH4 ton* / *yr* × 25 *CO2e* / *CH4* + 9.97 *N2O ton* / *yr* × 298 *CO2e* / *N2O*

**Autoclaves**

**CO2** 37,659 *ton/yr* = 1.95 ~~t~~ / ~~hr~~ × 1.1023 *ton* / ~~t~~ × 8,760 ~~hr~~ / *yr* × 2 *autoclaves*

**Acidulation Tanks**

**CO2** 83,816 *ton/yr* = 8.68 ~~t~~ / ~~hr~~ × 1.1023 *ton* / ~~t~~ × 8,760 ~~hr~~ / *yr*

Conversion(s):
907.2 *kg/ton*
1.1023 *ton/t*
2.4711 *acres/hectare*
3.6641 *CO2/CO2-C*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: GHG Emissions | DATE: October 14, 2021 | | |

**Heat Input Rates and Emission Factors for Greenhouse Gas Emissions**

**Heat Input Rates for Combustion GHG Sources**

| Source Type | | Fuel | Operation (hr/yr) | Heat Input (MMBtu/hr) | Heat Input (MMBtu/yr) |
|---|---|---|---|---|---|
| Power Plant Generators (12) | | Diesel | 8,760 | 1,721.7 | 15,081,772 |
| Airport Generators (2) | | Diesel | 8,760 | 3.8 | 32,893 |
| Black Start Generators (EU ID: 29-30) | | Diesel | 500 | 11.3 | 5,632 |
| Emergency Generators (EU ID: 31-34) | | Diesel | 500 | 57.0 | 28,481 |
| Fire Pumps (EU ID: 35-37) | | Diesel | 500 | 5.3 | 2,646 |
| Portable Heaters (20) | | Diesel | 8,760 | 17.2 | 150,672 |
| POX Boilers (2) | | Diesel | 8,760 | 58.6 | 513,172 |
| Oxygen Plant Boiler | | Diesel | 8,760 | 20.7 | 181,013 |
| Carbon Elution Heater | | Diesel | 8,760 | 16.0 | 140,160 |
| Power Plant Auxiliary Heaters (2) | | Diesel | 8,760 | 33.0 | 289,080 |
| SO2 Burner | | Natural Gas | 8,760 | 2.0 | 17,520 |
| Auxiliary SO2 Burner | | Diesel | 8,760 | 2.0 | 17,520 |
| Building Heaters (138) | | Natural Gas | 8,760 | 24.2 | 211,554 |
| Air Handlers (19) | | Natural Gas | 8,760 | 95.0 | 832,200 |
| Air Handlers (7) | | Natural Gas | 8,760 | 17.5 | 153,300 |
| Blasting | (1) | Diesel | | | 143,989 |
| Mobile Machinery | (2) | Diesel | | | 4,993,352 |
| Incinerators | | Waste | 8,760 | 4.5 | 39,352 |

(1) *Based on 1,106,184 gal/yr Fuel heating value of 130,167 Btu/gal Donlin*
(2) *Based on 38,361,124 gal/yr Fuel heating value of 130,167 Btu/gal Donlin*

**Emission Factors**

| Fuel (kg/MMBtu) | CO2 | CH4 | N2O | | |
|---|---|---|---|---|---|
| Diesel | 73.96 | 0.003 | 0.0006 | | *40 CFR 98 Tab. C-1 and C-2* |
| Natural Gas | 53.06 | 0.001 | 0.0001 | | *40 CFR 98 Tab. C-1 and C-2* |
| Waste | 90.7 | 0.032 | 0.0042 | (1) | *40 CFR 98 Tab. C-1 and C-2* |

(1) *Municipal waste*

| Global Warming Potential | | |
|---|---|---|
| CH4 | 25 | *40 CFR 98 Tab. A-1* |
| N2O | 298 | *40 CFR 98 Tab. A-1* |

**Emissions from Impacted Peatlands/Wetlands (Dewatering)**

| | Acre | Hectare | |
|---|---|---|---|
| Area Dewatered (only) | 546.4 | 221.1 | *Donlin* |
| Area Dewatered and Covered with Soil | 767.3 | 310.5 | *Donlin* |
| Area Dewatered, Extracted, Stockpiled | 1,250.8 | 506.2 | *Donlin* |
| Total | 2,564.5 | 1,037.8 | |

**Emission Factors (1) and Emissions**

| Climate zone, Source | CO2 (t CO2-C/ha-y) | CO2e(2) (t CO2-C-eq./ha-y) | CO2 (ton/yr) | CO2e(2) (ton/yr) |
|---|---|---|---|---|
| Boreal, Mining Areas | 2.5 | 3 | 5,368 | 6,442 |
| Boreal, Mining and Stockpile | 6.8 | 7.3 | 13,902 | 14,924 |

(1) *Emission factors for managed peat soils, J. Couwenberg, 2009, Tables 5 and 6 and Appendix A*
(2) *CO2, CH4, and N2O*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-1 | PAGE: 1 | OF: 9 | SHEET: HAP |
| AIR EMISSION CALCULATIONS | SUBJECT: HAP Emissions | | DATE: October 14, 2021 | |

**Hazardous Air Pollutants Emissions Summary** ***(ton/yr)***

| CAS | Pollutant | Wärtsilä Highest of NG or ULSD | Other Fuel Burning Equipment | Process & Fugitive Dust | MACT 7E & Fugitive Hg Sources | Camp Waste Incinerator | Sewage Sludge Incinerator | CN Leach Processes | Fuel Tanks | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 71556 | 1,1,1-Trichloroethane | | 1.11E-3 | | | | | | | 1.11E-3 |
| 79345 | 1,1,2,2-Tetrachloroethane | 7.32E-3 | | | | | | | | 7.32E-3 |
| 79005 | 1,1,2-Trichloroethane | 5.82E-3 | | | | | | | | 5.82E-3 |
| 75343 | Ethylidene dichloride (1,1-Dichloroethane) | 4.32E-3 | | | | | | | | 4.32E-3 |
| 107062 | Ethylene dichloride (1,2-Dichloroethane) | 4.32E-3 | | | | | | | | 4.32E-3 |
| 78875 | Propylene dichloride (1,2-Dichloropropane) | 4.92E-3 | | | | | | | | 4.92E-3 |
| 106990 | 1,3-Butadiene | 4.89E-2 | 6.95E-4 | | | | | | | 4.96E-2 |
| 542756 | 1,3-Dichloropropene | 4.83E-3 | | | | | | | | 4.83E-3 |
| 106467 | 1,4-Dichlorobenzene(p) | | | | | | 5.08E-3 | | | 5.08E-3 |
| 540841 | 2,2,4-Trimethylpentane | 4.58E-2 | | | | | | | | 4.58E-2 |
| 75070 | Acetaldehyde | 1.53E+0 | 1.41E-2 | | | | | | | 1.54E+0 |
| 107028 | Acrolein | 9.41E-1 | 1.78E-3 | | | | | | | 9.43E-1 |
| 7440360 | Antimony | | | 3.13E-2 | | | | | | 3.13E-2 |
| 7440382 | Arsenic | | 2.70E-3 | 8.52E-1 | | 9.47E-3 | 4.65E-5 | | | 8.64E-1 |
| 71432 | Benzene (including benzene from gasoline) | 1.44E-1 | 3.24E-2 | | | | 4.23E-6 | | 2.50E-5 | 1.76E-1 |
| 7440417 | Beryllium | | 1.94E-3 | 2.52E-3 | | | 4.23E-9 | | | 4.46E-3 |
| 117817 | Bis(2-ethylhexyl)phthalate (DEHP) | | | | | | 8.67E-4 | | | 8.67E-4 |
| 7440439 | Cadmium | | 2.59E-3 | 1.10E-3 | | 4.08E-5 | 3.55E-7 | | | 3.74E-3 |
| 56235 | Carbon tetrachloride | 6.72E-3 | | | | | 2.54E-7 | | | 6.72E-3 |
| 108907 | Chlorobenzene | 5.56E-3 | | | | | 1.06E-7 | | | 5.56E-3 |
| 75003 | Ethyl chloride (Chloroethane) | 3.42E-4 | | | | | | | | 3.42E-4 |
| 67663 | Chloroform | 5.22E-3 | | | | | | | | 5.22E-3 |
| 7440473 | Chromium | | 2.77E-3 | 2.72E-01 | | 1.94E-2 | 6.77E-6 | | | 2.94E-1 |
| 7440484 | Cobalt | | 9.63E-5 | 5.61E-2 | | | | | | 5.62E-2 |
| 25321226 | Dichlorobenzene | | 1.38E-3 | | | | | | | 1.38E-3 |
| 100414 | Ethyl benzene | 7.27E-3 | 3.00E-4 | | | | | | 0.00E+0 | 7.57E-3 |
| 106934 | Ethylene dibromide (Dibromoethane) | 8.11E-3 | | | | | | | | 8.11E-3 |
| 50000 | Formaldehyde | 9.66E+0 | 2.23E-1 | | | | | | | **9.89E+0** |
| 110543 | Hexane | 2.03E-1 | 2.06E+0 | | | | | | 3.36E-2 | 2.30E+0 |
| 7647010 | Hydrochloric acid | | | | | 2.45E-3 | 2.89E-4 | | | 2.74E-3 |
| 74908 | Hydrogen Cyanide | | | | | | | 1.86E+0 | | 1.86E+0 |
| 7439921 | Lead | | 6.11E-3 | 5.28E-2 | | 2.66E-4 | 5.18E-7 | | | 5.92E-2 |
| 7439965 | Manganese | | 4.10E-3 | 2.95E+0 | | | 6.35E-6 | | | 2.95E+0 |
| 7439976 | Mercury * | | 2.09E-3 | 1.33E-2 | 1.76E-2 | 6.21E-5 | 2.22E-5 | | | 3.31E-2 |
| 67561 | Methanol | 4.58E-1 | | | | | | | | 4.58E-1 |
| 1634044 | Methyl tert butyl ether | | | | | | | | 2.60E-4 | 2.60E-4 |
| 75092 | Methylene chloride (Dichloromethane) | 3.66E-3 | | | | | | | | 3.66E-3 |
| 7440020 | Nickel | | 3.19E-3 | 1.86E-1 | | 1.70E-2 | 3.70E-4 | | | 2.06E-1 |
| 95476 | o-Xylenes | | 5.14E-4 | | | | | | | 5.14E-4 |
| 108952 | Phenol | 4.39E-3 | | | | | | | | 4.39E-3 |
| 7782492 | Selenium | | 9.70E-3 | 6.50E-3 | | | 4.23E-6 | | | 1.62E-2 |
| 100425 | Styrene | 4.32E-3 | | | | | | | 0.00E+0 | 4.32E-3 |
| 108883 | Toluene | 7.47E-2 | 4.33E-2 | | | | | | 1.70E-4 | 1.18E-1 |
| 79016 | Trichloroethylene | | | | | | 5.50E-6 | | | 5.50E-6 |
| 75014 | Vinyl chloride | 2.73E-3 | | | | | | | | 2.73E-3 |
| 1330207 | Xylenes (isomers and mixture) | 3.58E-2 | 8.36E-3 | | | | | | 3.10E-4 | 4.45E-2 |
| POM | Polycylic Organic Matter | 8.42E-2 | 1.26E-2 | | | 1.03E-8 | 6.66E-12 | | 0.00E+0 | 9.69E-2 |
| | **Total** | **13.31** | **2.44** | **4.42** | **0.02** | **0.05** | **0.01** | **1.86** | **0.034** | **22.14** |
| | | | | | | | | | Highest HAP | 9.89 |

** Detailed mercury calculations are provided beginning on page 134*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-1 | PAGE: 2 | OF: 9 | SHEET: HAP |
| AIR EMISSION CALCULATIONS | SUBJECT: HAP Emissions | DATE: October 14, 2021 | | |

**AP-42 Emission Factors for Engines and Boilers (NG and ULSD)** *(lb/MMBtu)*

| CAS No. | Pollutant | NG4SLB NG Engines (1) | DSMALL ULSD Engines (2) | DLARGE ULSD Engines (3) | NGBOIL NG Boilers (4) | DBOIL ULSD Boilers (5) | DUALBOIL NG/ULSD Boilers (6) | POM |
|---|---|---|---|---|---|---|---|---|
| 71556 | 1,1,1-Trichloroethane | | | | | 1.72E-06 | 1.72E-06 | |
| 79345 | 1,1,2,2-Tetrachloroethane | 4.00E-05 | | | | | | |
| 79005 | 1,1,2-Trichloroethane | 3.18E-05 | | | | | | |
| 75343 | 1,1-Dichloroethane | 2.36E-05 | | | | | | |
| 107062 | 1,2-Dichloroethane | 2.36E-05 | | | | | | |
| 78875 | 1,2-Dichloropropane | 2.69E-05 | | | | | | |
| 106990 | 1,3-Butadiene | 2.67E-04 | 3.91E-05 | | | | | |
| 542756 | 1,3-Dichloropropene | 2.64E-05 | | | | | | |
| 540841 | 2,2,4-Trimethylpentane | 2.50E-04 | | | | | | |
| 91576 | 2-Methylnaphthalene | 3.32E-05 | | | 2.35E-08 | | 2.35E-08 | POM |
| 56495 | 3-Methylchloranthrene | | | | 1.76E-09 | | 1.76E-09 | POM |
| 57976 | 7,12-Dimethylbenz(a)anthracene | | | | 1.57E-08 | | 1.57E-08 | POM |
| 83329 | Acenaphthene | 1.25E-06 | 1.42E-06 | 4.68E-06 | 1.76E-09 | 1.54E-07 | 1.54E-07 | POM |
| 208968 | Acenaphthylene | 5.53E-06 | 5.06E-06 | 9.23E-06 | 1.76E-09 | 1.85E-09 | 1.85E-09 | POM |
| 75070 | Acetaldehyde | 8.36E-03 | 7.67E-04 | 2.52E-05 | | | | |
| 107028 | Acrolein | 5.14E-03 | 9.25E-05 | 7.88E-06 | | | | |
| 120127 | Anthracene | | 1.87E-06 | 1.23E-06 | 2.35E-09 | 8.91E-09 | 8.91E-09 | POM |
| 7440382 | Arsenic | | | | 1.96E-07 | 4.00E-06 | 4.00E-06 | |
| 56553 | Benz(a)anthracene | | 1.68E-06 | 6.22E-07 | 1.76E-09 | 2.93E-08 | 2.93E-08 | POM |
| 71432 | Benzene | 4.40E-04 | 9.33E-04 | 7.76E-04 | 2.06E-06 | 1.56E-06 | 2.06E-06 | |
| 50328 | Benzo(a)pyrene | | 1.88E-07 | 2.57E-07 | 1.18E-09 | | 1.18E-09 | POM |
| 205992 | Benzo(b)fluoranthene | 1.66E-07 | 9.91E-08 | 1.11E-06 | 1.76E-09 | | 1.76E-09 | POM |
| 192972 | Benzo(e)pyrene | 4.15E-07 | | | | | | POM |
| 191242 | Benzo(g,h,i)perylene | 4.14E-07 | 4.89E-07 | 5.56E-07 | 1.18E-09 | 1.65E-08 | 1.65E-08 | POM |
| 207089 | Benzo(k)fluoranthene | | 1.55E-07 | 2.18E-07 | 1.76E-09 | 1.08E-08 | 1.08E-08 | POM |
| 7440417 | Beryllium | | | | 1.18E-08 | 3.00E-06 | 3.00E-06 | |
| 92524 | Biphenyl | 2.12E-04 | | | | | | POM |
| 7440439 | Cadmium | | | | 1.08E-06 | 3.00E-06 | 3.00E-06 | |
| 56235 | Carbon Tetrachloride | 3.67E-05 | | | | | | |
| 108907 | Chlorobenzene | 3.04E-05 | | | | | | |
| 75003 | Chloroethane | 1.87E-06 | | | | | | |
| 67663 | Chloroform | 2.85E-05 | | | | | | |
| 7440473 | Chromium | | | | 1.37E-06 | 3.00E-06 | 3.00E-06 | |
| 218019 | Chrysene | 6.93E-07 | 3.53E-07 | 1.53E-06 | 1.76E-09 | 1.74E-08 | 1.74E-08 | POM |
| 7440484 | Cobalt | | | | 8.24E-08 | | 8.24E-08 | |
| 53703 | Dibenzo(a,h)anthracene | | 5.83E-07 | 3.46E-07 | 1.18E-09 | 1.22E-08 | 1.22E-08 | POM |
| 25321226 | Dichlorobenzene | | | | 1.18E-06 | | 1.18E-06 | |
| 100414 | Ethylbenzene | 3.97E-05 | | | | 4.64E-07 | 4.64E-07 | |
| 106934 | Ethylene Dibromide | 4.43E-05 | | | | | | |
| 206440 | Fluoranthene | 1.11E-06 | 7.61E-06 | 4.03E-06 | 2.94E-09 | 3.53E-08 | 3.53E-08 | POM |
| 86737 | Fluorene | 5.67E-06 | 2.92E-05 | 1.28E-05 | 2.75E-09 | 3.26E-08 | 3.26E-08 | POM |
| 50000 | Formaldehyde | 5.28E-02 | 1.18E-03 | 7.89E-05 | 7.35E-05 | 2.41E-04 | 2.41E-04 | |
| 110543 | Hexane | 1.11E-03 | | | 1.76E-03 | | 1.76E-03 | |
| 193395 | Indeno(1,2,3-c,d)pyrene | | 3.75E-07 | 4.14E-07 | 1.76E-09 | 1.56E-08 | 1.56E-08 | POM |
| 7439921 | Lead | | | | 4.90E-07 | 9.00E-06 | 9.00E-06 | |
| 7439965 | Manganese | | | | 3.73E-07 | 6.00E-06 | 6.00E-06 | |
| 7439976 | Mercury | ** Detailed mercury calculations are provided beginning on page 134* | | | | | | |
| 67561 | Methanol | 2.50E-03 | | | | | | |
| 75092 | Methylene Chloride | 2.00E-05 | | | | | | |
| 91203 | Naphthalene | 7.44E-05 | 8.48E-05 | 1.30E-04 | 5.98E-07 | 8.25E-06 | 8.25E-06 | POM |
| 7440020 | Nickel | | | | 2.06E-06 | 3.00E-06 | 3.00E-06 | |
| 95476 | o-Xylenes | | | | | 7.96E-07 | 7.96E-07 | |
| 85018 | Phenanthrene | 1.04E-05 | 2.94E-05 | 4.08E-05 | 1.67E-08 | 7.66E-08 | 7.66E-08 | POM |
| 108952 | Phenol | 2.40E-05 | | | | | | |
| 129000 | Pyrene | 1.36E-06 | 4.78E-06 | 3.71E-06 | 4.90E-09 | 3.10E-08 | 3.10E-08 | POM |
| 7782492 | Selenium | | | | 2.35E-08 | 1.50E-05 | 1.50E-05 | |
| 100425 | Styrene | 2.36E-05 | | | | | | |
| 108883 | Toluene | 4.08E-04 | 4.09E-04 | 2.81E-04 | 3.33E-06 | 4.53E-05 | 4.53E-05 | |
| 75014 | Vinyl Chloride | 1.49E-05 | | | | | | |
| 1330207 | Xylene | 1.84E-04 | 2.85E-04 | 1.93E-04 | | | | |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**AP-42 Emission Factors for Engines and Boilers (NG and ULSD) - continued**

References:

(1) *AP-42, Tab. 3.2-2, 07/00, 4-stroke lean-burn engines*

(2) *AP-42, Tab. 3.3-2, 10/96, diesel engines (≤ 600 hp)*

(3) *AP-42, Tabs. 3.4-3 & 3.4-4, 10/96, large diesel engines (> 600 hp)*

(4) *AP-42, Tabs. 1.4-2, 1.4-3 & 1.4-4, 07/98, external natural gas combustion, based on 1,020 Btu/Scf*

(5) *AP-42, Tabs. 1.3-9 & 1.3-10, 05/10, external fuel oil combustion, based on 137,000 Btu/gal*

(6) *Maximum emission factor from ULSD and NG combustion.*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-1 | PAGE: 4 | OF: 9 | SHEET: HAP |
| AIR EMISSION CALCULATIONS | SUBJECT: HAP Emissions | DATE: October 14, 2021 | | |

**Power Plant (EU ID: 1-12)** Heat Input: 14,867,903 *MMBtu/yr, NG*

**HAP Emissions** 15,081,772 *MMBtu/yr, ULSD*

| CAS No. | Pollutant | Emission Factors NG4SLB Uncontrolled *(lb/MMBtu)* [1] NG | Controlled *(lb/MMBtu)* NG | | HAP Emissions *(ton/yr)* NG | Emission Factors DLARGE Uncontrolled *(lb/MMBtu)* [4] ULSD | Controlled *(lb/MMBtu)* ULSD | | HAP Emissions *(ton/yr)* ULSD | Highest HAP Emissions *(ton/yr)* NG or ULSD | | POM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 79345 | 1,1,2,2-Tetrachloroethane | 4.00E-05 | 9.85E-07 | (2) | 0.007 | | | | | 0.007 | NG | |
| 79005 | 1,1,2-Trichloroethane | 3.18E-05 | 7.83E-07 | (2) | 0.006 | | | | | 0.006 | NG | |
| 75343 | 1,1-Dichloroethane | 2.36E-05 | 5.81E-07 | (2) | 0.004 | | | | | 0.004 | NG | |
| 107062 | 1,2-Dichloroethane | 2.36E-05 | 5.81E-07 | (2) | 0.004 | | | | | 0.004 | NG | |
| 78875 | 1,2-Dichloropropane | 2.69E-05 | 6.62E-07 | (2) | 0.005 | | | | | 0.005 | NG | |
| 106990 | 1,3-Butadiene | 2.67E-04 | 6.57E-06 | (2) | 0.049 | | | | | 0.049 | NG | |
| 542756 | 1,3-Dichloropropene | 2.64E-05 | 6.50E-07 | (2) | 0.005 | | | | | 0.005 | NG | |
| 540841 | 2,2,4-Trimethylpentane | 2.50E-04 | 6.16E-06 | (2) | 0.046 | | | | | 0.046 | NG | |
| 91576 | 2-Methylnaphthalene | 3.32E-05 | 8.17E-07 | (2) | 0.006 | | | | | 0.006 | NG | POM |
| 83329 | Acenaphthene | 1.25E-06 | 3.08E-08 | (2) | 0.0002 | 4.68E-06 | 1.15E-07 | (2) | 0.001 | 0.001 | ULSD | POM |
| 208968 | Acenaphthylene | 5.53E-06 | 1.36E-07 | (2) | 0.001 | 9.23E-06 | 2.27E-07 | (2) | 0.002 | 0.002 | ULSD | POM |
| 75070 | Acetaldehyde | 8.36E-03 | 2.06E-04 | (2) | 1.530 | 2.52E-05 | 6.20E-07 | (2) | 0.005 | 1.530 | NG | |
| 107028 | Acrolein | 5.14E-03 | 1.27E-04 | (2) | 0.941 | 7.88E-06 | 1.94E-07 | (2) | 0.001 | 0.941 | NG | |
| 120127 | Anthracene | | | | | 1.23E-06 | 3.03E-08 | (2) | 0.0002 | 0.0002 | NG | POM |
| 56553 | Benz(a)anthracene | | | | | 6.22E-07 | 1.53E-08 | (2) | 0.0001 | 0.0001 | NG | POM |
| 71432 | Benzene | 4.40E-04 | 1.08E-05 | (2) | 0.081 | 7.76E-04 | 1.91E-05 | (2) | 0.144 | 0.144 | ULSD | |
| 50328 | Benzo(a)pyrene | | | | | 2.57E-07 | 6.33E-09 | (2) | 0.00005 | 0.00005 | NG | POM |
| 205992 | Benzo(b)fluoranthene | 1.66E-07 | 4.09E-09 | (2) | 0.00003 | 1.11E-06 | 2.73E-08 | (2) | 0.0002 | 0.0002 | ULSD | POM |
| 192972 | Benzo(e)pyrene | 4.15E-07 | 1.02E-08 | (2) | 0.0001 | | | | | 0.0001 | NG | POM |
| 191242 | Benzo(g,h,i)perylene | 4.14E-07 | 1.02E-08 | (2) | 0.0001 | 5.56E-07 | 1.37E-08 | (2) | 0.0001 | 0.0001 | ULSD | POM |
| 207089 | Benzo(k)fluoranthene | | | | | 2.18E-07 | 5.37E-09 | (2) | 0.00004 | 0.00004 | NG | POM |
| 92524 | Biphenyl | 2.12E-04 | 5.22E-06 | (2) | 0.039 | | | | | 0.039 | NG | POM |
| 56235 | Carbon Tetrachloride | 3.67E-05 | 9.04E-07 | (2) | 0.007 | | | | | 0.007 | NG | |
| 108907 | Chlorobenzene | 3.04E-05 | 7.48E-07 | (2) | 0.006 | | | | | 0.006 | NG | |
| 75003 | Chloroethane | 1.87E-06 | 4.60E-08 | (2) | 0.000 | | | | | 0.000 | NG | |
| 67663 | Chloroform | 2.85E-05 | 7.02E-07 | (2) | 0.005 | | | | | 0.005 | NG | |
| 218019 | Chrysene | 6.93E-07 | 1.71E-08 | (2) | 0.0001 | 1.53E-06 | 3.77E-08 | (2) | 0.0003 | 0.0003 | ULSD | POM |
| 53703 | Dibenzo(a,h)anthracene | | | | | 3.46E-07 | 8.52E-09 | (2) | 0.0001 | 0.0001 | NG | POM |
| 100414 | Ethylbenzene | 3.97E-05 | 9.77E-07 | (2) | 0.007 | | | | | 0.007 | NG | |
| 106934 | Ethylene Dibromide | 4.43E-05 | 1.09E-06 | (2) | 0.008 | | | | | 0.008 | NG | |
| 206440 | Fluoranthene | 1.11E-06 | 2.73E-08 | (2) | 0.0002 | 4.03E-06 | 9.92E-08 | (2) | 0.001 | 0.001 | ULSD | POM |
| 86737 | Fluorene | 5.67E-06 | 1.40E-07 | (2) | 0.001 | 1.28E-05 | 3.15E-07 | (2) | 0.002 | 0.002 | ULSD | POM |
| 50000 | Formaldehyde | 5.28E-02 | 1.30E-03 | (3) | 9.664 | 7.89E-05 | 1.94E-06 | (2) | 0.015 | 9.664 | NG | |
| 110543 | Hexane | 1.11E-03 | 2.73E-05 | (2) | 0.203 | | | | | 0.203 | NG | |
| 193395 | Indeno(1,2,3-c,d)pyrene | | | | | 4.14E-07 | 1.02E-08 | (2) | 0.0001 | 0.0001 | NG | POM |
| 67561 | Methanol | 2.50E-03 | 6.16E-05 | (2) | 0.458 | | | | | 0.458 | NG | |
| 75092 | Methylene Chloride | 2.00E-05 | 4.92E-07 | (2) | 0.004 | | | | | 0.004 | NG | |
| 91203 | Naphthalene | 7.44E-05 | 1.83E-06 | (2) | 0.014 | 1.30E-04 | 3.20E-06 | (2) | 0.024 | 0.024 | ULSD | POM |
| 85018 | Phenanthrene | 1.04E-05 | 2.56E-07 | (2) | 0.002 | 4.08E-05 | 1.00E-06 | (2) | 0.008 | 0.008 | ULSD | POM |
| 108952 | Phenol | 2.40E-05 | 5.91E-07 | (2) | 0.004 | | | | | 0.004 | NG | |
| 129000 | Pyrene | 1.36E-06 | 3.35E-08 | (2) | 0.0002 | 3.71E-06 | 9.13E-08 | (2) | 0.001 | 0.001 | ULSD | POM |
| 100425 | Styrene | 2.36E-05 | 5.81E-07 | (2) | 0.004 | | | | | 0.004 | NG | |
| 108883 | Toluene | 4.08E-04 | 1.00E-05 | (2) | 0.075 | 2.81E-04 | 6.92E-06 | (2) | 0.052 | 0.075 | NG | |
| 75014 | Vinyl Chloride | 1.49E-05 | 3.67E-07 | (2) | 0.003 | | | | | 0.003 | NG | |
| 1330207 | Xylene | 1.84E-04 | 4.53E-06 | (2) | 0.034 | 1.93E-04 | 4.75E-06 | (2) | 0.036 | 0.036 | ULSD | |
| POM | POM Subtotal | | | | 0.063 | | | | | 0.084 | | |
| | **Total** | | | | **13.22** | | | | **0.29** | **13.31** | | |

[1] *AP-42, Tab. 3.2-2, 07/00, 4-stroke lean-burn engines*

[2] *Ratioed from formaldehyde controlled vs. uncontrolled emission rate from NG firing.*

[3] *Based on formaldehyde test data from two NG-fired Wärtsilä power plants (Western 102 and the MEA* ***Eklutna Generation Station*** *). The emission rate represents the average emissions across all engines.*

[4] *AP-42, Tabs. 3.4-3 & 3.4-4, 10/96, large diesel engines (> 600 hp)*

Conversion(s):

2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | | BY: E. Memon |
|---|---|---|---|---|
| | PROJECT NO: 281-1-1 | PAGE: 5 | OF: 9 | SHEET: HAP |
| AIR EMISSION CALCULATIONS | SUBJECT: HAP Emissions | DATE: October 14, 2021 | | |

**Other Fuel-Burning Equipment**

**HAP Emissions** *(ton/yr)*

| | | DSMALL | DLARGE | DSMALL | DBOIL | NGBOIL | DUALBOIL | | |
|---|---|---|---|---|---|---|---|---|---|
| **Sources:** | | **≤ 600 hp Generators** | **> 600 hp Generators** | **≤ 600 hp Fire Pumps** | **ULSD Boilers/Heaters** | **NG Boilers/Heaters** | **NG/ULSD Boilers/Heaters** | **Total** | |
| **Heat Input (*MMBtu/yr*):** | | **32,893** | **34,113** | **2,646** | **168,192** | **1,214,574** | **1,123,425** | | |
| **CAS No.** | **Pollutant** | ***(ton/yr)*** | ***(ton/yr)*** | ***(ton/yr)*** | ***(ton/yr)*** | ***(ton/yr)*** | | ***(ton/yr)*** | **POM** |
| 71556 | 1,1,1-Trichloroethane | | | | 1.45E-4 | | 9.68E-4 | 1.11E-3 | |
| 106990 | 1,3-Butadiene | 6.43E-4 | | 5.17E-5 | | | | 6.95E-4 | |
| 91576 | 2-Methylnaphthalene | | | | | 1.43E-5 | 1.32E-5 | 2.75E-5 | POM |
| 56495 | 3-Methylchloranthrene | | | | | 1.07E-6 | 9.91E-7 | 2.06E-6 | POM |
| 57976 | 7,12-Dimethylbenz(a)anthracene | | | | | 9.53E-6 | 8.81E-6 | 1.83E-5 | POM |
| 83329 | Acenaphthene | 2.34E-5 | 7.98E-5 | 1.88E-6 | 1.30E-5 | 1.07E-6 | 8.65E-5 | 2.06E-4 | POM |
| 208968 | Acenaphthylene | 8.32E-5 | 1.57E-4 | 6.69E-6 | 1.55E-7 | 1.07E-6 | 1.04E-6 | 2.50E-4 | POM |
| 75070 | Acetaldehyde | 1.26E-2 | 4.30E-4 | 1.01E-3 | | | | 1.41E-2 | |
| 107028 | Acrolein | 1.52E-3 | 1.34E-4 | 1.22E-4 | | | | 1.78E-3 | |
| 120127 | Anthracene | 3.08E-5 | 2.10E-5 | 2.47E-6 | 7.49E-7 | 1.43E-6 | 5.00E-6 | 6.14E-5 | POM |
| 7440382 | Arsenic | | | | 3.36E-4 | 1.19E-4 | 2.25E-3 | 2.70E-3 | |
| 56553 | Benz(a)anthracene | 2.76E-5 | 1.06E-5 | 2.22E-6 | 2.46E-6 | 1.07E-6 | 1.64E-5 | 6.04E-5 | POM |
| 71432 | Benzene | 1.53E-2 | 1.32E-2 | 1.23E-3 | 1.31E-4 | 1.25E-3 | 1.16E-3 | 3.24E-2 | |
| 50328 | Benzo(a)pyrene | 3.09E-6 | 4.38E-6 | 2.49E-7 | | 7.14E-7 | 6.61E-7 | 9.10E-6 | POM |
| 205992 | Benzo(b)fluoranthene | 1.63E-6 | 1.89E-5 | 1.31E-7 | | 1.07E-6 | 9.91E-7 | 2.28E-5 | POM |
| 191242 | Benzo(g,h,i)perylene | 8.04E-6 | 9.48E-6 | 6.47E-7 | 1.39E-6 | 7.14E-7 | 9.27E-6 | 2.95E-5 | POM |
| 207089 | Benzo(k)fluoranthene | 2.55E-6 | 3.72E-6 | 2.05E-7 | 9.08E-7 | 1.07E-6 | 6.07E-6 | 1.45E-5 | POM |
| 7440417 | Beryllium | | | | 2.52E-4 | 7.14E-6 | 1.69E-3 | 1.94E-3 | |
| 7440439 | Cadmium | | | | 2.52E-4 | 6.55E-4 | 1.69E-3 | 2.59E-3 | |
| 7440473 | Chromium | | | | 2.52E-4 | 8.34E-4 | 1.69E-3 | 2.77E-3 | |
| 218019 | Chrysene | 5.81E-6 | 2.61E-5 | 4.67E-7 | 1.46E-6 | 1.07E-6 | 9.76E-6 | 4.47E-5 | POM |
| 7440484 | Cobalt | | | | | 5.00E-5 | 4.63E-5 | 9.63E-5 | |
| 53703 | Dibenzo(a,h)anthracene | 9.59E-6 | 5.90E-6 | 7.71E-7 | 1.03E-6 | 7.14E-7 | 6.85E-6 | 2.48E-5 | POM |
| 25321226 | Dichlorobenzene | | | | | 7.14E-4 | 6.61E-4 | 1.38E-3 | |
| 100414 | Ethylbenzene | | | | 3.90E-5 | | 2.61E-4 | 3.00E-4 | |
| 206440 | Fluoranthene | 1.25E-4 | 6.87E-5 | 1.01E-5 | 2.97E-6 | 1.79E-6 | 1.98E-5 | 2.29E-4 | POM |
| 86737 | Fluorene | 4.80E-4 | 2.18E-4 | 3.86E-5 | 2.74E-6 | 1.67E-6 | 1.83E-5 | 7.60E-4 | POM |
| 50000 | Formaldehyde | 1.94E-2 | 1.35E-3 | 1.56E-3 | 2.03E-2 | 4.47E-2 | 1.35E-1 | 2.23E-1 | |
| 110543 | Hexane | | | | | 1.07E+0 | 9.91E-1 | 2.06E+0 | |
| 193395 | Indeno(1,2,3-c,d)pyrene | 6.17E-6 | 7.06E-6 | 4.96E-7 | 1.31E-6 | 1.07E-6 | 8.77E-6 | 2.49E-5 | POM |
| 7439921 | Lead | | | | 7.57E-4 | 2.98E-4 | 5.06E-3 | 6.11E-3 | |
| 7439965 | Manganese | | | | 5.05E-4 | 2.26E-4 | 3.37E-3 | 4.10E-3 | |
| 7439976 | Mercury * | ** Detailed mercury calculations are provided beginning on page 134* | | | | | | | |
| 91203 | Naphthalene | 1.39E-3 | 2.22E-3 | 1.12E-4 | 6.94E-4 | 3.63E-4 | 4.63E-3 | 9.41E-3 | POM |
| 7440020 | Nickel | | | | 2.52E-4 | 1.25E-3 | 1.69E-3 | 3.19E-3 | |
| 95476 | o-Xylenes | | | | 6.69E-5 | | 4.47E-4 | 5.14E-4 | |
| 85018 | Phenanthrene | 4.84E-4 | 6.96E-4 | 3.89E-5 | 6.45E-6 | 1.01E-5 | 4.31E-5 | 1.28E-3 | POM |
| 129000 | Pyrene | 7.86E-5 | 6.33E-5 | 6.32E-6 | 2.61E-6 | 2.98E-6 | 1.74E-5 | 1.71E-4 | POM |
| 7782492 | Selenium | | | | 1.26E-3 | 1.43E-5 | 8.43E-3 | 9.70E-3 | |
| 108883 | Toluene | 6.73E-3 | 4.79E-3 | 5.41E-4 | 3.81E-3 | 2.02E-3 | 2.54E-2 | 4.33E-2 | |
| 1330207 | Xylene | 4.69E-3 | 3.29E-3 | 3.77E-4 | | | | 8.36E-3 | |
| POM | POM Subtotal | | | | | | | 1.26E-2 | |
| | **Total** | **0.064** | **0.027** | **0.005** | **0.029** | **1.124** | **1.186** | **2.435** | |

Conversion(s):

2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Process and Fugitive Dust**
**HAP Emissions**

**Ore/Waste HAP Concentrations (*ppm*)** [(1)]

| CAS No. | | Pollutant | Ore | Waste | Composite [(2)] |
|---|---|---|---|---|---|
| 7440382 | As | Arsenic | 1,187.7 | 143.9 | 226.3 |
| 7440417 | Be | Beryllium | 0.52 | 0.52 | 0.52 |
| 7440439 | Cd | Cadmium | 0.18 | 0.23 | 0.23 |
| 7440484 | Co | Cobalt | 6.7 | 11.8 | 11.4 |
| 7440473 | Cr | Chromium | 59.3 | 56.5 | 56.8 |
| 7439976 | Hg | Mercury * | | | |
| 7439965 | Mn | Manganese | 411.5 | 620.6 | 604.1 |
| 7440020 | Ni | Nickel | 20.7 | 39.2 | 37.7 |
| 7439921 | Pb | Lead | 13.5 | 10.9 | 11.1 |
| 7440360 | Sb | Antimony | 19.7 | 6.1 | 7.2 |
| 7782492 | Se | Selenium | 1.1 | 1.4 | 1.3 |

** Detailed mercury calculations are provided beginning on page 134*

(1) *Donlin, ICP analysis geometric mean based on 18,484 ore and 41,072 waste samples.*

(2) *Based on:* *Ore Production of* 13,059,932 *ton/yr* 7.90%
*and Waste Production of* 152,286,568 *ton/yr* 92.10%

Calculations for LOM: 16

| | | | 7440382 | 7440417 | 7440439 | 7440484 | 7440473 | 7439976 | 7439965 | 7440020 | 7439921 | 7440360 | 7782492 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PM** | **Material** | **As** | **Be** | **Cd** | **Co** | **Cr** | **Hg*** | **Mn** | **Ni** | **Pb** | **Sb** | **Se** |
| | ***ton/yr*** | | ***ton/yr*** | ***ton/yr*** | ***ton/yr*** | ***ton/yr*** | ***ton/yr*** | ***ton/yr*** | ***ton/yr*** | ***ton/yr*** | ***ton/yr*** | ***ton/yr*** | ***ton/yr*** |
| Drilling (EU ID: 113) | 92.0 | Composite | 2.08E-2 | 4.81E-5 | 2.09E-5 | 1.05E-3 | 5.22E-3 | | 5.56E-2 | 3.47E-3 | 1.02E-3 | 6.58E-4 | 1.23E-4 |
| Blasting (EU ID: 114) | 180.4 | Composite | 4.08E-2 | 9.44E-5 | 4.10E-5 | 2.06E-3 | 1.02E-2 | | 1.09E-1 | 6.81E-3 | 2.01E-3 | 1.29E-3 | 2.42E-4 |
| Ore Loading | 33.2 | Ore | 3.95E-2 | 1.73E-5 | 5.85E-6 | 2.24E-4 | 1.97E-3 | | 1.37E-2 | 6.88E-4 | 4.50E-4 | 6.55E-4 | 3.62E-5 |
| Ore Unloading | 9.3 | Ore | 1.10E-2 | 4.84E-6 | 1.64E-6 | 6.26E-5 | 5.51E-4 | | 3.83E-3 | 1.92E-4 | 1.26E-4 | 1.83E-4 | 1.01E-5 |
| Waste (incl. OVB/PAG) Loading | 240.9 | Waste | 3.47E-2 | 1.26E-4 | 5.58E-5 | 2.85E-3 | 1.36E-2 | | 1.50E-1 | 9.44E-3 | 2.63E-3 | 1.46E-3 | 3.28E-4 |
| Waste (incl. OVB/PAG) Un- & Re | 245.4 | Waste | 3.53E-2 | 1.29E-4 | 5.68E-5 | 2.91E-3 | 1.39E-2 | | 1.52E-1 | 9.62E-3 | 2.68E-3 | 1.49E-3 | 3.34E-4 |
| Ore Hauling | 184.5 | Waste | 2.65E-2 | 9.66E-5 | 4.27E-5 | 2.18E-3 | 1.04E-2 | | 1.14E-1 | 7.23E-3 | 2.01E-3 | 1.12E-3 | 2.51E-4 |
| Waste Hauling | 3,086.5 | Waste | 4.44E-1 | 1.62E-3 | 7.15E-4 | 3.65E-2 | 1.75E-1 | | 1.92E+0 | 1.21E-1 | 3.37E-2 | 1.88E-2 | 4.20E-3 |
| Dozer Use | 324.5 | Waste | 4.67E-2 | 1.70E-4 | 7.52E-5 | 3.84E-3 | 1.83E-2 | | 2.01E-1 | 1.27E-2 | 3.54E-3 | 1.97E-3 | 4.41E-4 |
| Grader Use | 42.7 | Waste | 6.14E-3 | 2.24E-5 | 9.89E-6 | 5.06E-4 | 2.41E-3 | | 2.65E-2 | 1.67E-3 | 4.66E-4 | 2.59E-4 | 5.81E-5 |
| Water Truck Use | 73.3 | Waste | 1.05E-2 | 3.84E-5 | 1.70E-5 | 8.68E-4 | 4.14E-3 | | 4.55E-2 | 2.87E-3 | 7.99E-4 | 4.45E-4 | 9.97E-5 |
| **Wind Erosion of Exposed Surfaces (EU ID: 161) & Access Road Dust** | | | | | | | | | | | | | |
| Tailings Beach | 3.9 | Waste | 5.55E-4 | 2.02E-6 | 8.94E-7 | 4.57E-5 | 2.18E-4 | | 2.40E-3 | 1.51E-4 | 4.21E-5 | 2.35E-5 | 5.25E-6 |
| Haul Roads | 1.8 | Waste | 2.58E-4 | 9.38E-7 | 4.15E-7 | 2.12E-5 | 1.01E-4 | | 1.11E-3 | 7.02E-5 | 1.95E-5 | 1.09E-5 | 2.44E-6 |
| Access Roads | 1.2 | Waste | 1.72E-4 | 6.24E-7 | 2.76E-7 | 1.41E-5 | 6.74E-5 | | 7.40E-4 | 4.68E-5 | 1.30E-5 | 7.25E-6 | 1.62E-6 |
| Waste Rock Facility | 23.2 | Waste | 3.34E-3 | 1.22E-5 | 5.38E-6 | 2.75E-4 | 1.31E-3 | | 1.44E-2 | 9.11E-4 | 2.53E-4 | 1.41E-4 | 3.16E-5 |
| Ore Stockpiles | 1.3 | Ore | 1.57E-3 | 6.89E-7 | 2.33E-7 | 8.91E-6 | 7.85E-5 | | 5.45E-4 | 2.74E-5 | 1.79E-5 | 2.61E-5 | 1.44E-6 |
| Access Roads Dust | 174.0 | Waste | 2.50E-2 | 9.11E-5 | 4.03E-5 | 2.06E-3 | 9.84E-3 | | 1.08E-1 | 6.82E-3 | 1.90E-3 | 1.06E-3 | 2.37E-4 |
| **Ore Processing** | | | | | | | | | | | | | |
| ROM Ore Discharge and Crushin | 30.7 | Ore | 3.64E-2 | 1.60E-5 | 5.40E-6 | 2.06E-4 | 1.82E-3 | | 1.26E-2 | 6.35E-4 | 4.15E-4 | 6.05E-4 | 3.34E-5 |
| Coarse Ore Transfer | 20.4 | Ore | 2.42E-2 | 1.06E-5 | 3.59E-6 | 1.37E-4 | 1.21E-3 | | 8.40E-3 | 4.22E-4 | 2.76E-4 | 4.03E-4 | 2.23E-5 |
| Pebble Crushers and Recycle | 18.2 | Ore | 2.16E-2 | 9.44E-6 | 3.20E-6 | 1.22E-4 | 1.08E-3 | | 7.47E-3 | 3.76E-4 | 2.46E-4 | 3.58E-4 | 1.98E-5 |
| Refinery Sources | 10.7 | Ore | 1.27E-2 | 5.57E-6 | 1.89E-6 | 7.21E-5 | 6.35E-4 | | 4.41E-3 | 2.22E-4 | 1.45E-4 | 2.11E-4 | 1.17E-5 |
| Laboratories | 8.1 | Ore | 9.64E-3 | 4.22E-6 | 1.43E-6 | 5.46E-5 | 4.81E-4 | | 3.34E-3 | 1.68E-4 | 1.10E-4 | 1.60E-4 | 8.84E-6 |
| **Total** | **4,806.3** | | **0.852** | **0.003** | **0.001** | **0.056** | **0.272** | | **2.951** | **0.186** | **0.053** | **0.031** | **0.006** |

** Detailed mercury calculations are provided beginning on page 134*

Sample Calculations
**Waste Hauling**

| | | | | | |
|---|---|---|---|---|---|
| Arsenic (7440382) | 4.44E-1 | *ton/yr* | 1.4E+2 *ton As* / ~~*MMton PM*~~ | 3,087 ~~*ton PM*~~ / *yr* | 1 ~~*MMton*~~ / 1.0E+6 ~~*ton*~~ |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-1 | PAGE: 7 | OF: 9 | SHEET: HAP |
| AIR EMISSION CALCULATIONS | SUBJECT: HAP Emissions | DATE: October 14, 2021 | | |

**Process and Fugitive Mercury***
**MACT EEEEEEE Sources - Hg Emissions**

| Point Sources | Hg limit | Activity (ton/yr) | Hg Allowable (ton/yr) | Hg Potential (ton/yr) | |
|---|---|---|---|---|---|
| Autoclaves | | | | | * Detailed mercury calculations are provided beginning on page 134 |
| Carbon Processes with Retort | | | | | * Detailed mercury calculations are provided beginning on page 134 |

**Other Point Sources of Hg**

| Point Sources | Hg Potential (ton/yr) | |
|---|---|---|
| Assay Furnaces | | * Detailed mercury calculations are provided beginning on page 134 |

**Fugitive Hg Emissions (Gaseous Flux)**

| Fugitive Source | Emissions (kg/yr) | (lb/yr) | (ton/yr) | |
|---|---|---|---|---|
| Tailings Fugitive Gaseous | | | | * Detailed mercury calculations are provided beginning on page 134 |
| Other Fugitive Gaseous | | | | * Detailed mercury calculations are provided beginning on page 134 |

| Point and Fugitive | CAS No. | Pollutant | (ton/yr) | |
|---|---|---|---|---|
| Total | 7439976 | Mercury | | * Detailed mercury calculations are provided beginning on page 134 |

**Process and Fugitive Hydrogen Cyanide**
**Tailings, CIL Tanks, CN-Destruction Tanks, Neutralization Tanks, EW Cells, and Pregnant and Barren Tanks [1]**

| CAS No. | Pollutant | | Emissions (ton/yr) |
|---|---|---|---|
| 74908 | HCN | Hydrogen Cyanide | 1.86 |

[1] *Emission calculations provided on page: 95*

Conversion(s):
2,000 *lb/ton*
1,000 *g/kg*
435.59 *g/lb*
1.1023 *ton/t*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-1 | PAGE: 8 | OF: 9 | SHEET: HAP |
| AIR EMISSION CALCULATIONS | SUBJECT: HAP Emissions | DATE: October 14, 2021 | | |

**Incinerators**
**HAP Emissions**

**Camp Waste Incinerator (EU ID: 27)**

Waste Throughput 4336.2 *ton/yr*

| CAS No. | | Pollutant | AP-42[(1)] *lb/ton* | AP-42 Emissions *ton/yr* | NSPS[(2)] Emissions *ton/yr* | Potential Emissions *ton/yr* | POM |
|---|---|---|---|---|---|---|---|
| 7647010 | HCl | Hydrogen Chloride | 6.40E+0 | 1.39E+1 | 2.45E-3 | 2.45E-3 | |
| 7440382 | Ar | Arsenic | 4.37E-3 | 9.47E-3 | | 9.47E-3 | |
| 7440439 | Cd | Cadmium | 1.09E-2 | 2.36E-2 | 4.08E-5 | 4.08E-5 | |
| 7440473 | Cr | Chromium | 8.97E-3 | 1.94E-2 | | 1.94E-2 | |
| 7439976 | Hg | Mercury* | | | | | |
| 7440020 | Ni | Nickel | 7.85E-3 | 1.70E-2 | | 1.70E-2 | |
| 7439921 | Pb | Lead | 2.13E-1 | 4.62E-1 | 2.66E-4 | 2.66E-4 | |
| 1746016 | | Dioxins/Furans | 7.50E-6 | 1.63E-5 | 1.03E-8 | 1.03E-8 | POM |
| POM | | POM Subtotal | | | | 1.03E-8 | |
| **Total** | | | | | | **0.049** | |

** Detailed mercury calculations are provided beginning on page 134*

(1) *AP-42, Tab. 2.1-2 and 2.1-6, 10/96*
(2) *See "Incinerator" sheet.*

**Sewage Sludge Incinerator (EU ID: 28)**

Sludge Throughput 21.15 *ton/yr*

| CAS No. | | Pollutant | AP-42[(1)] *lb/ton* | AP-42 Emissions *ton/yr* | NSPS[(2)] Emissions *ton/yr* | Potential Emissions *ton/yr* | POM |
|---|---|---|---|---|---|---|---|
| 7647010 | HCl | Hydrogen Chloride | 1.00E-1 | 1.06E-3 | 2.89E-4 | 2.89E-4 | |
| 79016 | | 1,1,1-Trichloroethane | 5.20E-4 | 5.50E-6 | | 5.50E-6 | |
| 106467 | | 1,4-Dichlorobenzene | 4.80E-1 | 5.08E-3 | | 5.08E-3 | |
| 71432 | | Benzene | 4.00E-4 | 4.23E-6 | | 4.23E-6 | |
| 117817 | | Bis(2-ethylhexyl)phthalate | 8.20E-2 | 8.67E-4 | | 8.67E-4 | |
| 56235 | | Carbon Tetrachloride | 2.40E-5 | 2.54E-7 | | 2.54E-7 | |
| 108907 | | Chlorobenzene | 1.00E-5 | 1.06E-7 | | 1.06E-7 | |
| 1746016 | | Dioxins/Furans | 5.48E-8 | 5.80E-10 | 6.66E-12 | 6.66E-12 | POM |
| 7440382 | Ar | Arsenic | 4.40E-3 | 4.65E-5 | | 4.65E-5 | |
| 7440417 | Be | Beryllium | 4.00E-7 | 4.23E-9 | | 4.23E-9 | |
| 7440439 | Cd | Cadmium | 4.40E-3 | 4.65E-5 | 3.55E-7 | 3.55E-7 | |
| 7440473 | Cr | Chromium | 6.40E-4 | 6.77E-6 | | 6.77E-6 | |
| 7439965 | Mn | Manganese | 6.00E-4 | 6.35E-6 | | 6.35E-6 | |
| 7439976 | Hg | Mercury* | | | | | |
| 7440020 | Ni | Nickel | 3.50E-2 | 3.70E-4 | | 3.70E-4 | |
| 7782492 | Se | Selenium | 4.00E-4 | 4.23E-6 | | 4.23E-6 | |
| 7439921 | Pb | Lead | | | 5.18E-7 | 5.18E-7 | |
| POM | | POM Subtotal | | | | 6.66E-12 | |
| **Total** | | | | | | **0.007** | |

** Detailed mercury calculations are provided beginning on page 134*

(1) *AP-42, Tab. 2.2-7 and 2.2-8, 10/96*
(2) *See "Incinerator" sheet.*

Conversion(s):
2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**Fuel Storage Tanks**
**HAP Emissions**

**Tanks HAP Emissions Summary**

| CAS No. | Pollutant | Total *ton/yr* | POM |
|---|---|---|---|
| 71432 | Benzene | 2.50E-5 | |
| 100414 | Ethyl benzene | -- | |
| 110543 | Hexane | 3.36E-2 | |
| 91203 | Naphthalene | -- | POM |
| 100425 | Styrene | -- | |
| 108883 | Toluene | 1.70E-4 | |
| 1330207 | Xylenes (mixture) | 3.10E-4 | |
| 1634044 | Methyl tert butyl ether | 2.60E-4 | |
| POM | POM Subtotal | -- | |
| **Total** | | **0.034** | |

**Tank-Specific HAP Emissions *(lb/yr)*** [(1)]

| CAS No. | Pollutant | Tank Count | (2) 15 | (3) 2 | (4) 1 | (5) 3 | (6) 2 | (7) 1 | (8) 2 | (9) 1 | (10) 1 | (11) 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 71432 | Benzene | | 0 | 0 | 0 | 0 | 0 | 0 | 0.02 | 0.01 | 0 | 0 |
| 100414 | Ethyl benzene | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110543 | Hexane | | 4.25 | 0.82 | 0.1 | 0 | 0.37 | 0.07 | 0.15 | 0.11 | 0.06 | 0.33 |
| 91203 | Naphthalene | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100425 | Styrene | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 108883 | Toluene | | 0.02 | 0 | 0 | 0 | 0 | 0 | 0.01 | 0.02 | 0 | 0 |
| 1330207 | Xylenes (mixture) | | 0.04 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1634044 | Methyl tert butyl ether | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.52 | 0 | 0 |

(1) *TANKS 4.0.9d using fuel-specific HAP profile from EPCRA Section 313 Industry Guidance - Metal Mining Facilities, January 1999 (EPA 745-B-99-001), Table 3-8*
(2) *Tank Farm Tanks (ULSD, 25 Million-Gallon Capacity, 3 Turnovers)*
(3) *Fuel Station Tanks (ULSD, 25,000-Gallon Capacity, 761 Turnovers)*
(4) *ANFO Mixing Plant Tank (ULSD, 10,000-Gallon Capacity, 79 Turnovers)*
(5) *Fire Pump Tanks (ULSD, 270-Gallon Capacity, 25 Turnovers)*
(6) *Power Plant Tanks (ULSD, 33,000-Gallon Capacity, 105 Turnovers)*
(7) *Camp Emergency Generators Tank (ULSD, 25,000-Gallon Capacity, 9 Turnovers)*
(8) *Airport Jet Fuel Tanks (9,900-Gallon Capacity, 6 Turnovers)*
(9) *Airport Aviation Gasoline Tank (5,000-Gallon Capacity, 2 Turnovers)*
(10) *Airport Emergency Generators Tank (ULSD, 9,900-Gallon Capacity, 26 Turnovers)*
(11) *Combined for POX Boilers, Oxygen Plant Boiler, Carbon Elution Heater, and Auxiliary SO2 Burner Tanks*

Conversion(s):

2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

**DONLIN GOLD - HCN EMISSIONS**
***LOM - Year: 20***

Wind Speed: m/s 3.55 | Fw 1.14

| Area | Source | Cat. | Category Description | Acre | pH (Solution Parameters) | $CN^-$ g/$m^3$ (Solution Parameters) | T °C (Solution Parameters) | pKa | $a_o$ | H | Overall kG or Flux* m/s or g/$m^2$-s | Fa x Fw | g/s | lb/yr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tailings | Tailings Impoundment | TA | Tails, Aqueous Surface | 749.00 | 7.00 | 0.41 | 3.68 | 9.804 | 0.9984 | 0.00251 | 1.89E-05 | 0.44 | 2.55E-02 | 1,773.5 |
| | | TW | Tails, Wet Sediment | 386.43 | 7.00 | 0.41 | 3.68 | 9.804 | 0.9984 | 0.00251 | 1.02E-05 | 0.44 | 7.12E-03 | 495.3 |
| | | TD | Tails, Dry Sediment | 784.57 | 7.00 | 0.41 | 3.68 | 9.804 | 0.9984 | 0.00251 | 2.29E-06 | 1.00 | 7.41E-03 | 515.0 |
| | | | ***Active Surface Subtotal*** | **1,135.4** | | | | | | | | | | |
| Mill | CIL Tank 1 | TK | Tanks | 0.0472 | 10.50 | 106.16 | 24.7 | 9.258 | 0.0542 | 0.00539 | 3.11E-04 | 0.44 | 8.09E-04 | 56.2 |
| | CIL Tank 2 | TK | Tanks | 0.0472 | 10.50 | 106.16 | 24.7 | 9.258 | 0.0542 | 0.00539 | 3.11E-04 | 0.44 | 8.09E-04 | 56.2 |
| | CIL Tank 3 | TK | Tanks | 0.0472 | 10.50 | 106.16 | 24.7 | 9.258 | 0.0542 | 0.00539 | 3.11E-04 | 0.44 | 8.09E-04 | 56.2 |
| | CIL Tank 4 | TK | Tanks | 0.0472 | 10.50 | 106.16 | 24.7 | 9.258 | 0.0542 | 0.00539 | 3.11E-04 | 0.44 | 8.09E-04 | 56.2 |
| | CIL Tank 5 | TK | Tanks | 0.0472 | 10.50 | 106.16 | 24.7 | 9.258 | 0.0542 | 0.00539 | 3.11E-04 | 0.44 | 8.09E-04 | 56.2 |
| | CIL Tank 6 | TK | Tanks | 0.0472 | 10.50 | 106.16 | 24.7 | 9.258 | 0.0542 | 0.00539 | 3.11E-04 | 0.44 | 8.09E-04 | 56.2 |
| | Cyanide Destruction Tank | TK | Tanks | 0.0257 | 8.00 | 3.00 | 24.7 | 9.258 | 0.9477 | 0.00539 | 3.11E-04 | 0.44 | 2.17E-04 | 15.1 |
| | Neutralization Tank 1 | TK | Tanks | 0.0738 | 7.00 | 1.00 | 55.0 | 8.470 | 0.9672 | 0.01620 | 3.11E-04 | 0.44 | 6.39E-04 | 44.4 |
| | Neutralization Tank 2 | TK | Tanks | 0.0738 | 7.00 | 1.00 | 55.0 | 8.470 | 0.9672 | 0.01620 | 3.11E-04 | 0.44 | 6.39E-04 | 44.4 |
| | Neutralization Tank 3 | TK | Tanks | 0.0738 | 7.00 | 1.00 | 55.0 | 8.470 | 0.9672 | 0.01620 | 3.11E-04 | 0.44 | 6.39E-04 | 44.4 |
| | Neutralization Tank 4 | TK | Tanks | 0.0738 | 7.00 | 1.00 | 55.0 | 8.470 | 0.9672 | 0.01620 | 3.11E-04 | 0.44 | 6.39E-04 | 44.4 |
| | Neutralization Tank 5 | TK | Tanks | 0.0738 | 7.00 | 1.00 | 55.0 | 8.470 | 0.9672 | 0.01620 | 3.11E-04 | 0.44 | 6.39E-04 | 44.4 |
| | | | ***TOTAL AREA*** | **1,920.7** | | | | | | | | | ***Fugitive Total (lb/yr)*** | **3,358.2** |
| | | | | | | | | | | | | | ***Fugitive Total (ton/yr)*** | **1.68** |

| **Stack Emissions** | lb/hr | hr/yr | lb/yr |
|---|---|---|---|
| EW Cells | 0.018 | 8,760 | **156.5** |
| Pregnant/Barren Tanks | 0.024 | 8,760 | **209.9** |
| ***Stack Total (lb/yr)*** | | | **366.5** |
| ***Facility Total (ton/yr)*** | | | **1.86** |

** Per EPA's request, three mines conducted fugitive HCN emission measurements in the fourth quarter of 2009 in order to quantify emissions from the various fugitive HCN sources at gold mines. The Quality Assurance Project Plan (QAPP) for this testing, the EPA's approval letter of this QAPP, and the final fugitive HCN test report are provided on the federal docket website at http://www.regulations.gov/#!docketDetail;D=EPA-HQ-OAR-2010-0239. The IDs for these documents are EPA-HQ-OAR-2010-0239-0102, EPA-HQ-OAR-2010-0239-0103, and EPA-HQ-OAR-2010-0239-0163 (0163.0 through 0163.6), respectively. The above emission factors were taken from the final fugitive HCN test report, "T. Card and C.E. Schmidt. Evaluation of Air Emissions of Hydrogen Cyanide from Fugitive Sources at Nevada Gold Mines Using the USEPA Surface Isolation Flux Chamber Technology. April 2010."*

## CN Tank Information

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| ***CIL Tanks*** | | | |
| Quantity | 6 | | *Donlin* |
| pH | 10.5 | | *Donlin* |
| Temperature | 24.7 | °C | *Donlin* |
| NaCN | 0.4 | lb/ton | *Donlin* |
| Free Cyanide ($CN^-$) Concentration | 106.2 | $g/m^3$ | |
| Diameter | 15.6 | m | *Donlin* |
| | 51.2 | ft | |
| Area | 2,057.3 | $ft^2$ | |
| | 0.04723 | acre | |
| ***CN Destruct Tank*** | | | |
| Quantity | 1 | | *Donlin* |
| pH | 8 | | *Donlin* |
| Temp. | 24.7 | °C | |
| NaCN | 3 | ppm | *Estimate* |
| $CN^-$ Concentration | 3.0 | $g/m^3$ | |
| Diameter | 11.5 | m | *Donlin* |
| | 37.7 | ft | |
| Area | 1,118.0 | $ft^2$ | |
| | 0.026 | acre | |
| ***Neutralization Tanks*** | | | |
| Quantity | 5 | | *Donlin* |
| pH | 7 | | *Donlin* |
| Temp. | 55 | °C | *Donlin* |
| NaCN | 1 | ppm | *Estimate* |
| $CN^-$ Concentration | 1.0 | $g/m^3$ | |
| Diameter | 19.5 | m | *Donlin* |
| | 64.0 | ft | |
| Area | 3,214.54 | $ft^2$ | |
| | 0.074 | acre | |

## HCN Tailings Information

| Parameter | Value | Unit | *Reference* |
|---|---|---|---|
| Beach Area | 1,171 | acre | *LOM - Year: 20* |
| Pond Area | 749 | acre | *LOM - Year: 20* |
| Beach Wet Fraction | 33% | | *Donlin* |
| Beach Dry Fraction | 67% | | |
| Beach Wet Area | 386.4 | acre | |
| Beach Dry Area | 784.6 | acre | |
| pH | 7.0 | | *Donlin* |
| $CN^-$ Concentration | 0.41 | $g/m^3$ | *Donlin* |
| Temperature | 3.7 | °C | *Assume 5 °C above ambient* |

**Conversion Factors**

| | | | | |
|---|---|---|---|---|
| 3.3 | ft/m | | | |
| 4046.9 | $m^2$/acre | | | |
| 43,560 | $ft^2$/acre | | | |
| 1 | lb/ton NaCN = | 265.41 | $g/m^3$ CN | |

**Sample Calculations**

| | | | | | | |
|---|---|---|---|---|---|---|
| Flux Box | 5.385 $\mu g/m^2$-min | 140 $\mu g$ | 5 ~~L~~ | ~~$m^3$~~ | | |
| | | ~~$m^3$~~ | min | 1000 ~~L~~ | 0.13 $m^2$ | |
| Flux | 9E-08 $g/m^2$-s | 5.384615 ~~$\mu g$~~ | 1 ~~min~~ | g | | |
| | | $m^2$-~~min~~ | 60 s | 1.00E+06 ~~$\mu g$~~ | | |

**HCN Air Emission Calculations Methodology**

$$\mathbf{E = k_G \times HCN \times A \times F_a \times F_w} \qquad \text{or} \qquad \mathbf{E = EF \times A}$$

Where:

E = HCN emission rate (g/s).
$k_G$ = the gas-phase mass transfer coefficient (m/s).
HCN = the ground level concentration of HCN in the gas phase ($g/m^3$).
A = the surface area of emission source ($m^2$).
$F_a = [(4 \times 0.13/Pi)^{0.5} / (4 \times A/Pi)^{0.5}]^{0.11}$, the flux chamber adjustment for area, where A = total area of the source ($m^2$). The flux chamber area is 0.13 $m^2$.
$F_w = (U_{10}/3)^{0.78}$, the flux chamber adjustment for wind speed. $U_{10}$ = the wind speed (m/s) at a height of 10 m.
EF = the HCN flux rate ($g/m^2$-s).

The equations for $F_a$ and $F_w$ come from: USEPA. *Air Emissions Models for Waste and Wastewater.* EPA 453/R-94-080A, November 1994.

**Vapor-Liquid Equilibrium Equations for HCN and $a_o$**

$$\mathbf{HCN = a_o \times CN^- \times H}$$
$$\mathbf{a_o = 1/[1 + 10^{(pH - pKa)}]}$$
$$\mathbf{H = 0.0022 \times e^{(0.0363 \times T)}}$$

Where:

$a_o$ = the liquid-phase mass fraction of free cyanide that is in the form of HCN.
$CN^-$ = the liquid-phase free cyanide concentration (mg/l = $g/m^3$ = ppm, mass).
H = Henry's Constant [$vol_{liquid} / vol_{gas}$] or [$g/m^3_{gas} / g/m^3_{liquid}$]
pKa = -log(K)
K = Dissociation equilibrium constant
T = Temperature (°C).

**Sample Wind Erosion Calculations**

**Calculations for Waste Rock Storage (WRS) Area Wind Erosion**

**LOM Year 16 - Meteorological Year: 07/01/2008 - 06/30/2009**

(Similar Calculations are Completed for Each Area with Stockpiled Material)

| | | | |
|---|---|---|---|
| Waste Produced | 152,276,347 | ton/yr | |
| | 417,195 | ton/day | Annual average |
| | 17,383 | ton/hr | Annual average |
| Truck Dump (TD) Size | 399 | ton | Weighted average of 400 and 159 ton trucks |
| Material Density | 2.7 | $t/m^3$ | Average |
| | 0.08 | $ton/ft^3$ | |
| Material Specific Volume | 11.9 | $ft^3$/ton | |
| TD Volume | 4,738 | $ft^3$ | = 399 ~~ton~~ × 11.9 $ft^3$ / ~~ton~~ |

Conical Surface Calculations

| | | | | | |
|---|---|---|---|---|---|
| Side Slope | 38 | deg | | | |
| | 0.7 | rad | Conversions: | 365 | day/yr |
| | | | | 1.1023 | ton/t |
| Conical Surface Area (SA) | Π × r × (h^2 + r^2)^0.5 | | | 2.2046 | lb/kg |
| Conical Volume (V) | (Π × h × r^2) ÷ 3 | | | 3.2808 | ft/m |
| Conical Base Radius | r = | s × cos(slope) | | 43,560 | $ft^2$/acre |
| Conical Height | h = | s × sin(slope) | | 4,046.9 | $m^2$/acre |
| Sloped Side | s = | (h^2 + r^2)^0.5 | | 1,609.3 | m/mi |
| | | | | 3,600 | s/hr |
| Solution of Conical Volume Equation | | | | 453.6 | g/lb |
| Replacing h and r with s × sin(slope) and s × cos(slope): | | | | 2,000 | lb/ton |
| s = [3 × V/(pi × sin(slope) × cos^2(slope)]^(1/3) | 22.8 | ft | | 8,760 | hr/yr |
| r | 18.0 | ft | | | |
| h | 14.0 | ft | | | |
| SA | 1,286 | $ft^2$ | | | |
| | 0.030 | acre | | | |
| Pile Base Area (Diameter-Square) | 1,290 | $ft^2$ | | | |
| Unit Surface Area | 7.4E-05 | acre/ton-TD | | | |
| New Area Created Hourly | 1.28 | acre/hr | = 7.39155E-05 acre / ~~ton-TD~~ × 17,383 ~~ton-TD~~ / hr | | |

| | | | |
|---|---|---|---|
| Initial (maximum) Erodible Area | 8,061,770 | $m^2$ | Total surface area of the Waste Rock Storage Area |
| | 1,992 | acre | |
| Threshold Friction Velocity, $u_t$* | 1.02 | m/s | AP-42, Page 13.2.5-5, 11/06 (overburden) |
| Hourly Average to Fastest-Mile Wind Speed Conversion | 1.24 | | ADEC 2015 |

**Calculations Follow Example 1 on AP-42, Page 13.2.5-10**

| Area ID | A | B | C1+C2 | |
|---|---|---|---|---|
| Equivalent Friction Velocity, $(u_s/u_r)$ | 0.9 | 0.6 | 0.2 | AP-42, Page 13.2.5-10, 11/06 |
| % Pile Surface | 12% | 48% | 40% | AP-42, Page 13.2.5-10, 11/06 |

| | | | | | |
|---|---|---|---|---|---|
| **Event #1** | | | | | |
| Wind Data Start Date | 7/1/2008 | hour 1 | | | |
| Wind Erosion Event #1 Occurs on | 7/9/2008 | hour 14 | | | |
| Average Hourly Wind Speed for Event #1 | 10.53 m/s | | | | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 13.06 m/s | | | | |
| **Area ID** | **A** | **B** | **C1+C2** | | |
| Initial (maximum) Surface Area of Stockpiles | 1,992 | 1,992 | 1,992 | acre | |
| Friction Velocity, $u^* = (u_s/u_r) \times 0.1 \times u_{10}^+$ | 1.18 | 0.78 | 0.26 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \le u_t^*$ | 5.27 | 0.00 | 0.00 | $g/m^2$ | |
| | 47.1 | 0.0 | 0.0 | lb/acre | |
| Erodible Area for Event #1 | 239 | 956 | 797 | acre | |
| Event #1 Wind Erosion PM Emissions | 11,250.1 | 0.0 | 0.0 | lb | |
| **Event #2** | | | | | |
| Wind Erosion Event #2 Occurs on | 7/16/2008 | hour 14 | | | |
| Average Hourly Wind Speed for Event #2 | 9.56 m/s | | | | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 11.85 m/s | | | | |
| | | | | | |
| **Area ID** | **A** | **B** | **C1+C2** | | |
| Time Elapsed Since Event #1 | 168 | N/A | N/A | hr | N/A = Did not blow during previous event |
| New Surface Area Created Since Event #1 | 216 | 1,992 | 1,992 | acre | |
| Friction Velocity, $u^* = (u_s/u_r) \times 0.1 \times u_{10}^+$ | 1.07 | 0.71 | 0.24 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \le u_t^*$ | 1.30 | 0.00 | 0.00 | $g/m^2$ | |
| | 11.6 | 0.0 | 0.0 | lb/acre | |
| Erodible Area for Event #2 | 26 | 956 | 797 | acre | |
| Event #2 Wind Erosion PM Emissions | 300.4 | 0.0 | 0.0 | lb | |
| **Event #3** | | | | | |
| Wind Erosion Event #3 Occurs on | 10/28/2008 | hour 13 | | | |
| Average Hourly Wind Speed for Event #3 | 9.96 m/s | | | | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 12.35 m/s | | | | |
| **Area ID** | **A** | **B** | **C1+C2** | | |
| Time Elapsed Since Event #2 | 2,495 | N/A | N/A | hr | N/A = Did not blow during previous event |
| New Surface Area Created Since Event #2 | 1,992 | 1,992 | 1,992 | acre | |
| Friction Velocity, $u^* = (u_s/u_r) \times 0.1 \times u_{10}^+$ | 1.11 | 0.74 | 0.25 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \le u_t^*$ | 2.8 | 0.0 | 0.0 | $g/m^2$ | |
| | 24.8 | 0.0 | 0.0 | lb/acre | |
| Erodible Area for Event #3 | 239 | 956 | 797 | acre | |
| Event #3 Wind Erosion PM Emissions | 5,917.2 | 0.0 | 0.0 | lb | |

| | | | | | |
|---|---|---|---|---|---|
| **Event #4** | | | | | |
| Wind Erosion Event #4 Occurs on | 10/28/2008 | hour 14 | | | |
| Average Hourly Wind Speed for Event #4 | 10.17 m/s | | | | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 12.61 m/s | | | | |
| **Area ID** | **A** | **B** | **C1+C2** | | |
| Time Elapsed Since Event #3 | 1 | N/A | N/A | hr | N/A = Did not blow during previous event |
| New Surface Area Created Since Event #3 | 1.28 | 1,992 | 1,992 | acre | |
| Friction Velocity, $u^* = (u_s/u_r) \times 0.1 \times u_{10}^+$ | 1.13 | 0.76 | 0.25 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \leq u_t^*$ | 3.6 | 0.0 | 0.0 | $g/m^2$ | |
| | 32.5 | 0.0 | 0.0 | lb/acre | |
| Erodible Area for Event #4 | 0.15 | 956 | 797 | acre | |
| Event #4 Wind Erosion PM Emissions | 5.0 | 0.0 | 0.0 | lb | |
| **Event #5** | | | | | |
| Wind Erosion Event #5 Occurs on | 10/28/2008 | hour 15 | | | |
| Average Hourly Wind Speed for Event #5 | 9.46 m/s | | | | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 11.73 m/s | | | | |
| **Area ID** | **A** | **B** | **C1+C2** | | |
| Time Elapsed Since Event #4 | 1 | N/A | N/A | hr | N/A = Did not blow during previous event |
| New Surface Area Created Since Event #4 | 1 | 1,992 | 1,992 | acre | |
| Friction Velocity, $u^* = (u_s/u_r) \times 0.1 \times u_{10}^+$ | 1.06 | 0.70 | 0.23 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \leq u_t^*$ | 1.0 | 0.0 | 0.0 | $g/m^2$ | |
| | 8.6 | 0.0 | 0.0 | lb/acre | |
| Erodible Area for Event #5 | 0.15 | 956 | 797 | acre | |
| Event #5 Wind Erosion PM Emissions | 1.3 | 0.0 | 0.0 | lb | |

| | | | | |
|---|---|---|---|---|
| Total Number of Events in Year | 248 | | | |
| Total PM Emissions from Events #1 to #248 for WRS | 29.0 ton | | | |
| Total $PM_{10}$ Emissions from Events #1 to #248 for WRS | 14.5 ton | $PM/PM_{10}$ Scaling Factor | 0.5 | AP-42, Page 13.2.5-3, 11/06 |
| Total $PM_{2.5}$ Emissions from Events #1 to #248 for WRS | 2.2 ton | $PM/PM_{2.5}$ Scaling Factor | 0.075 | AP-42, Page 13.2.5-3, 11/06 |

## Dry Tailings Beach Area Wind Erosion

**LOM Year - Meteorological Year: 07/01/2008 - 06/30/2009**

| | | | |
|---|---|---|---|
| Initial (maximum) Surface Area of Dry Tailings Beach | 798 | acre | Donlin |
| New Surface Area of Dry Tailings Beach Created Every Day | 7.3 | acre/day | Donlin |
| Average Hourly New Surface Area of Dry Tailings Beach Created | 0.31 | acre/hr | |

**Event #1**

| | | | |
|---|---|---|---|
| Wind Erosion Event #1 Occurs on | 1/16/2009 | | hour 18 |
| Average Hourly Wind Speed for Event #1 | 16.06 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 19.91 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.06 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \le u_t^*$ | 1.0 | $g/m^2$ | |
| | 8.6 | lb/acre | |
| Initial (maximum) Surface Area of Dry Tailings Beach | 798.0 | acre | |
| Event #1 Tailings Wind Erosion PM Emissions | 6,831 | lb | |

**Event #2**

| | | | |
|---|---|---|---|
| Wind Erosion Event #2 Occurs on | 1/16/2009 | | hour 19 |
| Average Hourly Wind Speed for Event #2 | 17.82 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 22.10 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.17 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \le u_t^*$ | 5.1 | $g/m^2$ | |
| | 45.5 | lb/acre | |
| Time Elapsed Since Event #1 | 1 | hr | |
| New Surface Area Created Since Event #1 | 0.31 | acre | |
| Event #2 Tailings Wind Erosion PM Emissions | 13.93 | lb | |

**Event #3**

| | | | |
|---|---|---|---|
| Wind Erosion Event #3 Occurs on | 1/16/2009 | | hour 20 |
| Average Hourly Wind Speed for Event #3 | 19.61 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 24.32 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.29 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \le u_t^*$ | 10.9 | $g/m^2$ | |
| | 97.3 | lb/acre | |
| Time Elapsed Since Event #2 | 1 | hr | |
| New Surface Area Created Since Event #2 | 0.31 | acre | |
| Event #3 Tailings Wind Erosion PM Emissions | 29.78 | lb | |

**Event #4**

| | | | |
|---|---|---|---|
| Wind Erosion Event #4 Occurs on | 1/16/2009 | | hour 21 |
| Average Hourly Wind Speed for Event #4 | 19.13 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 23.72 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.26 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \le u_t^*$ | 9.2 | $g/m^2$ | |
| | 82.0 | lb/acre | |
| Time Elapsed Since Event #3 | 1 | hr | |
| New Surface Area Created Since Event #3 | 0.31 | acre | |
| Event #4 Tailings Wind Erosion PM Emissions | 25.10 | lb | |

**Event #5**

| | | | |
|---|---|---|---|
| Wind Erosion Event #5 Occurs on | 1/16/2009 | | hour 22 |
| Average Hourly Wind Speed for Event #5 | 16.22 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 20.11 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.07 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \le u_t^*$ | 1.3 | $g/m^2$ | |
| | 11.3 | lb/acre | |
| Time Elapsed Since Event #4 | 1 | hr | |
| New Surface Area Created Since Event #4 | 0.31 | acre | |
| Event #5 Tailings Wind Erosion PM Emissions | 3.47 | lb | |

**Event #6**

| | | | |
|---|---|---|---|
| Wind Erosion Event #6 Occurs on | 1/16/2009 | | hour 24 |
| Average Hourly Wind Speed for Event #6 | 17.52 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 21.72 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.15 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \le u_t^*$ | 4.3 | $g/m^2$ | |
| | 38.2 | lb/acre | |
| Time Elapsed Since Event #5 | 2 | hr | |
| New Surface Area Created Since Event #5 | 0.61 | acre | |
| Event #6 Tailings Wind Erosion PM Emissions | 23.41 | lb | |

**Event #7**

| | | | |
|---|---|---|---|
| Wind Erosion Event #7 Occurs on | 1/17/2009 | | hour 1 |
| Average Hourly Wind Speed for Event #7 | 19.58 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 24.28 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.29 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \leq u_t^*$ | 10.8 | $g/m^2$ | |
| | 96.3 | lb/acre | |
| Time Elapsed Since Event #6 | 1 | hr | |
| New Surface Area Created Since Event #6 | 0.31 | acre | |
| Event #7 Tailings Wind Erosion PM Emissions | 29.48 | lb | |

**Event #8**

| | | | |
|---|---|---|---|
| Wind Erosion Event #8 Occurs on | 1/17/2009 | | hour 2 |
| Average Hourly Wind Speed for Event #8 | 19.24 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 23.86 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.26 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \leq u_t^*$ | 9.6 | $g/m^2$ | |
| | 85.4 | lb/acre | |
| Time Elapsed Since Event #7 | 1 | hr | |
| New Surface Area Created Since Event #7 | 0.31 | acre | |
| Event #8 Tailings Wind Erosion PM Emissions | 26.15 | lb | |

**Event #9**

| | | | |
|---|---|---|---|
| Wind Erosion Event #9 Occurs on | 1/17/2009 | | hour 3 |
| Average Hourly Wind Speed for Event #9 | 18.51 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 22.95 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.22 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \leq u_t^*$ | 7.2 | $g/m^2$ | |
| | 63.8 | lb/acre | |
| Time Elapsed Since Event #8 | 1 | hr | |
| New Surface Area Created Since Event #8 | 0.31 | acre | |
| Event #9 Tailings Wind Erosion PM Emissions | 19.52 | lb | |

**Event #10**

| | | | |
|---|---|---|---|
| Wind Erosion Event #10 Occurs on | 1/17/2009 | | hour 4 |
| Average Hourly Wind Speed for Event #10 | 17.56 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 21.77 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.15 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \le u_t^*$ | 4.4 | $g/m^2$ | |
| | 39.2 | lb/acre | |
| Time Elapsed Since Event #9 | 1 | hr | |
| New Surface Area Created Since Event #9 | 0.31 | acre | |
| Event #10 Tailings Wind Erosion PM Emissions | 11.99 | lb | |

**Event #11**

| | | | |
|---|---|---|---|
| Wind Erosion Event #11 Occurs on | 2/13/2009 | | hour 6 |
| Average Hourly Wind Speed for Event #11 | 15.98 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 19.82 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.05 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \le u_t^*$ | 0.8 | $g/m^2$ | |
| | 7.2 | lb/acre | |
| Time Elapsed Since Event #10 | 650 | hr | |
| New Surface Area Created Since Event #10 | 198.89 | acre | |
| Event #11 Tailings Wind Erosion PM Emissions | 1,433.85 | lb | |

**Event #12**

| | | | |
|---|---|---|---|
| Wind Erosion Event #12 Occurs on | 2/13/2009 | | hour 7 |
| Average Hourly Wind Speed for Event #12 | 18.64 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 23.11 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.23 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \le u_t^*$ | 7.6 | $g/m^2$ | |
| | 67.5 | lb/acre | |
| Time Elapsed Since Event #11 | 1 | hr | |
| New Surface Area Created Since Event #11 | 0.31 | acre | |
| Event #12 Tailings Wind Erosion PM Emissions | 20.65 | lb | |

**Event #13**

| | | | |
|---|---|---|---|
| Wind Erosion Event #13 Occurs on | 2/13/2009 | | hour 8 |
| Average Hourly Wind Speed for Event #13 | 17.39 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 21.56 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.14 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \leq u_t^*$ | 3.9 | $g/m^2$ | |
| | 35.2 | lb/acre | |
| Time Elapsed Since Event #12 | 1 | hr | |
| New Surface Area Created Since Event #12 | 0.31 | acre | |
| Event #13 Tailings Wind Erosion PM Emissions | 10.78 | lb | |

**Event #14**

| | | | |
|---|---|---|---|
| Wind Erosion Event #14 Occurs on | 2/13/2009 | | hour 9 |
| Average Hourly Wind Speed for Event #14 | 16.49 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 20.45 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.08 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \leq u_t^*$ | 1.8 | $g/m^2$ | |
| | 16.3 | lb/acre | |
| Time Elapsed Since Event #13 | 1 | hr | |
| New Surface Area Created Since Event #13 | 0.31 | acre | |
| Event #14 Tailings Wind Erosion PM Emissions | 4.99 | lb | |

**Event #15**

| | | | |
|---|---|---|---|
| Wind Erosion Event #15 Occurs on | 2/13/2009 | | hour 10 |
| Average Hourly Wind Speed for Event #15 | 16.67 | m/s | |
| Fastest-Mile Wind Speed, u10+ (hourly wind speed × 1.24) | 20.67 | m/s | |
| Friction Velocity, $u^* = 0.053 \times u_{10}^+$ | 1.10 | m/s | |
| Erosion Potential, $P = 58(u^* - u_t^*)^2 + 25(u^* - u_t^*)$; $P = 0$ for $u^* \leq u_t^*$ | 2.2 | $g/m^2$ | |
| | 19.8 | lb/acre | |
| Time Elapsed Since Event #14 | 1 | hr | |
| New Surface Area Created Since Event #14 | 0.31 | acre | |
| Event #15 Tailings Wind Erosion PM Emissions | 6.06 | lb | |

| | | | | | |
|---|---|---|---|---|---|
| Total Number of Events in Year | 15 | | | | |
| Total PM Emissions from Events #1 to #15 for Tailings | 8,491 | lb | | | |
| | 4.2 | ton | | | |
| Total $PM_{10}$ Emissions from Events #1 to #15 for Tailings | 2.1 | ton | $PM/PM_{10}$ Scaling Factor | 0.5 | AP-42, Page 13.2.5-3, 11/06 |
| Total $PM_{2.5}$ Emissions from Events #1 to #15 for Tailings | 0.3 | ton | $PM/PM_{2.5}$ Scaling Factor | 0.075 | AP-42, Page 13.2.5-3, 11/06 |

## Road Surface Wind Erosion

**LOM Year - Meteorological Year: 07/01/2008 - 06/30/2009**

Unlike Stockpiles or Tailings Areas, Road Surfaces are Assumed to be Disturbed Continuously.

For road surfaces, an annual erosion potential is calculated as sum of flat surface erosion potentials per year.

(Sum of erosion potentials from Events #1 to #15 calculated for dry tailings beach.)

| | | |
|---|---|---|
| Flat Area Erosion Potential | 713.9 | lb/acre |
| Control Efficiency | 90% | |

| Haul/Access Road Segment | Length (m) | Width (m) | Surface Area ($m^2$) | Surface Area (acre) | Controlled PM (ton) | Controlled $PM_{10}$ (ton) | Controlled $PM_{2.5}$ (ton) |
|---|---|---|---|---|---|---|---|
| Haul Road - Inside Pit | 18,206 | 29 | 527,974 | 130.5 | 4.7 | 2.3 | 0.3 |
| Haul Road - Outside Pit | 11,749 | 29 | 340,728 | 84.2 | 3.0 | 1.5 | 0.2 |
| Access Road - Camp to Mine Site (EU ID: 158) | 6,743 | 9 | 60,684 | 15.0 | 0.5 | 0.3 | 0.0 |
| Access Road - Airport to Camp (EU ID: 159) | 10,093 | 9 | 90,841 | 22.4 | 0.8 | 0.4 | 0.1 |
| Access Road - Jungjuk Port to Mine Site | 47,442 | 9 | 426,977 | 105.5 | 3.8 | 1.9 | 0.3 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Tank Farm Tanks-VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Vertical Fixed Roof Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Height (ft): | 25.59 |
| Diameter (ft): | 140.09 |
| Liquid Height (ft) : | 21.80 |
| Avg. Liquid Height (ft): | 12.79 |
| Volume (gallons): | 2,500,000.00 |
| Turnovers: | 3.00 |
| Net Throughput(gal/yr): | 7,500,000.00 |
| Is Tank Heated (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |
| Roof Color/Shade: | White/White |
| Roof Condition: | Good |

**Roof Characteristics**

| | |
|---|---|
| Type: | Cone |
| Height (ft) | 0.00 |
| Slope (ft/ft) (Cone Roof) | 0.00 |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

### Tank Farm Tanks-VOCs - Vertical Fixed Roof Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0031 | 0.0031 | 0.0031 | 130.0000 | | | 188.00 | Option 1: VP40 = .0031 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

### Tank Farm Tanks-VOCs - Vertical Fixed Roof Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 71.96 | 131.01 | 202.97 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Tank Farm Tanks-HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Vertical Fixed Roof Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Height (ft): | 25.59 |
| Diameter (ft): | 140.09 |
| Liquid Height (ft) : | 21.80 |
| Avg. Liquid Height (ft): | 12.79 |
| Volume (gallons): | 2,500,000.00 |
| Turnovers: | 3.00 |
| Net Throughput(gal/yr): | 7,500,000.00 |
| Is Tank Heated (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |
| Roof Color/Shade: | White/White |
| Roof Condition: | Good |

**Roof Characteristics**

| | |
|---|---|
| Type: | Cone |
| Height (ft) | 0.00 |
| Slope (ft/ft) (Cone Roof) | 0.00 |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Tank Farm Tanks-HAPs - Vertical Fixed Roof Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0001 | 0.0001 | 0.0001 | 86.3820 | | | 1.02 | Option 1: VP40 = .0031 |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0000 | 0.0005 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0001 | 0.0004 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0100 | 0.9836 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0055 | 0.0004 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.9809 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Styrene | | | | | | 0.0232 | 0.0202 | 0.0266 | 104.1500 | 0.0003 | 0.0008 | 104.15 | Option 2: A=7.14, B=1574.51, C=224.09 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0003 | 0.0043 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0029 | 0.0100 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

TANKS 4.0.9d
Emissions Report - Summary Format
Individual Tank Emission Totals

## Emissions Report for: Annual

### Tank Farm Tanks-HAPs - Vertical Fixed Roof Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 1.53 | 2.79 | 4.32 |
| Benzene | 0.00 | 0.00 | 0.00 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 1.51 | 2.75 | 4.25 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |
| Styrene | 0.00 | 0.00 | 0.00 |
| Toluene | 0.01 | 0.01 | 0.02 |
| Xylenes (mixed isomers) | 0.02 | 0.03 | 0.04 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Fuel Station Tanks- VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 42.75 |
| Diameter (ft): | 10.00 |
| Volume (gallons): | 25,000.00 |
| Turnovers: | 761.40 |
| Net Throughput(gal/yr): | 19,035,000.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Fuel Station Tanks- VOCs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0031 | 0.0031 | 0.0031 | 130.0000 | | | 188.00 | Option 1: VP40 = .0031 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## Fuel Station Tanks- VOCs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 37.64 | 1.42 | 39.06 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Fuel Station Tanks-HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 42.75 |
| Diameter (ft): | 10.00 |
| Volume (gallons): | 25,000.00 |
| Turnovers: | 761.40 |
| Net Throughput(gal/yr): | 19,035,000.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Fuel Station Tanks-HAPs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0001 | 0.0001 | 0.0001 | 86.3820 | | | 1.02 | Option 1: VP40 = .0031 |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0000 | 0.0005 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0001 | 0.0004 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0100 | 0.9836 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0055 | 0.0004 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.9809 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Styrene | | | | | | 0.0232 | 0.0202 | 0.0266 | 104.1500 | 0.0003 | 0.0008 | 104.15 | Option 2: A=7.14, B=1574.51, C=224.09 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0003 | 0.0043 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0029 | 0.0100 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## Fuel Station Tanks-HAPs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 0.80 | 0.03 | 0.83 |
| Benzene | 0.00 | 0.00 | 0.00 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 0.79 | 0.03 | 0.82 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |
| Styrene | 0.00 | 0.00 | 0.00 |
| Toluene | 0.00 | 0.00 | 0.00 |
| Xylenes (mixed isomers) | 0.01 | 0.00 | 0.01 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | ANFO Mixing Plant Tank- VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 26.75 |
| Diameter (ft): | 8.00 |
| Volume (gallons): | 10,000.00 |
| Turnovers: | 79.31 |
| Net Throughput(gal/yr): | 793,103.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## ANFO Mixing Plant Tank- VOCs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0031 | 0.0031 | 0.0031 | 130.0000 | | | 188.00 | Option 1: VP40 = .0031 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## ANFO Mixing Plant Tank- VOCs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 4.15 | 0.57 | 4.72 |

# TANKS 4.0.9d
## Emissions Report - Summary Format
## Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | ANFO Mixing Plant Tank-HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 26.75 |
| Diameter (ft): | 8.00 |
| Volume (gallons): | 10,000.00 |
| Turnovers: | 79.31 |
| Net Throughput(gal/yr): | 793,103.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
## Emissions Report - Summary Format
## Liquid Contents of Storage Tank

### ANFO Mixing Plant Tank-HAPs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0001 | 0.0001 | 0.0001 | 86.3820 | | | 1.02 | Option 1: VP40 = .0031 |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0000 | 0.0005 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0001 | 0.0004 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0100 | 0.9836 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0055 | 0.0004 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.9809 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Styrene | | | | | | 0.0232 | 0.0202 | 0.0266 | 104.1500 | 0.0003 | 0.0008 | 104.15 | Option 2: A=7.14, B=1574.51, C=224.09 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0003 | 0.0043 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0029 | 0.0100 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

# TANKS 4.0.9d
## Emissions Report - Summary Format
## Individual Tank Emission Totals

## Emissions Report for: Annual

### ANFO Mixing Plant Tank-HAPs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 0.09 | 0.01 | 0.10 |
| Benzene | 0.00 | 0.00 | 0.00 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 0.09 | 0.01 | 0.10 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |
| Styrene | 0.00 | 0.00 | 0.00 |
| Toluene | 0.00 | 0.00 | 0.00 |
| Xylenes (mixed isomers) | 0.00 | 0.00 | 0.00 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Fire Pump Tanks- VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | | |
|---|---|---|
| Shell Length (ft): | | 6.00 |
| Diameter (ft): | | 3.17 |
| Volume (gallons): | | 270.00 |
| Turnovers: | | 25.10 |
| Net Throughput(gal/yr): | | 6,776.00 |
| Is Tank Heated (y/n): | N | |
| Is Tank Underground (y/n): | N | |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Fire Pump Tanks- VOCs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0031 | 0.0031 | 0.0031 | 130.0000 | | | 188.00 | Option 1: VP40 = .0031 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

### Fire Pump Tanks- VOCs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 0.07 | 0.02 | 0.09 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

## Identification

| | |
|---|---|
| User Identification: | Fire Pump Tanks-HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

## Tank Dimensions

| | | |
|---|---|---|
| Shell Length (ft): | | 6.00 |
| Diameter (ft): | | 3.17 |
| Volume (gallons): | | 270.00 |
| Turnovers: | | 25.10 |
| Net Throughput(gal/yr): | | 6,776.00 |
| Is Tank Heated (y/n): | N | |
| Is Tank Underground (y/n): | N | |

## Paint Characteristics

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

## Breather Vent Settings

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Fire Pump Tanks-HAPs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0001 | 0.0001 | 0.0001 | 86.3820 | | | 1.02 | Option 1: VP40 = .0031 |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0000 | 0.0005 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0001 | 0.0004 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0100 | 0.9836 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0055 | 0.0004 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.9809 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Styrene | | | | | | 0.0232 | 0.0202 | 0.0266 | 104.1500 | 0.0003 | 0.0008 | 104.15 | Option 2: A=7.14, B=1574.51, C=224.09 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0003 | 0.0043 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0029 | 0.0100 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## Fire Pump Tanks-HAPs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 0.00 | 0.00 | 0.00 |
| Benzene | 0.00 | 0.00 | 0.00 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 0.00 | 0.00 | 0.00 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |
| Styrene | 0.00 | 0.00 | 0.00 |
| Toluene | 0.00 | 0.00 | 0.00 |
| Xylenes (mixed isomers) | 0.00 | 0.00 | 0.00 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | POX Boilers Tank-VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 23.67 |
| Diameter (ft): | 6.00 |
| Volume (gallons): | 5,000.00 |
| Turnovers: | 788.48 |
| Net Throughput(gal/yr): | 3,942,411.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## POX Boilers Tank-VOCs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0031 | 0.0031 | 0.0031 | 130.0000 | | | 188.00 | Option 1: VP40 = .0031 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## POX Boilers Tank-VOCs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 7.74 | 0.28 | 8.03 |

## TANKS 4.0.9d
## Emissions Report - Summary Format
## Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | POX Boilers Tank-HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 23.67 |
| Diameter (ft): | 6.00 |
| Volume (gallons): | 5,000.00 |
| Turnovers: | 788.48 |
| Net Throughput(gal/yr): | 3,942,411.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

## TANKS 4.0.9d
## Emissions Report - Summary Format
## Liquid Contents of Storage Tank

### POX Boilers Tank-HAPs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0001 | 0.0001 | 0.0001 | 86.3864 | | | 1.02 | Option 1: VP40 = .0031 |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0000 | 0.0005 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0001 | 0.0005 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0100 | 0.9831 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0055 | 0.0004 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.9808 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Styrene | | | | | | 0.0232 | 0.0202 | 0.0266 | 104.1500 | 0.0003 | 0.0009 | 104.15 | Option 2: A=7.14, B=1574.51, C=224.09 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0003 | 0.0046 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0029 | 0.0100 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

## TANKS 4.0.9d
## Emissions Report - Summary Format
## Individual Tank Emission Totals

## Emissions Report for: Annual

### POX Boilers Tank-HAPs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 0.16 | 0.01 | 0.17 |
| Benzene | 0.00 | 0.00 | 0.00 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 0.16 | 0.01 | 0.17 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Styrene | 0.00 | 0.00 | 0.00 |
| Toluene | 0.00 | 0.00 | 0.00 |
| Xylenes (mixed isomers) | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Oxygen Plant Boiler Tank-VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 23.67 |
| Diameter (ft): | 6.00 |
| Volume (gallons): | 5,000.00 |
| Turnovers: | 278.12 |
| Net Throughput(gal/yr): | 1,390,621.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

### Oxygen Plant Boiler Tank-VOCs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0031 | 0.0031 | 0.0031 | 130.0000 | | | 188.00 | Option 1: VP40 = .0031 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

### Oxygen Plant Boiler Tank-VOCs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 3.66 | 0.28 | 3.95 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Oxygen Plant Boiler Tank-HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | | |
|---|---|---|
| Shell Length (ft): | | 23.67 |
| Diameter (ft): | | 6.00 |
| Volume (gallons): | | 5,000.00 |
| Turnovers: | | 278.12 |
| Net Throughput(gal/yr): | | 1,390,621.00 |
| Is Tank Heated (y/n): | N | |
| Is Tank Underground (y/n): | N | |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Oxygen Plant Boiler Tank-HAPs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0001 | 0.0001 | 0.0001 | 86.3864 | | | 1.02 | Option 1: VP40 = .0031 |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0000 | 0.0005 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0001 | 0.0005 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0100 | 0.9831 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0055 | 0.0004 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.9808 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Styrene | | | | | | 0.0232 | 0.0202 | 0.0266 | 104.1500 | 0.0003 | 0.0009 | 104.15 | Option 2: A=7.14, B=1574.51, C=224.09 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0003 | 0.0046 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0029 | 0.0100 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## Oxygen Plant Boiler Tank-HAPs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 0.08 | 0.01 | 0.08 |
| Benzene | 0.00 | 0.00 | 0.00 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 0.08 | 0.01 | 0.08 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Styrene | 0.00 | 0.00 | 0.00 |
| Toluene | 0.00 | 0.00 | 0.00 |
| Xylenes (mixed isomers) | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |

# TANKS 4.0.9d
## Emissions Report - Summary Format
## Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Carbon Elution Heater Tank-VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 23.67 |
| Diameter (ft): | 6.00 |
| Volume (gallons): | 5,000.00 |
| Turnovers: | 174.98 |
| Net Throughput(gal/yr): | 874,876.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
## Emissions Report - Summary Format
## Liquid Contents of Storage Tank

### Carbon Elution Heater Tank-VOCs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0031 | 0.0031 | 0.0031 | 130.0000 | | | 188.00 | Option 1: VP40 = .0031 |

# TANKS 4.0.9d
## Emissions Report - Summary Format
## Individual Tank Emission Totals

## Emissions Report for: Annual

### Carbon Elution Heater Tank-VOCs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 2.84 | 0.28 | 3.12 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Carbon Elution Heater Tank-HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 23.67 |
| Diameter (ft): | 6.00 |
| Volume (gallons): | 5,000.00 |
| Turnovers: | 174.98 |
| Net Throughput(gal/yr): | 874,876.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Carbon Elution Heater Tank-HAPs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0001 | 0.0001 | 0.0001 | 86.3864 | | | 1.02 | Option 1: VP40 = .0031 |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0000 | 0.0005 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0001 | 0.0005 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0100 | 0.9831 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0055 | 0.0004 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.9808 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Styrene | | | | | | 0.0232 | 0.0202 | 0.0266 | 104.1500 | 0.0003 | 0.0009 | 104.15 | Option 2: A=7.14, B=1574.51, C=224.09 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0003 | 0.0046 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0029 | 0.0100 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## Carbon Elution Heater Tank-HAPs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 0.06 | 0.01 | 0.07 |
| Benzene | 0.00 | 0.00 | 0.00 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 0.06 | 0.01 | 0.07 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Styrene | 0.00 | 0.00 | 0.00 |
| Toluene | 0.00 | 0.00 | 0.00 |
| Xylenes (mixed isomers) | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Auxiliary SO2 Burner Tank-VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 6.00 |
| Diameter (ft): | 4.00 |
| Volume (gallons): | 500.00 |
| Turnovers: | 269.19 |
| Net Throughput(gal/yr): | 134,596.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

### Auxiliary SO2 Burner Tank-VOCs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0031 | 0.0031 | 0.0031 | 130.0000 | | | 188.00 | Option 1: VP40 = .0031 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

### Auxiliary SO2 Burner Tank-VOCs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 0.36 | 0.03 | 0.39 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Auxiliary SO2 Burner Tank-HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 6.00 |
| Diameter (ft): | 4.00 |
| Volume (gallons): | 500.00 |
| Turnovers: | 269.19 |
| Net Throughput(gal/yr): | 134,596.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Auxiliary SO2 Burner Tank-HAPs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0001 | 0.0001 | 0.0001 | 86.3864 | | | 1.02 | Option 1: VP40 = .0031 |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0000 | 0.0005 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0001 | 0.0005 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0100 | 0.9831 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0055 | 0.0004 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.9808 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Styrene | | | | | | 0.0232 | 0.0202 | 0.0266 | 104.1500 | 0.0003 | 0.0009 | 104.15 | Option 2: A=7.14, B=1574.51, C=224.09 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0003 | 0.0046 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0029 | 0.0100 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## Auxiliary SO2 Burner Tank-HAPs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 0.01 | 0.00 | 0.01 |
| Benzene | 0.00 | 0.00 | 0.00 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 0.01 | 0.00 | 0.01 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Styrene | 0.00 | 0.00 | 0.00 |
| Toluene | 0.00 | 0.00 | 0.00 |
| Xylenes (mixed isomers) | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Power Plant Tanks- VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 47.33 |
| Diameter (ft): | 12.00 |
| Volume (gallons): | 33,000.00 |
| Turnovers: | 109.03 |
| Net Throughput(gal/yr): | 3,597,855.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Power Plant Tanks- VOCs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0031 | 0.0031 | 0.0031 | 130.0000 | | | 188.00 | Option 1: VP40 = .0031 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

### Power Plant Tanks- VOCs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 15.25 | 2.27 | 17.52 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

## Identification

| | |
|---|---|
| User Identification: | Power Plant Tanks-HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

## Tank Dimensions

| | | |
|---|---|---|
| Shell Length (ft): | | 47.33 |
| Diameter (ft): | | 12.00 |
| Volume (gallons): | | 33,000.00 |
| Turnovers: | | 109.03 |
| Net Throughput(gal/yr): | | 3,597,855.00 |
| Is Tank Heated (y/n): | N | |
| Is Tank Underground (y/n): | N | |

## Paint Characteristics

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

## Breather Vent Settings

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Power Plant Tanks-HAPs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0001 | 0.0001 | 0.0001 | 86.3864 | | | 1.02 | Option 1: VP40 = .0031 |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0000 | 0.0005 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0001 | 0.0005 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0100 | 0.9831 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0055 | 0.0004 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.9808 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Styrene | | | | | | 0.0232 | 0.0202 | 0.0266 | 104.1500 | 0.0003 | 0.0009 | 104.15 | Option 2: A=7.14, B=1574.51, C=224.09 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0003 | 0.0046 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0029 | 0.0100 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## Power Plant Tanks-HAPs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 0.32 | 0.05 | 0.37 |
| Benzene | 0.00 | 0.00 | 0.00 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 0.32 | 0.05 | 0.37 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Styrene | 0.00 | 0.00 | 0.00 |
| Toluene | 0.00 | 0.00 | 0.00 |
| Xylenes (mixed isomers) | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |

# TANKS 4.0.9d
## Emissions Report - Summary Format
## Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Camp Emergency Generators Tank- VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 42.75 |
| Diameter (ft): | 10.00 |
| Volume (gallons): | 25,000.00 |
| Turnovers: | 8.75 |
| Net Throughput(gal/yr): | 218,800.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
## Emissions Report - Summary Format
## Liquid Contents of Storage Tank

### Camp Emergency Generators Tank- VOCs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0031 | 0.0031 | 0.0031 | 130.0000 | | | 188.00 | Option 1: VP40 = .0031 |

# TANKS 4.0.9d
## Emissions Report - Summary Format
## Individual Tank Emission Totals

## Emissions Report for: Annual

### Camp Emergency Generators Tank- VOCs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 2.10 | 1.42 | 3.52 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Camp Emergency Generator Tank-HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | |
|---|---|
| Shell Length (ft): | 42.75 |
| Diameter (ft): | 10.00 |
| Volume (gallons): | 25,000.00 |
| Turnovers: | 8.75 |
| Net Throughput(gal/yr): | 218,800.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Camp Emergency Generator Tank-HAPs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0001 | 0.0001 | 0.0001 | 86.3864 | | | 1.02 | Option 1: VP40 = .0031 |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0000 | 0.0005 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0001 | 0.0005 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0100 | 0.9831 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0055 | 0.0004 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.9808 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Styrene | | | | | | 0.0232 | 0.0202 | 0.0266 | 104.1500 | 0.0003 | 0.0009 | 104.15 | Option 2: A=7.14, B=1574.51, C=224.09 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0003 | 0.0046 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0029 | 0.0100 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## Camp Emergency Generator Tank-HAPs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 0.04 | 0.03 | 0.07 |
| Benzene | 0.00 | 0.00 | 0.00 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 0.04 | 0.03 | 0.07 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Styrene | 0.00 | 0.00 | 0.00 |
| Toluene | 0.00 | 0.00 | 0.00 |
| Xylenes (mixed isomers) | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |

# TANKS 4.0.9d
## Emissions Report - Summary Format
## Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Airport Jet Fuel Tanks- VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | | |
|---|---|---|
| Shell Length (ft): | | 26.75 |
| Diameter (ft): | | 8.00 |
| Volume (gallons): | | 9,900.00 |
| Turnovers: | | 6.00 |
| Net Throughput(gal/yr): | | 55,000.00 |
| Is Tank Heated (y/n): | N | |
| Is Tank Underground (y/n): | N | |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
## Emissions Report - Summary Format
## Liquid Contents of Storage Tank

### Airport Jet Fuel Tanks- VOCs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jet naphtha (JP-4) | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.8000 | 0.8000 | 0.8000 | 80.0000 | | | 120.00 | Option 1: VP40 = .8 |

# TANKS 4.0.9d
## Emissions Report - Summary Format
## Individual Tank Emission Totals

## Emissions Report for: Annual

### Airport Jet Fuel Tanks- VOCs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Jet naphtha (JP-4) | 83.81 | 76.60 | 160.41 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Airport Jet Fuel Tanks- HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | | |
|---|---|---|
| Shell Length (ft): | | 26.75 |
| Diameter (ft): | | 8.00 |
| Volume (gallons): | | 9,900.00 |
| Turnovers: | | 6.00 |
| Net Throughput(gal/yr): | | 55,000.00 |
| Is Tank Heated (y/n): | N | |
| Is Tank Underground (y/n): | N | |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Airport Jet Fuel Tanks- HAPs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jet Fuel | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0008 | 0.0007 | 0.0008 | 86.1184 | | | 1.16 | |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0100 | 0.0851 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0050 | 0.0031 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0560 | 0.8262 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0047 | 0.0000 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.8603 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0320 | 0.0689 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0320 | 0.0166 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## Airport Jet Fuel Tanks- HAPs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Jet Fuel | 0.09 | 0.09 | 0.18 |
| Benzene | 0.01 | 0.01 | 0.02 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 0.07 | 0.08 | 0.15 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Toluene | 0.01 | 0.01 | 0.01 |
| Xylenes (mixed isomers) | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Airport Aviation Gasoline Tank-VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | | |
|---|---|---|
| Shell Length (ft): | | 16.00 |
| Diameter (ft): | | 8.00 |
| Volume (gallons): | | 5,000.00 |
| Turnovers: | | 2.00 |
| Net Throughput(gal/yr): | | 10,000.00 |
| Is Tank Heated (y/n): | N | |
| Is Tank Underground (y/n): | N | |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Airport Aviation Gasoline Tank-VOCs - Horizontal Tank

| | | Daily Liquid Surf. Temperature (deg F) | | | Liquid Bulk Temp | Vapor Pressure (psia) | | | Vapor Mol. | Liquid Mass | Vapor Mass | Mol. | Basis for Vapor Pressure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mixture/Component | Month | Avg. | Min. | Max. | (deg F) | Avg. | Min. | Max. | Weight. | Fract. | Fract. | Weight | Calculations |
| Gasoline (RVP 7) | All | 30.00 | 26.58 | 33.41 | 28.98 | 1.8217 | 1.6835 | 1.9691 | 68.0000 | | | 92.00 | Option 4: RVP=7, ASTM Slope=3 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

### Airport Aviation Gasoline Tank-VOCs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Gasoline (RVP 7) | 29.49 | 145.10 | 174.59 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Airport Aviation Gasoline Tank-HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | | |
|---|---|---|
| Shell Length (ft): | | 16.00 |
| Diameter (ft): | | 8.00 |
| Volume (gallons): | | 5,000.00 |
| Turnovers: | | 2.00 |
| Net Throughput(gal/yr): | | 10,000.00 |
| Is Tank Heated (y/n): | N | |
| Is Tank Underground (y/n): | N | |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Airport Aviation Gasoline Tank-HAPs - Horizontal Tank

| | | Daily Liquid Surf. Temperature (deg F) | | | Liquid Bulk Temp | Vapor Pressure (psia) | | | Vapor Mol. | Liquid Mass | Vapor Mass | Mol. | Basis for Vapor Pressure |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mixture/Component | Month | Avg. | Min. | Max. | (deg F) | Avg. | Min. | Max. | Weight. | Fract. | Fract. | Weight | Calculations |
| Gasoline (RVP 7) | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0069 | 0.0068 | 0.0071 | 87.7859 | | | 1.66 | Option 4: RVP=7, ASTM Slope=3 |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0161 | 0.0210 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0161 | 0.0015 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0714 | 0.1613 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Methyl-tert-butyl ether (MTBE) | | | | | | 1.9200 | 1.9200 | 1.9200 | 88.1500 | 0.1500 | 0.7867 | 88.15 | Option 1: VP40 = 1.92 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0044 | 0.0000 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.5982 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0721 | 0.0238 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0717 | 0.0057 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## Airport Aviation Gasoline Tank-HAPs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Gasoline (RVP 7) | 0.14 | 0.51 | 0.66 |
| Benzene | 0.00 | 0.01 | 0.01 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 0.02 | 0.08 | 0.11 |
| Methyl-tert-butyl ether (MTBE) | 0.11 | 0.40 | 0.52 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |
| Toluene | 0.00 | 0.01 | 0.02 |
| Xylenes (mixed isomers) | 0.00 | 0.00 | 0.00 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

**Identification**

| | |
|---|---|
| User Identification: | Airport Generators Tank-VOCs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

**Tank Dimensions**

| | | |
|---|---|---|
| Shell Length (ft): | | 26.75 |
| Diameter (ft): | | 8.00 |
| Volume (gallons): | | 9,900.00 |
| Turnovers: | | 25.52 |
| Net Throughput(gal/yr): | | 252,695.00 |
| Is Tank Heated (y/n): | N | |
| Is Tank Underground (y/n): | N | |

**Paint Characteristics**

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

**Breather Vent Settings**

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

### Airport Generators Tank-VOCs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0031 | 0.0031 | 0.0031 | 130.0000 | | | 188.00 | Option 1: VP40 = .0031 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

### Airport Generators Tank-VOCs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 2.42 | 0.57 | 2.99 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Tank Indentification and Physical Characteristics

## Identification

| | |
|---|---|
| User Identification: | Airport Generators Tank-HAPs |
| City: | |
| State: | |
| Company: | |
| Type of Tank: | Horizontal Tank |
| Description: | |

## Tank Dimensions

| | |
|---|---|
| Shell Length (ft): | 26.75 |
| Diameter (ft): | 8.00 |
| Volume (gallons): | 9,900.00 |
| Turnovers: | 25.52 |
| Net Throughput(gal/yr): | 252,695.00 |
| Is Tank Heated (y/n): | N |
| Is Tank Underground (y/n): | N |

## Paint Characteristics

| | |
|---|---|
| Shell Color/Shade: | White/White |
| Shell Condition | Good |

## Breather Vent Settings

| | |
|---|---|
| Vacuum Settings (psig): | -0.03 |
| Pressure Settings (psig) | 0.03 |

Meterological Data used in Emissions Calculations: Bethel, Alaska (Avg Atmospheric Pressure = 14.54 psia)

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Liquid Contents of Storage Tank

## Airport Generators Tank-HAPs - Horizontal Tank

| Mixture/Component | Month | Daily Liquid Surf. Temperature (deg F) Avg. | Min. | Max. | Liquid Bulk Temp (deg F) | Vapor Pressure (psia) Avg. | Min. | Max. | Vapor Mol. Weight. | Liquid Mass Fract. | Vapor Mass Fract. | Mol. Weight | Basis for Vapor Pressure Calculations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distillate fuel oil no. 2 | All | 30.00 | 26.58 | 33.41 | 28.98 | 0.0001 | 0.0001 | 0.0001 | 86.3864 | | | 1.02 | Option 1: VP40 = .0031 |
| Benzene | | | | | | 0.4771 | 0.4271 | 0.5318 | 78.1100 | 0.0000 | 0.0005 | 78.11 | Option 2: A=6.905, B=1211.033, C=220.79 |
| Ethylbenzene | | | | | | 0.0352 | 0.0306 | 0.0403 | 106.1700 | 0.0001 | 0.0005 | 106.17 | Option 2: A=6.975, B=1424.255, C=213.21 |
| Hexane (-n) | | | | | | 0.8269 | 0.7456 | 0.9155 | 86.1700 | 0.0100 | 0.9831 | 86.17 | Option 2: A=6.876, B=1171.17, C=224.41 |
| Naphthalene | | | | | | 0.0006 | 0.0005 | 0.0007 | 128.2000 | 0.0055 | 0.0004 | 128.20 | Option 2: A=7.3729, B=1968.36, C=222.61 |
| Non-HAPs | | | | | | 0.0000 | 0.0000 | 0.0000 | 1.0000 | 0.9808 | 0.0000 | 1.00 | Option 1: VP40 = .000000001 |
| Styrene | | | | | | 0.0232 | 0.0202 | 0.0266 | 104.1500 | 0.0003 | 0.0009 | 104.15 | Option 2: A=7.14, B=1574.51, C=224.09 |
| Toluene | | | | | | 0.1208 | 0.1066 | 0.1365 | 92.1300 | 0.0003 | 0.0046 | 92.13 | Option 2: A=6.954, B=1344.8, C=219.48 |
| Xylenes (mixed isomers) | | | | | | 0.0290 | 0.0252 | 0.0333 | 106.1700 | 0.0029 | 0.0100 | 106.17 | Option 2: A=7.009, B=1462.266, C=215.11 |

# TANKS 4.0.9d
# Emissions Report - Summary Format
# Individual Tank Emission Totals

## Emissions Report for: Annual

## Airport Generators Tank-HAPs - Horizontal Tank

| | Losses(lbs) | | |
|---|---|---|---|
| Components | Working Loss | Breathing Loss | Total Emissions |
| Distillate fuel oil no. 2 | 0.05 | 0.01 | 0.06 |
| Benzene | 0.00 | 0.00 | 0.00 |
| Ethylbenzene | 0.00 | 0.00 | 0.00 |
| Hexane (-n) | 0.05 | 0.01 | 0.06 |
| Naphthalene | 0.00 | 0.00 | 0.00 |
| Styrene | 0.00 | 0.00 | 0.00 |
| Toluene | 0.00 | 0.00 | 0.00 |
| Xylenes (mixed isomers) | 0.00 | 0.00 | 0.00 |
| Non-HAPs | 0.00 | 0.00 | 0.00 |

| AIR SCIENCES INC. | **Project Title** Donlin Gold | **By** K. Lewis |
|---|---|---|
| | **Project No** 281-21B-1 | **Page** 1 **of** 9 **Sheet** Hg EI |
| AIR EMISSION CALCULATIONS | **Subject:** Mercury Emissions | **Date:** October 11, 2021 |

**Summary of Hg Emission**

| Type | Source | Hg Emissions kg/yr | lb/yr | | | |
|---|---|---|---|---|---|---|
| Fugitive Evaporative Mercury Emissions (Peak LOM Year) | | | | | | |
| | Stockpiles | 0.14 | 0.30 | | | |
| | Rock Dumps | 0.95 | 2.10 | | | |
| | Pits | 0.65 | 1.42 | | | |
| | Tailings - dry beach | 0.43 | 0.96 | | | |
| | Tailings - wet beach | 5.53 | 12.18 | | | |
| | Tailings - pond | 1.52 | 3.34 | | | |
| | Subtotal | 9.21 | 20.30 | 9.209 | 9.209 | chk |
| Mining Fugitive Dust Mercury Emissions (Peak LOM Year) | | | | | | |
| | Pit | 1.40 | 3.08 | | | |
| | Stockpiles | 0.18 | 0.40 | | | |
| | WRF | 0.98 | 2.15 | | | |
| | TSF | 0.002 | 0.00 | | | |
| | Area (Process Area) | 0.21 | 0.47 | | | |
| | Subtotal | 2.77 | 6.11 | 2.771 | 2.771 | chk |
| Ore Processing and Analysis Dust Mercury Emissions | | | | | | |
| | ROM Ore Discharge and Crushing | 0.04 | 0.08 | | | |
| | Coarse Ore Transfer | 0.02 | 0.05 | | | |
| | Pebble Crushers and Recycle | 0.02 | 0.05 | | | |
| | Laboratories | 0.01 | 0.02 | | | |
| | Subtotal | 0.09 | 0.20 | 0.089 | 0.089 | chk |
| Ore Thermal Processing Mercury Emissions | | | | | | |
| | Autoclave 101 | 0.29 | 0.64 | | | |
| | Autoclave 201 | 0.29 | 0.64 | | | |
| | Carbon Regeneration Kiln | 3.97 | 8.75 | | | |
| | EW Cells | 7.03 | 15.50 | | | |
| | Retort | 0.68 | 1.50 | | | |
| | Induction Melting Furnace | 3.69 | 8.14 | | | |
| | Subtotal | 15.95 | 35.16 | 15.946 | 15.946 | chk |
| Fuel Combustion and Incineration Mercury Emissions | | | | | | |
| | Boilers/Heaters | 1.90 | 4.18 | | | |
| | Incinerators | 0.08 | 0.17 | | | |
| | Subtotal | 1.97 | 4.35 | 1.975 | 1.975 | chk |
| Total | | 29.99 | 66.12 | | | |

Conversions
2.20462 lb/kg

| AIR SCIENCES INC. | **Project Title** Donlin Gold | **By** K. Lewis |
|---|---|---|
| | **Project No** 281-21B-1 | **Page** 2 **of** 9 **Sheet** Hg EI |
| AIR EMISSION CALCULATIONS | **Subject:** Mercury Emissions | **Date:** October 11, 2021 |

**Fugitive Evaporative Mercury Emissions**

Activity Information

| | Tailings Storage Facility (TSF) | | | | | |
|---|---|---|---|---|---|---|
| | Beach | Pond | Total | Stockpiles | WRF | Pit |
| LOM | acre | acre | acre | acre | acre | acre |
| Year | (1) | (1) | | (2) | (3) | (4) |
| 1 | 111 | 192 | 303 | 204 | 318 | 22 |
| 2 | 190 | 252 | 442 | 204 | 318 | 75 |
| 3 | 270 | 311 | 581 | 204 | 842 | 145 |
| 4 | 349 | 371 | 720 | 204 | 1,171 | 215 |
| 5 | 428 | 430 | 858 | 204 | 1,253 | 270 |
| 6 | 501 | 448 | 949 | 204 | 1,545 | 355 |
| 7 | 574 | 467 | 1,041 | 204 | 1,625 | 447 |
| 8 | 646 | 485 | 1,131 | 204 | 1,702 | 551 |
| 9 | 719 | 503 | 1,222 | 204 | 1,892 | 649 |
| 10 | 773 | 523 | 1,296 | 204 | 1,927 | 711 |
| 11 | 827 | 542 | 1,369 | 204 | 2,042 | 772 |
| 12 | 880 | 562 | 1,442 | 204 | 2,094 | 819 |
| 13 | 934 | 581 | 1,515 | 204 | 2,138 | 866 |
| 14 | 977 | 599 | 1,576 | 204 | 2,205 | 965 |
| 15 | 1,021 | 618 | 1,639 | 204 | 2,220 | 1,051 |
| 16 | 1,064 | 636 | 1,700 | 204 | 2,278 | 1,137 |
| 17 | 1,107 | 654 | 1,761 | 204 | 2,309 | 1,181 |
| 18 | 1,128 | 686 | 1,814 | 204 | 2,347 | 1,226 |
| 19 | 1,150 | 717 | 1,867 | 204 | 2,347 | 1,265 |
| 20 | 1,171 | 749 | 1,920 | 204 | 2,412 | 1,305 |
| 21 | 1,192 | 780 | 1,972 | 204 | 2,412 | 1,344 |
| 22 | 1,227 | 787 | 2,014 | 204 | 2,412 | 1,462 |
| 23 | 1,263 | 794 | 2,057 | 204 | 2,412 | 1,462 |
| 24 | 1,298 | 801 | 2,099 | 204 | 2,412 | 1,462 |
| 25 | 1,333 | 808 | 2,141 | 204 | 2,412 | 1,462 |
| 26 | 1,418 | 774 | 2,192 | 204 | 2,412 | 1,462 |
| 27 | 1,502 | 740 | 2,242 | 204 | 2,412 | 1,462 |
| 28 | 1,733 | 501 | 2,234 | 204 | 2,412 | 1,462 |

Mercury Emissions (Hg0)

| LOM Year | TSF kg/yr | Stockpiles kg/yr | WRF kg/yr | Pit kg/yr |
|---|---|---|---|---|
| 1 | 0.96 | **0.14** | 0.13 | 0.01 |
| 2 | 1.42 | **0.14** | 0.13 | 0.03 |
| 3 | 1.87 | **0.14** | 0.33 | 0.06 |
| 4 | 2.32 | **0.14** | 0.46 | 0.09 |
| 5 | 2.77 | **0.14** | 0.49 | 0.12 |
| 6 | 3.08 | **0.14** | 0.61 | 0.16 |
| 7 | 3.39 | **0.14** | 0.64 | 0.20 |
| 8 | 3.69 | **0.14** | 0.67 | 0.24 |
| 9 | 3.99 | **0.14** | 0.75 | 0.29 |
| 10 | 4.24 | **0.14** | 0.76 | 0.31 |
| 11 | 4.48 | **0.14** | 0.81 | 0.34 |
| 12 | 4.73 | **0.14** | 0.83 | 0.36 |
| 13 | 4.97 | **0.14** | 0.84 | 0.38 |
| 14 | 5.17 | **0.14** | 0.87 | 0.43 |
| 15 | 5.38 | **0.14** | 0.88 | 0.46 |
| 16 | 5.58 | **0.14** | 0.90 | 0.50 |
| 17 | 5.79 | **0.14** | 0.91 | 0.52 |
| 18 | 5.95 | **0.14** | 0.93 | 0.54 |
| 19 | 6.12 | **0.14** | 0.93 | 0.56 |
| 20 | 6.29 | **0.14** | **0.95** | 0.58 |
| 21 | 6.46 | **0.14** | **0.95** | 0.59 |
| 22 | 6.60 | **0.14** | **0.95** | **0.65** |
| 23 | 6.75 | **0.14** | **0.95** | **0.65** |
| 24 | 6.89 | **0.14** | **0.95** | **0.65** |
| 25 | 7.03 | **0.14** | **0.95** | **0.65** |
| 26 | 7.22 | **0.14** | **0.95** | **0.65** |
| 27 | 7.40 | **0.14** | **0.95** | **0.65** |
| 28 | **7.48** | **0.14** | **0.95** | **0.65** |
| **Peak (LOM Year 28)** | **7.48** | **0.14** | **0.95** | **0.65** |

*(1) (Donlin Gold 2015a), (Donlin Gold 2015b)*

*(2) Area estimated from DXF contour files (Donlin Gold 2013).*

*(3) Area estimated from DXF contour files (Donlin Gold 2013). Ultimate area is 2,541 acres, p. 11 (Corps 2018).*

*WRF Area Adjustment*

| Source | LOM Year | DXF acre | FEIS acre | LT Stock E acre | WRF acre | Adj % |
|---|---|---|---|---|---|---|
| WRF | Ultimate | 2,123 | 2,541 | 129 | 2,412 | 13.6% |

*(4) Section 4.6.3 and Figures 4-15 and 4-25 (AMEC 2011). Ultimate area is 1,462 acres, Year 22, Figure 2.3-3 (Corps 2018).*

*Pit Area Adjustment*

| Source | LOM Year | Figures acre | FEIS acre | Adj % |
|---|---|---|---|---|
| Pit | Ultimate | 1,191 | 1,462 | 22.8% |

| AIR SCIENCES INC. | **Project Title** Donlin Gold | **By** K. Lewis |
|---|---|---|
| | **Project No** 281-21B-1 | **Page** 3 **of** 9 **Sheet** Hg EI |
| AIR EMISSION CALCULATIONS | **Subject:** Mercury Emissions | **Date:** October 11, 2021 |

**Fugitive Evaporative Mercury Emissions - Continued** LOM Year 28

Mercury Emissions (Hg0)

| Source | Surface Area acre | m2 | Hg Flux µg/m2-yr | Hg0 kg/yr | |
|---|---|---|---|---|---|
| Stockpiles | 204 | 825,559 | 165.5 | 0.14 | |
| Rock Dumps | 2,412 | 9,761,026 | 97.4 | 0.95 | |
| Pits | 1,462 | 5,916,509 | 109.1 | 0.65 | |
| Tailings - dry beach | 1,161 | 4,698,850 | 92.5 | 0.43 | |
| Tailings - wet beach | 572 | 2,314,359 | 2,387.7 | 5.53 | |
| Tailings - pond | 501 | 2,027,477 | 747.3 | 1.52 | 7.48 kg/yr TSF Subtotal |
| Total | | | | 9.21 | 7.476 |
| *Percent of tailings beach wet:* | | *33%* | *(Donlin Gold 2015a)* | | chk |

Mercury Flux Emission Factors for Dry Surfaces (Stockpiles, Rock Dumps, Pits, and Tailings - dry beach)

| Source | Hg Conc. µg/g (1) | Donlin Hg Flux ng/m2-d (2) | Hg Flux µg/m2-yr (2) |
|---|---|---|---|
| Stockpiles | 1.27 | 453.4 | 165.5 |
| Rock Dumps | 0.59 | 266.9 | 97.4 |
| Pits | 0.695 | 298.9 | 109.1 |
| Tailings - dry beach | 0.7 | 253.3 | 92.5 |

(1) *(Donlin Gold 2014) for ore and waste; (SRK 2017) Table C-2, Feasibility Pilot (Phase 2) for tailings solids*

| | | | |
|---|---|---|---|
| *Total Ore Mined* | 505 | *MMtonne* | *(AMEC 2011) App. C4-23* |
| *Total Waste Mined* | 2,765 | *MMtonne* | *(AMEC 2011) App. C4-23* |
| *Weighted average of ore and waste* | 0.695 | *µg/g* | |

(2) *(Eckley 2010) Figure 2: log(y) = m*log(x) + b*

*y = Hg Flux (ng/m2-d)* *x = material Hg concentration (µg/g)* *m = slope, ƒ(solar rad)* *b = intercept*

*Cortez (used for Stockpiles, Rock Dumps, Pits, and Tailings - dry beach)*

| *Solar Cat.* | *W/m2* | *m* | *b* |
|---|---|---|---|
| *Low* | <140 | *0.67* | *2.49* |
| *Middle* | ≥140, ≤252 | *0.71* | *2.69* |
| *High* | >252 | *0.73* | *2.85* |

*Twin Creeks (used for Tailings - dry beach)*

| *Solar Cat.* | *W/m2* | *m* | *b* |
|---|---|---|---|
| *Low* | <140 | *0.59* | *2.59* |
| *Middle* | ≥140, ≤252 | *0.60* | *2.88* |
| *High* | >252 | *0.77* | *2.97* |

*Donlin Camp Station Temperature and Solar Radiation*

| | *Month* | *Mo Avg. of Daily Mean °C (A)* | *Mo Avg. of Daily Mean W/m2 (A)* | *Mo Avg. Snow Depth in (B)* | *Solar Cat. (C)* | *Snow/Ice Cover (D)* | |
|---|---|---|---|---|---|---|---|
| 8-2020 | *Aug-20* | *12.7* | *161* | *17* | *Middle* | *No* | 31 |
| 9-2020 | *Sep-20* | *6.1* | *93* | *6* | *Low* | *No* | 30 |
| 10-2020 | *Oct-20* | *0.5* | *46* | *0* | *Low* | *No* | 31 |
| 11-2020 | *Nov-20* | *-8.2* | *15* | *3* | *Low* | *Yes* | 30 |
| 12-2020 | *Dec-20* | *-12.4* | *5* | *9* | *Low* | *Yes* | 31 |
| 1-2021 | *Jan-21* | *-13.8* | *13* | *12* | *Low* | *Yes* | 31 |
| 2-2021 | *Feb-21* | *-15.3* | *39* | *18* | *Low* | *Yes* | 28 |
| 3-2021 | *Mar-21* | *-11.2* | *89* | *29* | *Low* | *Yes* | 31 |
| 4-2021 | *Apr-21* | *-1.9* | *179* | *25* | *Middle* | *No* | 30 |
| 5-2021 | *May-21* | *8.6* | *237* | *2* | *Middle* | *No* | 31 |
| 6-2021 | *Jun-21* | *11.7* | *187* | *19* | *Middle* | *No* | 30 |
| 7-2021 | *Jul-21* | *12.9* | *142* | *32* | *Middle* | *No* | 31 |

*Dry Surface Emission Factors Based on Donlin Site-Specific Conditions*

| *Dry Surface Type* | *x µg/g* | *Low y(L) ng/m2-d* | *Middle y(M) ng/m2-d* | *High y(H) ng/m2-d* | *Average y(A) ng/m2-d* |
|---|---|---|---|---|---|
| *No Snow/Ice Adjustment* | *Solar Cat: Days:* | *Low* *7* | *Middle* *5* | *High* *0* | *Total* *12* |
| *Calculated from Cortez data* | | | | | |
| *Stockpiles* | *1.27* | *363* | *580* | *843* | *453.4* |
| *Rock Dumps* | *0.59* | *217* | *337* | *482* | *266.9* |
| *Pits* | *0.695* | *242* | *378* | *543* | *298.9* |
| *Snow/Ice Adjustment* | *Solar Cat: Days:* | *Low* *2* | *Middle* *5* | *High* *0* | *Total* *12* |
| *Calculated from Cortez data* | | | | | |
| *Tailings* | *0.7* | *243* | *380* | *546* | *199.0* |
| *Calculated from Twin Creeks data* | | | | | |
| *Tailings* | *0.7* | *315* | *612* | *709* | *307.7* |
| Tailings - Average | | 279 | 496 | N/A | 253 |

*(A) (Air Sciences 2021)*

*(B) (NOAA 2021) for snow depth and Snow/Ice category.*

*(C) (Eckley 2010) for Low, Middle, and High categories.*

*(D) Snow/Ice cover is based on monthly average temperature, snow depth, and solar radiation.*

| AIR SCIENCES INC. | **Project Title** Donlin Gold | **By** K. Lewis |
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| | **Project No** 281-21B-1 | **Page** 4 **of** 9 **Sheet** Hg EI |
| AIR EMISSION CALCULATIONS | **Subject:** Mercury Emissions | **Date:** October 11, 2021 |

**Fugitive Evaporative Mercury Emissions - Continued**

Mercury Flux Emission Factor for Tailings Pond

| | | | | | | |
|---|---|---|---|---|---|---|
| TC Tailings Pond | 496 | µg/L | *(1)* | 23,848 | ng/m2-d | *(2)* |
| Donlin Tailings Pond | 73 | µg/L | *(3)* | 3509.9 | ng/m2-d | |
| *(1) (Eckley 2011)* | | | | 1281.1 | µg/m2-yr | |
| *(2) (Eckley 2010)* | | | | 747.3 | µg/m2-yr | *Zero emissions assumed during snow/ice months* |

*(3) (SRK 2017) Actual pore water and pond concentrations are anticipated to be <0.010 mg/L based on reductions observed at a Barrick facility using UNR reagent.*

Mercury Flux Emission Factor for Tailings Wet Beach

log(y) = m*log(x) + b

y = Hg Flux (ng/m2-d)　　x = material Hg concentration (µg/g)

m = slope, *f*(solar rad)　　b = intercept

Cortez (used for Stockpiles, Rock Dumps, and Pits)

| Solar Cat. | W/m2 | m | b |
|---|---|---|---|
| | | *(1)* | *(1)* |
| Low | <140 | 0.55 | 3.65 |
| Middle | ≥140, ≤252 | 0.56 | 4.24 |
| High | >252 | | |

LINEST

*(1) (Eckley 2011) Derived from Table 1 for surfaces with moisture >5%. m and b were calculated at the average TC TSF moisture content of 19.1%*

Wet Surface Emission Factors Calculated for Donlin Site-Specific Conditions

| | Solar Cat: | Low | Middle | High | Total | |
|---|---|---|---|---|---|---|
| | Months: | 2 | 5 | *0* | 12 | |
| Wet Surface Type | x µg/g | Low y(L) ng/m2-d | Middle y(M) ng/m2-d | High y(H) ng/m2-d | Average y(A) ng/m2-d | Average y(A) µg/m2-yr |
| Calculated from Cortez and Twin Creeks Wet Data | | | | | | |
| Tailings - wet beach | 0.7 | 3,671 | 14,232 | | 6,541.7 | 2,387.7 |

Conversions

| | | | |
|---|---|---|---|
| 365 | day/yr | 1,000,000 | unit/MM unit |
| 4,047 | m2/acre | 1,000,000 | µg/g |
| 453.6 | g/lb | 1,000 | g/kg |
| | | 1,000 | ng/µg |

| AIR SCIENCES INC. | **Project Title** Donlin Gold | **By** K. Lewis |
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| AIR EMISSION CALCULATIONS | **Subject:** Mercury Emissions | **Date:** October 11, 2021 |

**Mining Fugitive Dust Mercury Emissions**

| General Mercury Emission Distribution | | | | | LOM Year--> | 1 | 2 | 3 | *See Sheet:* |
|---|---|---|---|---|---|---|---|---|---|
| | | Ore | | | Project | PM | PM | PM | *MineDust* |
| | Pit | Stockpiles | WRF | TSF | Area | ton/yr | ton/yr | ton/yr | *for all* |
| Drilling | 100% | | | | | 76.1 | 99.0 | 104.7 | *LOM years* |
| Blasting | 100% | | | | | 24.2 | 119.9 | 144.3 | |
| **Material Handling (Loading and Unloading)** | | | | | | - | - | - | |
| Ore Loading (In-Pit) | 100% | | | | | 28.3 | 36.7 | 46.7 | |
| Ore Unloading (Short-Term Stockpile) | | 100% | | | | 4.7 | 14.6 | 15.1 | |
| Ore Unloading (Long-Term Stockpile) | | 100% | | | | 17.9 | 4.2 | 13.2 | |
| Ore Reloading (Long-Term Stockpile) | | 100% | | | | 2.8 | 0.1 | 0.0 | |
| Waste (incl. OVB/PAG) Loading (In-Pit) | 100% | | | | | 145.4 | 172.5 | 169.2 | |
| Waste (incl. OVB/PAG) Un- & Re-loading | | | 100% | | | 143.8 | 174.4 | 170.8 | |
| **Material Hauling** | | | | | | - | - | - | |
| Ore Hauling | 50% | 50% | | | | 115.1 | 178.5 | 246.8 | |
| Waste Hauling | 50% | | 50% | | | 1,131.3 | 1,556.8 | 1,392.6 | |
| **Maintenance Equipment** | | | | | | - | - | - | |
| Dozer Use | | | | | 100% | 288.1 | 292.5 | 306.1 | |
| Grader Use | | | | | 100% | 23.5 | 22.1 | 24.8 | |
| Water Truck Use | | | | | 100% | 0.0 | 0.0 | 0.0 | |
| **Wind Erosion of Exposed Surfaces** | | | | | | - | - | - | |
| Tailings Beach (Dry) | | | | 100% | | 0.2 | 0.3 | 0.5 | |
| Haul Roads | | | | | 100% | 1.8 | 1.8 | 1.8 | |
| Access Roads | | | | | 100% | 1.2 | 1.2 | 1.2 | |
| Waste Rock Facility | | | 100% | | | 16.8 | 19.7 | 19.6 | |
| Short-term Stockpile | | 100% | | | | 0.2 | 0.4 | 0.4 | |
| Long-term Stockpile West | | 100% | | | | 1.2 | 0.6 | 1.1 | |
| Long-term Stockpile East (& PAG) | | 100% | | | | 0.7 | 0.7 | 0.7 | |
| Overburden Stockpile South/North | | | | | 100% | 0.4 | 0.3 | 0.2 | |
| Total | | | | | | 2,023.5 | 2,696.3 | 2,659.6 | |
| | | | | | | 2,023.5 | 2,696.3 | 2,659.6 | |
| | | | | | | chk | chk | chk | |

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| | **Project No** 281-21B-1 | **Page** 6 **of** 9 **Sheet** Hg EI |
| AIR EMISSION CALCULATIONS | **Subject:** Mercury Emissions | **Date:** October 11, 2021 |

**Mining Fugitive Dust Mercury Emissions - Continued**

| | Mining Fugitive Dust Emissions | | | | | | Mercury Emissions (HgP) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ore | | | Project | | Pit | Stockpiles | WRF | TSF | Area | Total |
| LOM | Pit | Stockpiles | WRF | TSF | Area | Total | Mix | Ore | Waste | Waste | Waste | HgP |
| Year | ton/yr | ton/yr | ton/yr | ton/yr | ton/yr | ton/yr | kg/yr | kg/yr | kg/yr | kg/yr | kg/yr | kg/yr |
| 1 | 897.2 | 85.0 | 726.2 | 0.2 | 314.9 | 2,023.5 | 0.566 | 0.098 | 0.389 | 0.000 | 0.169 | 1.221 |
| 2 | 1,295.8 | 109.8 | 972.4 | 0.3 | 317.9 | 2,696.3 | 0.817 | 0.127 | 0.520 | 0.000 | 0.170 | 1.634 |
| 3 | 1,284.5 | 153.8 | 886.7 | 0.5 | 334.1 | 2,659.6 | 0.810 | 0.177 | 0.475 | 0.000 | 0.179 | 1.641 |
| 4 | 1,446.8 | 205.6 | 1,001.8 | 1.7 | 398.5 | 3,054.5 | 0.912 | 0.237 | 0.536 | 0.001 | 0.213 | 1.899 |
| 5 | 1,627.1 | 197.3 | 1,166.4 | 2.0 | 398.0 | 3,390.9 | 1.026 | 0.227 | 0.624 | 0.001 | 0.213 | 2.092 |
| 6 | 1,789.7 | 177.8 | 1,336.4 | 2.3 | 450.3 | 3,756.5 | 1.128 | 0.205 | 0.715 | 0.001 | 0.241 | 2.291 |
| 7 | 1,686.4 | 232.0 | 1,154.4 | 2.6 | 428.7 | 3,504.2 | 1.063 | 0.267 | 0.618 | 0.001 | 0.229 | 2.179 |
| 8 | 1,925.9 | 158.7 | 1,475.8 | 3.0 | 437.0 | 4,000.4 | 1.214 | 0.183 | 0.790 | 0.002 | 0.234 | 2.423 |
| 9 | 2,081.5 | 140.5 | 1,645.7 | 3.1 | 440.5 | 4,311.4 | 1.312 | 0.162 | 0.881 | 0.002 | 0.236 | 2.593 |
| 10 | 1,689.9 | 172.0 | 1,232.0 | 3.3 | 434.0 | 3,531.1 | 1.065 | 0.198 | 0.659 | 0.002 | 0.232 | 2.157 |
| 11 | 1,858.3 | 155.9 | 1,422.5 | 3.4 | 440.8 | 3,880.9 | 1.172 | 0.180 | 0.761 | 0.002 | 0.236 | 2.350 |
| 12 | 1,762.5 | 169.6 | 1,321.9 | 3.5 | 433.2 | 3,690.7 | 1.111 | 0.195 | 0.708 | 0.002 | 0.232 | 2.248 |
| 13 | 1,959.7 | 126.1 | 1,558.0 | 3.7 | 437.5 | 4,085.0 | 1.236 | 0.145 | 0.834 | 0.002 | 0.234 | 2.451 |
| 14 | 1,908.0 | 105.3 | 1,546.8 | 3.7 | 435.5 | 3,999.2 | 1.203 | 0.121 | 0.828 | 0.002 | 0.233 | 2.387 |
| 15 | 1,995.9 | 112.2 | 1,626.0 | 3.8 | 438.0 | 4,175.9 | 1.258 | 0.129 | 0.870 | 0.002 | 0.234 | 2.494 |
| 16 | 2,169.5 | 115.4 | 1,811.9 | 3.9 | 443.7 | 4,544.4 | 1.368 | 0.133 | 0.970 | 0.002 | 0.237 | 2.710 |
| 17 | 2,159.3 | 149.3 | 1,750.4 | 3.9 | 443.7 | 4,506.6 | 1.361 | 0.172 | 0.937 | 0.002 | 0.237 | 2.710 |
| 18 | 2,064.7 | 139.3 | 1,692.0 | 4.0 | 437.8 | 4,337.7 | 1.302 | 0.160 | 0.906 | 0.002 | 0.234 | 2.604 |
| 19 | 2,055.8 | 147.5 | 1,682.3 | 4.0 | 431.6 | 4,321.3 | 1.296 | 0.170 | 0.900 | 0.002 | 0.231 | 2.600 |
| 20 | **2,217.9** | **158.5** | **1,822.7** | **4.0** | **397.4** | **4,600.5** | **1.398** | **0.183** | **0.976** | **0.002** | **0.213** | **2.771** |
| 21 | 2,104.2 | 182.5 | 1,652.0 | 4.1 | 442.0 | 4,384.7 | 1.327 | 0.210 | 0.884 | 0.002 | 0.237 | 2.660 |
| 22 | 1,232.5 | 170.0 | 808.6 | 4.1 | 386.1 | 2,601.4 | 0.777 | 0.196 | 0.433 | 0.002 | 0.207 | 1.615 |
| 23 | 869.7 | 140.3 | 554.8 | 4.2 | 309.5 | 1,878.5 | 0.548 | 0.162 | 0.297 | 0.002 | 0.166 | 1.175 |
| 24 | 772.9 | 142.6 | 491.0 | 4.3 | 272.0 | 1,682.7 | 0.487 | 0.164 | 0.263 | 0.002 | 0.146 | 1.062 |
| 25 | 343.8 | 136.8 | 165.7 | 4.4 | 194.9 | 845.6 | 0.217 | 0.158 | 0.089 | 0.002 | 0.104 | 0.570 |
| 26 | 122.8 | 158.0 | 10.0 | 4.5 | 3.2 | 298.5 | 0.077 | 0.182 | 0.005 | 0.002 | 0.002 | 0.269 |
| 27 | 106.5 | 137.2 | 10.0 | 3.1 | 3.2 | 260.0 | 0.067 | 0.158 | 0.005 | 0.002 | 0.002 | 0.234 |
| **Peak Yr** | **2,217.9** | **158.5** | **1,822.7** | **4.0** | **397.4** | **4,600.5** | **1.398** | **0.183** | **0.976** | **0.002** | **0.213** | **2.771** |

*See Sheet: MineDust*

87,022.1
87,022.1
chk

| | | |
|---|---|---|
| *Ore* | *1.27* | *ppm Hg* |
| *Waste* | *0.59* | *ppm Hg* |
| *Mix* | *0.69* | *ppm Hg* |

Conversions

| | |
|---|---|
| 2.20462 | lb/kg |
| 2000 | lb/ton |
| 1,000,000 | parts/million |

| AIR SCIENCES INC. | **Project Title** Donlin Gold | **By** K. Lewis |
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| | **Project No** 281-21B-1 | **Page** 7 **of** 9 **Sheet** Hg EI |
| AIR EMISSION CALCULATIONS | **Subject:** Mercury Emissions | **Date:** August 3, 2021 |

**Mining Fugitive Dust Mercury Emissions - Continued**

| | Mercury Emissions (HgP10) | | | | | | Mercury Emissions (HgP2.5) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pit | Stockpile | WRF | TSF | Area | Total | Pit | Stockpile | WRF | TSF | Area | Total |
| LOM | Mix | Ore | Waste | Waste | Waste | HgP10 | Mix | Ore | Waste | Waste | Waste | HgP2.5 |
| Year | kg/yr | kg/yr | kg/yr | kg/yr | kg/yr | kg/yr | kg/yr | kg/yr | kg/yr | kg/yr | kg/yr | kg/yr |
| 1 | 0.180 | 0.031 | 0.115 | 0.000 | 0.034 | 0.360 | 0.019 | 0.004 | 0.014 | 0.000 | 0.017 | 0.053 |
| 2 | 0.267 | 0.036 | 0.151 | 0.000 | 0.034 | 0.489 | 0.027 | 0.004 | 0.018 | 0.000 | 0.017 | 0.066 |
| 3 | 0.272 | 0.051 | 0.139 | 0.000 | 0.036 | 0.498 | 0.027 | 0.006 | 0.016 | 0.000 | 0.018 | 0.067 |
| 4 | 0.300 | 0.071 | 0.155 | 0.000 | 0.045 | 0.571 | 0.030 | 0.009 | 0.018 | 0.000 | 0.018 | 0.075 |
| 5 | 0.332 | 0.066 | 0.178 | 0.001 | 0.045 | 0.622 | 0.033 | 0.008 | 0.021 | 0.000 | 0.018 | 0.080 |
| 6 | 0.363 | 0.061 | 0.203 | 0.001 | 0.051 | 0.678 | 0.036 | 0.007 | 0.023 | 0.000 | 0.020 | 0.088 |
| 7 | 0.352 | 0.078 | 0.179 | 0.001 | 0.048 | 0.658 | 0.035 | 0.009 | 0.021 | 0.000 | 0.020 | 0.085 |
| 8 | 0.387 | 0.053 | 0.223 | 0.001 | 0.050 | 0.712 | 0.038 | 0.006 | 0.025 | 0.000 | 0.020 | 0.090 |
| 9 | 0.410 | 0.045 | 0.245 | 0.001 | 0.051 | 0.751 | 0.041 | 0.005 | 0.028 | 0.000 | 0.020 | 0.094 |
| 10 | 0.348 | 0.057 | 0.190 | 0.001 | 0.050 | 0.645 | 0.035 | 0.007 | 0.022 | 0.000 | 0.020 | 0.083 |
| 11 | 0.373 | 0.051 | 0.215 | 0.001 | 0.051 | 0.690 | 0.037 | 0.006 | 0.025 | 0.000 | 0.020 | 0.088 |
| 12 | 0.357 | 0.055 | 0.202 | 0.001 | 0.050 | 0.666 | 0.036 | 0.006 | 0.023 | 0.000 | 0.020 | 0.086 |
| 13 | 0.387 | 0.040 | 0.234 | 0.001 | 0.050 | 0.712 | 0.039 | 0.004 | 0.027 | 0.000 | 0.020 | 0.090 |
| 14 | 0.379 | 0.035 | 0.234 | 0.001 | 0.050 | 0.698 | 0.038 | 0.004 | 0.027 | 0.000 | 0.020 | 0.089 |
| 15 | 0.392 | 0.037 | 0.244 | 0.001 | 0.051 | 0.725 | 0.039 | 0.004 | 0.028 | 0.000 | 0.020 | 0.092 |
| 16 | 0.418 | 0.039 | 0.269 | 0.001 | 0.052 | 0.779 | 0.042 | 0.005 | 0.030 | 0.000 | 0.020 | 0.097 |
| 17 | 0.417 | 0.047 | 0.260 | 0.001 | 0.052 | 0.777 | 0.042 | 0.005 | 0.029 | 0.000 | 0.020 | 0.097 |
| 18 | 0.396 | 0.045 | 0.250 | 0.001 | 0.051 | 0.743 | 0.040 | 0.005 | 0.028 | 0.000 | 0.020 | 0.093 |
| 19 | 0.390 | 0.047 | 0.246 | 0.001 | 0.050 | 0.734 | 0.039 | 0.005 | 0.027 | 0.000 | 0.020 | 0.092 |
| 20 | **0.422** | **0.050** | **0.269** | **0.001** | **0.047** | **0.790** | **0.043** | **0.006** | **0.030** | **0.000** | **0.017** | **0.096** |
| 21 | 0.411 | 0.058 | 0.246 | 0.001 | 0.051 | 0.766 | 0.041 | 0.006 | 0.028 | 0.000 | 0.020 | 0.096 |
| 22 | 0.266 | 0.056 | 0.129 | 0.001 | 0.042 | 0.494 | 0.026 | 0.006 | 0.015 | 0.000 | 0.018 | 0.066 |
| 23 | 0.186 | 0.046 | 0.088 | 0.001 | 0.034 | 0.355 | 0.018 | 0.005 | 0.010 | 0.000 | 0.015 | 0.049 |
| 24 | 0.157 | 0.045 | 0.074 | 0.001 | 0.030 | 0.308 | 0.015 | 0.005 | 0.008 | 0.000 | 0.013 | 0.042 |
| 25 | 0.070 | 0.047 | 0.026 | 0.001 | 0.020 | 0.164 | 0.006 | 0.006 | 0.003 | 0.000 | 0.010 | 0.025 |
| 26 | 0.019 | 0.054 | 0.003 | 0.001 | 0.001 | 0.077 | 0.002 | 0.006 | 0.000 | 0.000 | 0.000 | 0.009 |
| 27 | 0.016 | 0.047 | 0.003 | 0.001 | 0.001 | 0.067 | 0.002 | 0.006 | 0.000 | 0.000 | 0.000 | 0.008 |
| **Peak** | **0.422** | **0.050** | **0.269** | **0.001** | **0.047** | **0.790** | **0.043** | **0.006** | **0.030** | **0.000** | **0.017** | **0.096** |

*Ore* *1.27 ppm Hg* *Ore* *1.27 ppm Hg*
*Waste* *0.59 ppm Hg* *Waste* *0.59 ppm Hg*
*Mix* *0.69 ppm Hg* *Mix* *0.69 ppm Hg*

**Ore Processing and Analysis Dust Mercury Emissions**

| Source/Activity | PM ton/yr *(1)* | HgP kg/yr *(2)* | PM10 ton/yr *(1)* | PM2.5 ton/yr *(1)* | HgP10 kg/yr *(2)* | HgP2.5 kg/yr *(2)* |
|---|---|---|---|---|---|---|
| ROM Ore Discharge and Crushing | 30.67 | 0.035 | 19.46 | 10.92 | 0.022 | 0.013 |
| Coarse Ore Transfer | 20.41 | 0.024 | 14.08 | 9.26 | 0.016 | 0.011 |
| Pebble Crushers and Recycle | 18.16 | 0.021 | 14.53 | 11.76 | 0.017 | 0.014 |
| Laboratories | 8.11 | 0.009 | 8.11 | 8.11 | 0.009 | 0.009 |
| Total | 77.36 | 0.089 | 56.18 | 40.05 | 0.065 | 0.046 |

*(1) (Donlin_EI_FSU2) Dust emissions are based on equipment design capacity for all LOM years.*
*(2) Ore 1.27 ppm Hg*

Conversions
2.20462 lb/kg
2000 lb/ton
1,000,000 parts/million

| AIR SCIENCES INC. | Project Title: Donlin Gold | By: K. Lewis |
|---|---|---|
| | Project No: 281-21B-1 | Page 8 of 9 Sheet Hg EI |
| AIR EMISSION CALCULATIONS | Subject: Mercury Emissions | Date: October 11, 2021 |

**Ore Thermal Processing Mercury Emissions**

Emissions at Maximum Operation

| Source/Activity | Controlled Hg Concentration gr/dscf | Ref. | Stack Flow dscfm (1) | Max Operation hr/yr | Total Hg kg/yr | Speciated Emissions Hg0 kg/yr (3) | Hg2 kg/yr (3) | HgP2.5 kg/yr (3) |
|---|---|---|---|---|---|---|---|---|
| Autoclave 101 | 1.1E-06 | (1) | 7,436 | 8,760 | 0.29 | 0.231 | 0.015 | 0.043 |
| Autoclave 201 | 1.1E-06 | (1) | 7,436 | 8,760 | 0.29 | 0.231 | 0.015 | 0.043 |
| Carbon Regeneration Kiln | 5.0E-05 | (1) | 2,311 | 8,760 | 3.97 | 3.165 | 0.108 | 0.694 |
| EW Cells | 5.0E-05 | (2) | 4,128 | 8,760 | 7.03 | 6.863 | 0.134 | 0.033 |
| Retort | 1.0E-04 | (2) | 200 | 8,760 | 0.68 | 0.600 | 0.032 | 0.049 |
| Induction Melting Furnace | 1.0E-05 | (2) | 21,674 | 4,380 | 3.69 | 3.618 | 0.048 | 0.025 |
| Total | | | | | 15.95 | 14.71 | 0.35 | 0.89 |

15.95 chk

(1) *(Hatch 2014) Table 4-2 multiplied by an adjustment factor based on Nevada teast data and limits for similar units.*

| | | | |
|---|---|---|---|
| *Autoclave 101* | *5.7E-07* | *gr/dscf* | 2x |
| *Autoclave 201* | *5.7E-07* | *gr/dscf* | 2x |
| *Carbon Regeneration Kiln* | *2.1E-04* | *gr/dscf* | 0.24x |
| *EW Cells* | *2.1E-04* | *gr/dscf* | N/A |
| *Retort* | *1.8E-03* | *gr/dscf* | N/A |
| *Induction Melting Furnace* | *1.0E-06* | *gr/dscf* | N/A |

(2) *(NDEP 2016)*

| | | |
|---|---|---|
| *Autoclave* | *case-by-case* | |
| *Carbon Kiln* | *1E-04* | *gr/dscf* |
| *Fluid System (Pregnant Tanks, Barren Tanks, Electro Winning, etc.)* | *5E-05* | *gr/dscf* |
| *Retort* | *1E-04* | *gr/dscf* |
| *Furnaces* | *1E-05* | *gr/dscf* |

(3) *Goldstrike Test Data, Permit Limits, and Hg Speciation (Alliance 2018-2020)*

| *Source* | *Test Years* | *Average Hg gr/dscf* | *Maximum Hg gr/dscf* | *Permit Limit gr/dscf* | *Average Flow dscfm* | *Mercury Speciation Hg0* | *Hg2* | *HgP* |
|---|---|---|---|---|---|---|---|---|
| *Autoclaves 456 (1)* | *2018-2020* | *6.6E-07* | *8.0E-07* | *7.8E-05* | *7,337* | *80.0%* | *5.2%* | *14.9%* |
| *Kiln & P/B Tanks* | *2018-2020* | *5.2E-06* | *8.7E-06* | *5.0E-05* | *1,526* | *79.8%* | *2.7%* | *17.5%* |
| *EW Cells* | *2018-2020* | *7.4E-05* | *6.4E-04* | *7.3E-04* | *4,230* | *97.6%* | *1.9%* | *0.5%* |
| *Retort* | *2018-2020* | *9.4E-06* | *1.6E-05* | *1.0E-04* | *78* | *88.1%* | *4.7%* | *7.2%* |
| *E/W Furnces & EW* | *2018-2020* | *3.0E-04* | *6.4E-04* | *7.3E-04* | *4,547* | *98.0%* | *1.3%* | *0.7%* |

NESHAP 7E Limits

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Carbon Processes with Retort | 0.8 lb/ton concentrate | 0.04097 ton/hr | (2) | 8760 hr/yr | = | 130 kg/yr |
| Autoclaves | 84 lb/MMton of ore processed | 420 ton/hr | (1) | 8760 hr/yr | = | 140 kg/yr |

(2) *(Hatch 2013a)*

(1) *(Hatch 2013b)*

Conversions

60 min/hr
7000 gr/lb
2.20462 lb/kg
1.10231 ton/tonne
1,000,000 unit/MM unit

| AIR SCIENCES INC. | **Project Title** Donlin Gold | **By** K. Lewis |
|---|---|---|
| | **Project No** 281-21B-1 | **Page** 9 **of** 9 **Sheet** Hg EI |
| AIR EMISSION CALCULATIONS | **Subject:** Mercury Emissions | **Date:** October 11, 2021 |

**Fuel Combustion and Incineration Mercury Emissions**

Boilers and Heaters Activity and Emissions

| Source/Activity | Fuel | Combined Input | Operation | Hg Emissions | | Speciated Emissions Hg0 kg/yr | Hg2 kg/yr | HgP2.5 kg/yr |
|---|---|---|---|---|---|---|---|---|
| | (1) | MMBtu/h | hr/yr | lb/yr | kg/yr | (2) | (2) | (2) |
| POX Boilers (2) | Dual | 58.6 | 8,760 | 1.540 | 0.698 | 0.349 | 0.209 | 0.140 |
| Oxygen Plant Boiler | Dual | 20.7 | 8,760 | 0.543 | 0.246 | 0.123 | 0.074 | 0.049 |
| Carbon Elution Heater | Dual | 16.0 | 8,760 | 0.420 | 0.191 | 0.095 | 0.057 | 0.038 |
| Power Plant Auxiliary Heaters ( | Dual | 33.0 | 8,760 | 0.867 | 0.393 | 0.197 | 0.118 | 0.079 |
| SO2 Burner | NG | 2.0 | 8,760 | 0.004 | 0.002 | 0.001 | 0.001 | 0.000 |
| Auxiliary SO2 Burner | ULSD | 2.0 | 8,760 | 0.053 | 0.024 | 0.012 | 0.007 | 0.005 |
| Building Heaters (138) | NG | 24.2 | 8,760 | 0.054 | 0.024 | 0.012 | 0.007 | 0.005 |
| Air Handlers (19) | NG | 95.0 | 8,760 | 0.212 | 0.096 | 0.048 | 0.029 | 0.019 |
| Air Handlers (7) | NG | 17.5 | 8,760 | 0.039 | 0.018 | 0.009 | 0.005 | 0.004 |
| Portable Heaters (20) | ULSD | 17.2 | 8,760 | 0.452 | 0.205 | 0.103 | 0.062 | 0.041 |
| Total | | | | 4.184 | 1.898 | 0.949 | 0.569 | 0.380 |

*(1) NG = natural gas; ULSD = ultra-low sulfur diesel; Dual = dual fuel, NG or ULSD*

*(2) (Eyth, A 2011) (Ramboll 2021)* — *Hg0* 50%, *Hg2* 30%, *HgP2.5* 20%

Boiler/Heater Emission Factors

| Fuel | Hg Emission Factor | | Reference |
|---|---|---|---|
| NG | 2.55E-07 | lb/MMBtu | *AP-42, Table 1.4-4, 07/98, natural gas, based on 1,020 Btu/Scf* |
| ULSD | 3.0E-06 | lb/MMBtu | *AP-42, Table 1.3-9, 05/10, distillate fuel oil combustion* |
| Dual | 3.0E-06 | lb/MMBtu | *Maximum of ULSD and NG emission factors* |

Incinerators Activity and Emissions

| Source/Activity | Input | Operation | Hg Emissions | | Speciated Emissions Hg0 kg/yr | Hg2 kg/yr | HgP2.5 kg/yr |
|---|---|---|---|---|---|---|---|
| | MJ/day (1) | hr/yr | lb/yr | kg/yr | (2) | (2) | (2) |
| Camp Incinerator | 112,796 | 365 | 0.124 | 0.056 | 0.012 | 0.033 | 0.011 |
| Sewage Sludge Incinerator | 941.5 | 365 | 0.044 | 0.020 | 0.004 | 0.012 | 0.004 |
| Total | | | 0.169 | 0.076 | 0.017 | 0.044 | 0.015 |

*(1)* 990 *lb/hr, camp waste* 24 *hr/day*
71 *lb/year/person, dry sludge (1.5x)*
600 *people*

*(2) (Eyth, A 2011) (Ramboll 2021)* — *Hg0* 22%, *Hg2* 58%, *HgP2.5* 20%

Incinerator Emission Factors

| Fuel | Hg Emission Factor | | Reference |
|---|---|---|---|
| Camp Incinerator | 1.37E-06 | g/MJ | *Based on vendor guarantee of 0.0035 mg/Nm3 @ 7% O2, dry* |
| Sewage Sludge Incinerator | 5.86E-05 | g/MJ | *Based on vendor guarantee of 0.15 mg/Nm3 @ 7% O2, dry* |

*Camp Incinerator*: $\frac{0.0035 \text{ mg}}{\text{Nm3@7\%O2}} \times \frac{0.26 \text{ Nm3@0\%O2}}{\text{MJ}} \times \frac{(20.9\% - 0.0\%)}{(20.9\% - 7.0\%)} \times \frac{\text{g}}{1{,}000 \text{ mg}} = \frac{1.4\text{E-06 g Hg}}{\text{MJ}}$

*Highest of 40 CFR 60 Subpart CCCC, Table 8 for small remote unit and Table 5 for large unit*

*Sewage Sludge Incinerator* 0.15 *mg/Nm3 @ 7% O2, dry 40 CFR 60 Subpart LLLL, Table 2* = *5.9E-05 g Hg/MJ*

Conversions

| | | | |
|---|---|---|---|
| 2,000 | lb/ton | 0.26 | Nm3/MJ @ 0% O2, incenerator |
| 2.2046 | lb/kg | 10,466 | J/g solid waste |
| 1,000 | g/kg or mg/g | 7,700 | Btu/lb dry sludge |
| 453.5929 | g/lb | 1,055 | J/Btu |

1,000,000 unit/MM unit

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

Calculations for LOM: 19

**Facility-Wide Emissions Summary** *(ton/yr)*

| Activity | CO | NOx | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|
| Mining Activities | 1,921.0 | 51.6 | 155.1 | 1,214.5 | 4,321.3 | 0.2 | |
| Power Generation | 367.0 | 1,032.8 | 564.2 | 564.2 | 564.2 | 11.5 | 1,123.7 |
| Emergency Equipment | 18.7 | 33.3 | 1.1 | 1.1 | 1.1 | 0.03 | 33.3 |
| Mobile Machinery | 2,045.8 | 1,978.9 | 22.9 | 22.9 | 22.9 | 3.9 | 111.1 |
| Processing Operations | 774.9 | 0.1 | 64.5 | 80.6 | 101.8 | 9.8 | 2.3 |
| Boilers | 94.9 | 158.1 | 8.9 | 9.5 | 20.9 | 1.4 | 6.5 |
| Incinerators | 0.4 | 0.8 | 0.3 | 0.3 | 0.3 | 0.53 | -- |
| Access Roads | 4.5 | 2.3 | 4.3 | 43.2 | 174.2 | 0.01 | 0.2 |
| Tanks | | | | | | | 1.8 |
| Process and Ancillary Source Subtotal | 1,256 | 1,225 | 639 | 656 | 688 | 23 | 1,168 |
| Mining Activity (including access roads) Subtotal | 1,925 | 54 | 159 | 1,258 | 4,495 | 0 | 0 |
| Mobile Machinery Subtotal | 2,046 | 1,979 | 23 | 23 | 23 | 4 | 111 |
| **Facility Total** | **5,227** | **3,258** | **821** | **1,936** | **5,207** | **27** | **1,279** |

Assessable PTE 10,835 ton/yr

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | | BY: E. Memon |
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| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

Calculations for LOM: 19

**Detailed Emissions Summary** *(ton/yr)*

| Activity | Rate | | CO | NOx | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|---|---|
| **Mining Activities - Subtotal** | | | **1,921** | **52** | **155** | **1,214** | **4,321** | **0.17** | **0.00** |
| Drilling (EU ID: 113) | 131,003 | *holes/yr* | | | 2.55 | 44.28 | 85.15 | | |
| Blasting (EU ID: 114) | 550 | *blasts/yr* | 1,921 | 51.61 | 4.80 | 83.22 | 160.04 | 0.17 | |
| **Material Handling (Loading and Unloading) (EU ID: 115-120)** | | | | | | | | | |
| Ore Loading (In-Pit) | 16,049,018 | *ton/yr* | | | 1.82 | 12.01 | 25.39 | | |
| Ore Unloading (Short-Term Stockpile) | 7,222,058 | *ton/yr* | | | 0.82 | 5.40 | 11.43 | | |
| Ore Unloading (Long-Term Stockpile) | 0 | *ton/yr* | | | 0.00 | 0.00 | 0.00 | | |
| Ore Reloading (Long-Term Stockpile) | 5,487,648 | *ton/yr* | | | 0.62 | 4.11 | 8.68 | | |
| Waste (incl. OVB/PAG) Loading (In-Pit) | 122,842,043 | *ton/yr* | | | 13.92 | 91.9 | 194.4 | | |
| Waste (incl. OVB/PAG) Un- & Re-loading | 124,244,181 | *ton/yr* | | | 14.08 | 93.0 | 196.6 | | |
| **Material Hauling (EU ID: 160)** | | | | | | | | | |
| Ore Hauling | 373,876 | *VMT/yr* | | | 6.13 | 61.31 | 252.1 | | |
| Waste Hauling | 4,345,270 | *VMT/yr* | | | 71.26 | 712.6 | 2,930 | | |
| **Maintenance Equipment (EU ID: 121-123)** | | | | | | | | | |
| Dozer Use | 75,495 | *hr/yr* | | | 34.07 | 58.14 | 324.5 | | |
| Grader Use | 45,653 | *hr/yr* | | | 1.32 | 18.86 | 42.70 | | |
| Water Truck Use | 11,795 | *hr/yr* | | | 1.49 | 14.90 | 61.28 | | |
| **Wind Erosion of Exposed Surfaces (EU ID: 161)** | | | | | | | | | |
| Tailings Beach (Dry) | 863 | *acre* | | | 0.30 | 1.99 | 3.98 | | |
| Haul Roads | 215 | *acre* | | | 0.13 | 0.90 | 1.79 | | |
| Access Roads | 143 | *acre* | | | 0.09 | 0.60 | 1.19 | | |
| Waste Rock Facility | variable | *acre* | | | 1.57 | 10.47 | 20.95 | | |
| Short-term Stockpile | variable | *acre* | | | 0.02 | 0.16 | 0.33 | | |
| Long-term Stockpile West | variable | *acre* | | | 0.0285 | 0.1901 | 0.380 | | |
| Long-term Stockpile East (& PAG) | variable | *acre* | | | 0.0488 | 0.3254 | 0.651 | | |
| Overburden Stockpile South | variable | *acre* | | | 0.0153 | 0.1021 | 0.204 | | |
| **Power Generation - Subtotal** | | | **367.0** | **1,033** | **564.2** | **564.2** | **564.2** | **11.54** | **1,124** |
| Power Plant Generators (12) | 204,912 | *kWe* | 350.1 | 1,031 | 564.1 | 564.1 | 564.1 | 11.51 | 1,123 |
| Airport Generators (2) | 400 | *kWe* | 16.90 | 1.93 | 0.097 | 0.097 | 0.097 | 0.026 | 0.92 |
| **Mobile Machinery - Subtotal** | | | **2,046** | **1,979** | **22.95** | **22.95** | **22.95** | **3.87** | **111.1** |
| Hydraulic Shovel | 9,954,953 | *hp-hr/yr* | 28.64 | 28.64 | 0.33 | 0.33 | 0.33 | 0.05 | 1.55 |
| Front-End Loader | 11,594,785 | *hp-hr/yr* | 33.36 | 33.36 | 0.38 | 0.38 | 0.38 | 0.06 | 1.81 |
| Haul Truck | 594,518,171 | *hp-hr/yr* | 1,710 | 1,710 | 19.55 | 19.55 | 19.55 | 3.23 | 92.85 |
| Drill | 30,233,452 | *hp-hr/yr* | 86.98 | 79.16 | 0.94 | 0.94 | 0.94 | 0.16 | 4.72 |
| Track Dozer | 27,401,903 | *hp-hr/yr* | 78.83 | 55.94 | 0.75 | 0.75 | 0.75 | 0.15 | 4.28 |
| Wheel Dozer | 11,963,331 | *hp-hr/yr* | 34.42 | 34.42 | 0.39 | 0.39 | 0.39 | 0.07 | 1.87 |
| Grader | 10,220,103 | *hp-hr/yr* | 29.40 | 3.36 | 0.17 | 0.17 | 0.17 | 0.06 | 1.60 |
| Water Truck | 5,794,339 | *hp-hr/yr* | 16.67 | 16.67 | 0.19 | 0.19 | 0.19 | 0.03 | 0.90 |
| Hydraulic Excavator | 4,519,036 | *hp-hr/yr* | 13.00 | 9.96 | 0.13 | 0.13 | 0.13 | 0.02 | 0.71 |
| Fuel Truck | 2,089,431 | *hp-hr/yr* | 6.01 | 6.01 | 0.07 | 0.07 | 0.07 | 0.01 | 0.33 |
| Service Truck | 171,440 | *hp-hr/yr* | 0.49 | 0.056 | 0.0028 | 0.0028 | 0.0028 | 0.0009 | 0.027 |
| Mobile Crane | 214,301 | *hp-hr/yr* | 0.62 | 0.070 | 0.0035 | 0.0035 | 0.0035 | 0.0012 | 0.033 |
| Low Boy Truck | 1,000,069 | *hp-hr/yr* | 2.88 | 0.33 | 0.016 | 0.016 | 0.016 | 0.0054 | 0.16 |
| Tire Handler | 1,428,671 | *hp-hr/yr* | 4.11 | 0.47 | 0.023 | 0.023 | 0.023 | 0.0078 | 0.22 |
| Light Plant | 3,428,810 | *hp-hr/yr* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 19

**Detailed Emissions Summary (*ton/yr*) - continued**

| Activity | Rate | CO | NOx | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|---|
| **Emergency Equipment - Subtotal** | | **18.74** | **33.29** | **1.07** | **1.07** | **1.07** | **0.03** | **33.29** |
| Black Start Generators (2) | 1,200 *kWe* | 2.89 | 5.29 | 0.17 | 0.17 | 0.17 | 0.0044 | 5.29 |
| Emergency Generators (4) | 6,000 *kWe* | 14.47 | 26.46 | 0.83 | 0.83 | 0.83 | 0.022 | 26.46 |
| Fire Pumps (3) | 756 *hp* | 1.38 | 1.54 | 0.079 | 0.079 | 0.079 | 0.00205 | 1.54 |
| **Processing Operations - Subtotal** | | **774.88** | **0.08** | **64.50** | **80.63** | **101.81** | **9.79** | **2.30** |
| ROM Ore Discharge and Crushing | 5,100 *ton/hr* | | | 10.92 | 19.456 | 30.67 | | |
| Coarse Ore Transfer | 5,100 *ton/hr* | | | 9.26 | 14.081 | 20.41 | | |
| Pebble Crushers and Recycle | 660 *ton/hr* | | | 11.76 | 14.529 | 18.16 | | |
| Reagents Handling and Mixing | | | | 12.61 | 12.613 | 12.61 | | |
| Refinery Sources | | 774.9 | 0.1 | 10.71 | 10.71 | 10.71 | 9.79 | 2.30 |
| Laboratories | | | | 8.11 | 8.11 | 8.11 | | |
| Water Treatment Plant | | | | 1.13 | 1.13 | 1.13 | | |
| **Boilers - Subtotal** | | **94.94** | **158.14** | **8.87** | **9.49** | **20.90** | **1.36** | **6.52** |
| POX Boilers (2) | 58.58 *MMBtu/hr* | 21.13 | 39.42 | 1.91 | 1.97 | 6.50 | 0.40 | 1.38 |
| Oxygen Plant Boiler | 20.66 *MMBtu/hr* | 7.45 | 13.91 | 0.67 | 0.70 | 2.29 | 0.14 | 0.49 |
| Carbon Elution Heater | 16 *MMBtu/hr* | 5.77 | 10.77 | 0.52 | 0.54 | 1.78 | 0.11 | 0.38 |
| Power Plant Auxiliary Heaters (2) | 33 *MMBtu/hr* | 11.90 | 22.21 | 1.08 | 1.11 | 3.66 | 0.22 | 0.78 |
| SO2 Burner | 2 *MMBtu/hr* | 0.72 | 0.86 | 0.07 | 0.07 | 0.07 | 0.01 | 0.05 |
| Auxiliary SO2 Burner | 2 *MMBtu/hr* | 0.34 | 1.35 | 0.02 | 0.07 | 0.22 | 0.01 | 0.02 |
| Building Heaters (138) | 24.15 *MMBtu/hr* | 4.15 | 9.75 | 0.79 | 0.79 | 0.79 | 0.06 | 0.57 |
| Air Handlers (19) | 95 *MMBtu/hr* | 34.27 | 40.79 | 3.10 | 3.10 | 3.10 | 0.24 | 2.24 |
| Air Handlers (7) | 17.5 *MMBtu/hr* | 6.31 | 7.51 | 0.57 | 0.57 | 0.57 | 0.05 | 0.41 |
| Portable Heaters (20) | 17.2 *MMBtu/hr* | 2.89 | 11.58 | 0.14 | 0.58 | 1.91 | 0.12 | 0.20 |
| **Incinerators - Subtotal** | | **0.361** | **0.84** | **0.33** | **0.33** | **0.33** | **0.531** | |
| Camp Waste Incinerator (EU ID: 27) | 0.50 *ton/hr* | 0.351 | 0.78 | 0.32 | 0.32 | 0.32 | 0.5197 | |
| Sewage Sludge Incinerator (EU ID: 28) | 0.007 *ton/hr* | 0.0096 | 0.064 | 0.0089 | 0.0089 | 0.0089 | 0.0110 | |
| **Access Roads - Subtotal** | | **4.47** | **2.29** | **4.30** | **43.18** | **174.15** | **0.0091** | **0.183** |
| Camp to Mine Site (EU ID: 158) | | 0.344 | 0.113 | 0.32 | 3.22 | 13.09 | 0.00069 | 0.0118 |
| Airport to Camp (EU ID: 159) | | 0.297 | 0.049 | 0.186 | 1.88 | 7.55 | 0.00038 | 0.0113 |
| Jungjuk Port to Mine Site | | 3.83 | 2.13 | 3.79 | 38.08 | 153.51 | 0.0080 | 0.160 |
| **Tanks - Subtotal** | | | | | | | | **1.840** |
| Mine Site Tanks | | | | | | | | 1.57 |
| Power Plant Tanks | | | | | | | | 0.018 |
| Camp Site Tanks | | | | | | | | 0.002 |
| Airport Tanks | | | | | | | | 0.249 |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

**Life-of-Mine Mining Activity, Machinery Tailpipes, Wind Erosion, and Access Roads Emissions Summary** ***(ton/yr)***

| LOM | CO | NOX | PM2.5 | PM10 | PM | SO2 | VOC | Total |
|---|---|---|---|---|---|---|---|---|
| 4 | 3,097.4 | 1,159.0 | 140.7 | 967.6 | 3,241.6 | 2.40 | 63.80 | 8,672 |
| 5 | 3,240.5 | 1,302.9 | 151.3 | 1,059.9 | 3,579.6 | 2.67 | 71.57 | 9,408 |
| 6 | 3,296.9 | 1,354.7 | 165.6 | 1,162.4 | 3,945.9 | 2.77 | 74.63 | 10,003 |
| 7 | 3,411.3 | 1,465.4 | 160.6 | 1,111.1 | 3,694.8 | 2.99 | 80.85 | 9,927 |
| 8 | 3,568.3 | 1,622.5 | 174.0 | 1,230.8 | 4,192.8 | 3.29 | 89.37 | 10,881 |
| 9 | 3,702.0 | 1,752.5 | 182.6 | 1,306.3 | 4,505.3 | 3.54 | 96.63 | 11,549 |
| 10 | 3,484.2 | 1,539.9 | 161.1 | 1,110.2 | 3,722.6 | 3.13 | 84.80 | 10,106 |
| 11 | 3,487.7 | 1,547.0 | 169.6 | 1,193.9 | 4,072.5 | 3.13 | 84.99 | 10,559 |
| 12 | 3,602.4 | 1,664.9 | 166.6 | 1,149.6 | 3,883.6 | 3.35 | 91.22 | 10,562 |
| 13 | 3,692.2 | 1,755.7 | 176.8 | 1,243.7 | 4,278.9 | 3.52 | 96.09 | 11,247 |
| 14 | 3,764.3 | 1,829.3 | 176.4 | 1,226.7 | 4,194.0 | 3.66 | 100.01 | 11,294 |
| 15 | 3,868.1 | 1,930.2 | 181.7 | 1,271.3 | 4,371.9 | 3.85 | 105.64 | 11,733 |
| 16 | 3,967.8 | 2,031.7 | **192.4** | 1,364.1 | 4,741.4 | 4.04 | 111.06 | **12,413** |
| 17 | 3,900.3 | 1,961.9 | 190.0 | 1,351.5 | 4,702.9 | 3.91 | 107.39 | 12,218 |
| 18 | 3,894.6 | 1,958.2 | 183.7 | 1,296.9 | 4,534.0 | 3.90 | 107.08 | 11,978 |
| 19 | **3,971.3** | **2,032.8** | 182.3 | 1,280.6 | 4,518.4 | **4.05** | **111.24** | 12,101 |
| 20 | 3,891.3 | 1,951.6 | 188.2 | **1,372.3** | **4,796.7** | 3.90 | 106.90 | 12,311 |
| 21 | 3,559.2 | 1,621.3 | 183.2 | 1,319.9 | 4,577.1 | 3.27 | 88.88 | 11,353 |
| 22 | 2,749.4 | 829.9 | 123.3 | 844.7 | 2,784.6 | 1.74 | 44.91 | 7,379 |
| 23 | 2,522.8 | 616.3 | 91.5 | 614.4 | 2,059.2 | 1.31 | 32.61 | 5,938 |
| 24 | 2,551.2 | 643.7 | 80.9 | 535.1 | 1,863.7 | 1.36 | 34.15 | 5,710 |
| 25 | 2,199.0 | 309.0 | 46.7 | 286.5 | 1,022.7 | 0.70 | 15.03 | 3,880 |
| 26 | 2,013.3 | 141.8 | 15.1 | 129.4 | 473.7 | 0.35 | 4.95 | 2,779 |
| 27 | 2,001.7 | 130.1 | 13.8 | 118.5 | 435.0 | 0.33 | 4.32 | 2,704 |

*Red numbers represent the highest values*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

TOT_MINING_FU( TOT_MINING_FUG_NOX TOT_MINING_FUG_ TOT_MINING_FU( TOT_MINING_I TOT_MINING_FUG_SO2

**Life-of-Mine Mining Activity Fugitive Emissions Summary (*ton/yr*)**

APP_C4_23

| LOM | CO | NOX | PM2.5 | PM10 | PM | SO2 |
|---|---|---|---|---|---|---|
| 4 | **1,921** | **51.61** | 121.4 | 897.7 | 3,027 | **0.17** |
| 5 | **1,921** | **51.61** | 130.3 | 988.5 | 3,364 | **0.17** |
| 6 | **1,921** | **51.61** | 143.8 | 1,089.0 | 3,727 | **0.17** |
| 7 | **1,921** | **51.61** | 137.5 | 1,036.2 | 3,474 | **0.17** |
| 8 | **1,921** | **51.61** | 149.1 | 1,154.0 | 3,970 | **0.17** |
| 9 | **1,921** | **51.61** | 156.4 | 1,228.9 | 4,283 | **0.17** |
| 10 | **1,921** | **51.61** | 137.1 | 1,034.4 | 3,501 | **0.17** |
| 11 | **1,921** | **51.61** | 145.6 | 1,117.9 | 3,850 | **0.17** |
| 12 | **1,921** | **51.61** | 141.2 | 1,072.2 | 3,660 | **0.17** |
| 13 | **1,921** | **51.61** | 150.5 | 1,166.2 | 4,056 | **0.17** |
| 14 | **1,921** | **51.61** | 149.1 | 1,147.3 | 3,968 | **0.17** |
| 15 | **1,921** | **51.61** | 153.3 | 1,190.6 | 4,145 | **0.17** |
| 16 | **1,921** | **51.61** | **162.8** | 1,282.2 | 4,513 | **0.17** |
| 17 | **1,921** | **51.61** | 161.3 | 1,271.4 | 4,477 | **0.17** |
| 18 | **1,921** | **51.61** | 155.1 | 1,216.5 | 4,307 | **0.17** |
| 19 | **1,921** | **51.61** | 152.9 | 1,199.7 | 4,292 | **0.17** |
| 20 | **1,921** | **51.61** | 160.0 | **1,294.6** | **4,576** | **0.17** |
| 21 | **1,921** | **51.61** | 159.2 | 1,248.8 | 4,365 | **0.17** |
| 22 | **1,921** | **51.61** | 108.4 | 782.9 | 2,582 | **0.17** |
| 23 | **1,921** | **51.61** | 79.2 | 555.3 | 1,860 | **0.17** |
| 24 | **1,921** | **51.61** | 68.2 | 475.5 | 1,664 | **0.17** |
| 25 | **1,921** | **51.61** | 38.0 | 230.9 | 827 | **0.17** |
| 26 | **1,921** | **51.61** | 8.4 | 75.9 | 280 | **0.17** |
| 27 | **1,921** | **51.61** | 7.3 | 65.8 | 243 | **0.17** |

*Red numbers represent the highest values*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

TOT_MACHINES_FUG_C TOT_MACHINES_FU TOT_MACHINES_ TOT_MACHINE TOT_MACHINES_FUG_NMHC

**Life-of-Mine Machinery Tailpipes Emissions Summary (*ton/yr*)**

APP_C4_23

| LOM | CO | NOx | PM | SO2 | VOC |
|---|---|---|---|---|---|
| 4 | 1,172 | 1,105 | 12.96 | 2.21 | 63.6 |
| 5 | 1,315 | 1,249 | 14.60 | 2.48 | 71.4 |
| 6 | 1,371 | 1,301 | 15.22 | 2.59 | 74.5 |
| 7 | 1,486 | 1,412 | 16.50 | 2.81 | 80.7 |
| 8 | 1,643 | 1,569 | 18.30 | 3.10 | 89.2 |
| 9 | 1,777 | 1,699 | 19.80 | 3.36 | 96.4 |
| 10 | 1,559 | 1,486 | 17.34 | 2.95 | 84.6 |
| 11 | 1,562 | 1,493 | 17.41 | 2.95 | 84.8 |
| 12 | 1,677 | 1,611 | 18.74 | 3.17 | 91.0 |
| 13 | 1,767 | 1,702 | 19.77 | 3.34 | 95.9 |
| 14 | 1,839 | 1,775 | 20.61 | 3.47 | 99.8 |
| 15 | 1,943 | 1,876 | 21.77 | 3.67 | 105.5 |
| 16 | 2,042 | 1,978 | 22.92 | 3.86 | 110.9 |
| 17 | 1,975 | 1,908 | 22.14 | 3.73 | 107.2 |
| 18 | 1,969 | 1,904 | 22.09 | 3.72 | 106.9 |
| 19 | **2,046** | **1,979** | **22.95** | **3.87** | **111.1** |
| 20 | 1,966 | 1,898 | 22.03 | 3.71 | 106.7 |
| 21 | 1,634 | 1,567 | 18.24 | 3.09 | 88.7 |
| 22 | 824 | 776 | 9.11 | 1.56 | 44.7 |
| 23 | 597 | 562 | 6.60 | 1.13 | 32.4 |
| 24 | 626 | 590 | 6.92 | 1.18 | 34.0 |
| 25 | 274 | 255 | 3.01 | 0.52 | 14.9 |
| 26 | 88 | 88 | 1.00 | 0.17 | 4.8 |
| 27 | 76 | 76 | 0.87 | 0.14 | 4.1 |

*Red numbers represent the highest values*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 7 | OF: 7 | SHEET: Summary |
| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

**Life-of-Mine Wind Erosion and Access Road Fugitive Emissions Summary (*ton/yr*)**

| LOM | CO | NOX | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|
| 4 | **4.47** | **2.29** | 6.37 | 56.95 | 201.70 | **0.01** | **0.18** |
| 5 | **4.47** | **2.29** | 6.35 | 56.82 | 201.43 | **0.01** | **0.18** |
| 6 | **4.47** | **2.29** | 6.55 | 58.14 | 204.09 | **0.01** | **0.18** |
| 7 | **4.47** | **2.29** | 6.58 | 58.33 | 204.47 | **0.01** | **0.18** |
| 8 | **4.47** | **2.29** | 6.60 | 58.49 | 204.77 | **0.01** | **0.18** |
| 9 | **4.47** | **2.29** | 6.47 | 57.60 | 203.00 | **0.01** | **0.18** |
| 10 | **4.47** | **2.29** | 6.60 | 58.47 | 204.74 | **0.01** | **0.18** |
| 11 | **4.47** | **2.29** | 6.61 | 58.55 | 204.90 | **0.01** | **0.18** |
| 12 | **4.47** | **2.29** | 6.62 | 58.62 | 205.04 | **0.01** | **0.18** |
| 13 | **4.47** | **2.29** | 6.49 | 57.74 | 203.28 | **0.01** | **0.18** |
| 14 | **4.47** | **2.29** | 6.64 | 58.79 | 205.38 | **0.01** | **0.18** |
| 15 | **4.47** | **2.29** | 6.66 | 58.87 | 205.55 | **0.01** | **0.18** |
| 16 | **4.47** | **2.29** | **6.67** | **58.98** | **205.76** | **0.01** | **0.18** |
| 17 | **4.47** | **2.29** | 6.51 | 57.91 | 203.63 | **0.01** | **0.18** |
| 18 | **4.47** | **2.29** | 6.58 | 58.33 | 204.46 | **0.01** | **0.18** |
| 19 | **4.47** | **2.29** | 6.51 | 57.91 | 203.63 | **0.01** | **0.18** |
| 20 | **4.47** | **2.29** | 6.17 | 55.63 | 199.05 | **0.01** | **0.18** |
| 21 | **4.47** | **2.29** | 5.75 | 52.84 | 193.48 | **0.01** | **0.18** |
| 22 | **4.47** | **2.29** | 5.73 | 52.70 | 193.21 | **0.01** | **0.18** |
| 23 | **4.47** | **2.29** | 5.70 | 52.51 | 192.81 | **0.01** | **0.18** |
| 24 | **4.47** | **2.29** | 5.72 | 52.60 | 192.99 | **0.01** | **0.18** |
| 25 | **4.47** | **2.29** | 5.71 | 52.55 | 192.89 | **0.01** | **0.18** |
| 26 | **4.47** | **2.29** | 5.71 | 52.56 | 192.91 | **0.01** | **0.18** |
| 27 | **4.47** | **2.29** | 5.60 | 51.84 | 191.48 | **0.01** | **0.18** |

*Red numbers represent the highest values*

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| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: Mining Activity Emissions | DATE: October 14, 2021 | | |

Calculations for LOM: 19 Max Daily Ore: Yes

**Mining Activity Emissions Summary**

HgDustPM2.5 HgDustPM10 HgDust

**Particulate Emissions**

| Activity | Rate | | PM2.5 (lb/hr) | PM2.5 (lb/day) | PM2.5 (ton/yr) | PM10 (lb/hr) | PM10 (lb/day) | PM10 (ton/yr) | PM (ton/yr) |
|---|---|---|---|---|---|---|---|---|---|
| Drilling (EU ID: 113) | 131,003 | *holes/yr* | 0.58 | 14.00 | 2.55 | 10.11 | 242.62 | 44.28 | 85.2 |
| Blasting (EU ID: 114) | 550 | *blasts/yr* | 87.30 | 87.30 | 4.80 | 1,513.12 | 1,513.12 | 83.22 | 160.0 |
| **Material Handling (Loading and Unloading) (EU ID: 115-120)** | | | | | - | | | - | - |
| Ore Loading (In-Pit) | 16,049,018 | *ton/yr* | 1.16 | 27.74 | 1.82 | 7.63 | 183.19 | 12.01 | 25.4 |
| Ore Unloading (Short-Term Stockpile) | 7,222,058 | *ton/yr* | 0.19 | 4.48 | 0.82 | 1.23 | 29.61 | 5.40 | 11.4 |
| Ore Unloading (Long-Term Stockpile) | 0 | *ton/yr* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 |
| Ore Reloading (Long-Term Stockpile) | 5,487,648 | *ton/yr* | 0.14 | 3.41 | 0.62 | 0.94 | 22.50 | 4.11 | 8.7 |
| Waste (incl. OVB/PAG) Loading (In-Pit) | 122,842,043 | *ton/yr* | 3.18 | 76.27 | 13.92 | 20.99 | 503.70 | 91.93 | 194.4 |
| Waste (incl. OVB/PAG) Un- & Re-loading | 124,244,181 | *ton/yr* | 3.21 | 77.15 | 14.08 | 21.23 | 509.45 | 92.97 | 196.6 |
| **Material Hauling (EU ID: 160)** | | | | | - | | | - | - |
| Ore Hauling | 373,876 | *VMT/yr* | 1.40 | 33.60 | 6.13 | 14.00 | 335.95 | 61.31 | 252.1 |
| Waste Hauling | 4,345,270 | *VMT/yr* | 16.27 | 390.45 | 71.26 | 162.69 | 3,904.53 | 712.58 | 2,929.6 |
| **Maintenance Equipment (EU ID: 121-123)** | | | | | - | | | - | - |
| Dozer Use | 75,495 | *hr/yr* | 7.78 | 186.68 | 34.07 | 13.28 | 318.60 | 58.14 | 324.5 |
| Grader Use | 45,653 | *hr/yr* | 0.30 | 7.25 | 1.32 | 4.31 | 103.34 | 18.86 | 42.7 |
| Water Truck Use | 11,795 | *hr/yr* | 0.34 | 8.17 | 1.49 | 3.40 | 81.67 | 14.90 | 61.3 |
| **Wind Erosion of Exposed Surfaces (EU ID: 161)** | | | | | - | | | - | - |
| Tailings Beach (Dry) | 862.5 | *acre* | 0.07 | 1.64 | 0.30 | 0.45 | 10.92 | 1.99 | 3.98 |
| Haul Roads | 214.7 | *acre* | 0.03 | 0.74 | 0.13 | 0.20 | 4.91 | 0.90 | 1.79 |
| Access Roads | 143.0 | *acre* | 0.02 | 0.49 | 0.09 | 0.14 | 3.27 | 0.60 | 1.19 |
| Waste Rock Facility | *variable* | *acre* | 0.36 | 8.61 | 1.57 | 2.39 | 57.39 | 10.47 | 20.95 |
| Short-term Stockpile | *variable* | *acre* | 0.01 | 0.13 | 0.02 | 0.04 | 0.90 | 0.16 | 0.33 |
| Long-term Stockpile West | *variable* | *acre* | 0.0065 | 0.16 | 0.029 | 0.043 | 1.04 | 0.19 | 0.38 |
| Long-term Stockpile East (& PAG) | *variable* | *acre* | 0.0111 | 0.27 | 0.049 | 0.074 | 1.78 | 0.33 | 0.65 |
| Overburden Stockpile South | *variable* | *acre* | 0.0035 | 0.08 | 0.015 | 0.023 | 0.56 | 0.10 | 0.20 |
| **Total** | | | **122.35** | **928.61** | **155.10** | **1,776.28** | **7,829.05** | **1,214.46** | **4,321.28** |

**Other Emissions**

| Activity | CO (lb/hr) | CO (lb/day) | CO (ton/yr) | NOx (lb/hr) | NOx (lb/day) | NOx (ton/yr) | SO2 (lb/hr) | SO2 (lb/day) | SO2 (ton/yr) |
|---|---|---|---|---|---|---|---|---|---|
| Blasting (EU ID: 114) | 34,926.6 | 34,926.6 | 1,921.0 | 938.33 | 938.33 | 51.61 | 3.13 | 3.13 | 0.17 |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
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| AIR EMISSION CALCULATIONS | SUBJECT: Mining Activity Emissions | DATE: October 14, 2021 | | |

Calculations for LOM: 19

**Drilling (EU ID: 113)**

**Activity Information**

| | | | | |
|---|---|---|---|---|
| Tota Total Drilling | 1,781,630 | *m/yr* | *Donlin* | APP_C4_23 |
| Drill Hole Depth | 13.6 | *m* | *Donlin* | |
| No. of Holes | 131,003 | *holes/yr* | | |
| Operation | 365 | *days/yr* | | |
| | 24 | *hr/day* | | |

**Emission Factor(s)**

| | | | |
|---|---|---|---|
| TSP | 1.3 | *lb/hole* | *AP-42, Tab. 11.9-4, 7/98 (overburden)* |

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.03 | *AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)* |
| PM10 | 0.52 | *AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)* |
| PM | 1 | |

| Emissions | *(lb/hole)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|---|
| PM2.5 | 0.039 | 0.6 | 14.0 | 2.6 |
| PM10 | 0.676 | 10.1 | 242.6 | 44.3 |
| PM | 1.3 | 19.4 | 466.6 | 85.2 |

**Sample Calculations**

**PM10**

| | (Activity) | (TSP EF) | (Conversion) | (SF) |
|---|---|---|---|---|
| 44.3 *ton/yr* | 131,003 *~~hole~~* / *yr* | 1.3 *~~lb~~* / *~~hole~~* | *ton* / 2,000 *~~lb~~* | 0.52 |

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 19

**Blasting (EU ID: 114)**

**Activity Information**

| | | | | |
|---|---|---|---|---|
| Tota Material Mined | | 126,000,000 | *t/yr* | *Donlin* APP_C4_23 |
| BVol | | 46,203,451 | $m^3$/yr | *Donlin* |
| Con: Blasting Agent Use | | 60,000 | *t/yr* | *Donlin (11/08/2016)* |
| Excluding Water | (13.3%) | 52,020 | *t/yr* | *Donlin* |
| | | 57,342 | *ton/yr* | |
| Blas No. of Blasts | | 550 | *blasts/yr* | *Donlin* |
| Bench Height | | 12 | *m* | *Donlin* |
| Operation | | 365 | *days/yr* | |
| | | 24 | *hr/day* | |

**Emission Factor(s)**

| | | | |
|---|---|---|---|
| Emission Factor Equation | TSP (lb/blast) = 0.000014 x $A^{1.5}$ | | *AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)* |
| Where, A = Area per Blast | 120,000 | $ft^2$ | *Donlin (11/08/2016)* |
| TSP | 582.0 | *lb/blast* | |
| CO | 67 | *lb/ton-ANFO* | *AP-42, Tab. 13.3-1, 2/80 (ANFO)* |
| NOx | 0.9 | *kg/t-ANFO* | *CSIRO* |
| | 1.80 | *lb/ton-ANFO* | |
| SO2 | 0.006 | *lb/ton-ANFO* | *Based on 15 ppm S in FO and a maximum of 10% FO in ANFO* |

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.03 | *AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)* |
| PM10 | 0.52 | *AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)* |

| Emissions | *(lb/blast)* | *(lb/hr)* [1] | *(lb/day)* [1] | *(ton/yr)* |
|---|---|---|---|---|
| PM2.5 | 17.46 | 87.30 | 87.30 | 4.80 |
| PM10 | 302.62 | 1,513.12 | 1,513.12 | 83.22 |
| PM | 581.97 | 2,909.85 | 2,909.85 | 160.04 |
| CO | 6,985.32 | 34,926.59 | 34,926.59 | 1,920.96 |
| NOx | 187.67 | 938.33 | 938.33 | 51.61 |
| SO2 | 0.63 | 3.13 | 3.13 | 0.17 |

(1) *Based on:* 5 *blasts/day, occurring in 1 hour*

**Sample Calculations**

**PM10**

| | (Activity) | (TSP EF) | (SF) | (Conversion) |
|---|---|---|---|---|
| 83.2 *ton/yr* | 550 ~~*blast*~~ / *yr* | 582.0 ~~*lb*~~ / ~~*blast*~~ | 0.52 | *ton* / 2,000 ~~*lb*~~ |

**SO2 Emission Factor**

| | | | | |
|---|---|---|---|---|
| 0.006 *lb/ton-ANFO* | 0.000015 ~~*lb S*~~ / ~~*lb FO*~~ | 2 *lb SO2* / ~~*lb S*~~ | 10% ~~*lb FO*~~ / ~~*lb*~~ *ANFO* | 2,000 ~~*lb*~~ / *ton* |

Conversion(s):

| | |
|---|---|
| 2,000 | *lb/ton* |
| 1.1023 | *ton/t* |
| 2.2046 | *lb/kg* |
| 3.2808 | *ft/m* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | BY: E. Memon | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: Mining Activity Emissions | DATE: October 14, 2021 | | |

Calculations for LOM: 19

**Material Handling (Loading and Unloading) (EU ID: 115-120)**

**Activity Information**

| | | | | | |
|---|---|---|---|---|---|
| OreM | In-Pit Ore Removed | 14,559,441 | *t/yr* | *Donlin* | APP_C4_23 |
| | | 16,049,018 | *ton/yr* | | |
| | | 122,400 | *ton/day (daily maximum ore processing rate)* | | |
| M2ST | Long-Term Ore Stockpiled | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |
| STS2 | Short-Term Ore Stockpiled | 6,551,748 | *t/yr* | *Donlin* | |
| | | 7,222,058 | *ton/yr* | | |
| S2PT | Long-Term Stockpile Ore Processed (to Crusher) | 4,978,317 | *t/yr* | *Donlin* | |
| | | 5,487,648 | *ton/yr* | | |
| Wast | In-Pit Waste (including OVB and PAG) Removed | 111,440,559 | *t/yr* | *Donlin* | |
| | | 122,842,043 | *ton/yr* | | |
| W&C | Waste (including OVB) Deposited to Waste Dump | 111,408,572 | *t/yr* | *Donlin* | |
| | | 122,806,782 | *ton/yr* | | |
| OVB- | OVB Stockpiled | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |
| PAG- | PAG Stockpiled | 31,987 | *t/yr* | *Donlin* | |
| | | 35,260 | *ton/yr* | | |
| OVB- | Stockpiled OVB to Waste Dump Reclamation | 636,000 | *t/yr* | *Donlin* | |
| | | 701,069 | *ton/yr* | | |
| PAG- | Stockpiled PAG to In-Pit Backfill | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |
| W-BI | In-Pit Waste to In-Pit Backfill | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |
| W-TI | Waste Deposited to Tails Dam | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |

Operation 365 *days/yr*
24 *hr/day*

**Emission Factor(s)**

| | | | | | |
|---|---|---|---|---|---|
| Emission Factor Equation | $E = 0.0032k(U/5)^{1.3}/(M/2)^{1.4}$ | | | *AP-42, Sec. 13.2.4, Eq. 1, 11/06* | |
| U = Mean wind speed | 7.947 | *mph* | | *American Ridge* | *07/05 - 06-10* |
| M = Material moisture content | 2.5 | *%* | | *Donlin* | |
| | PM2.5 | PM10 | PM | | |
| k = Particle size multiplier | 0.053 | 0.35 | 0.74 | *AP-42, Sec. 13.2.4, Pg. 4, 11/06* | |
| E = Emission factor | 0.000227 | 0.001497 | 0.003164 | *lb/ton* | |

**Ore Loading (In-Pit) (EU ID: 115)**

| **Emissions** | *(lb/hr)** | *(lb/day)** | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 1.2 | 27.7 | 1.8 |
| PM10 | 7.6 | 183.2 | 12.0 |
| PM | 16.1 | 387.3 | 25.4 |

*Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

* *Based on the daily maximum ore processing rate.*

**Ore Unloading (Long-Term Stockpile) (EU ID: 117)**

| **Emissions** | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.00 | 0.0 | 0.00 |
| PM10 | 0.00 | 0.0 | 0.00 |
| PM | 0.00 | 0.0 | 0.00 |

Conversion(s): 2,000 *lb/ton*
1.1023 *ton/t*
2.2369 *mph/mps*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 19

**Material Handling (Loading and Unloading) (EU ID: 115-120) - continued**

**Ore Unloading (Short-Term Stockpile)** [(1)] **(EU ID: 116)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.2 | 4.5 | 0.8 |
| PM10 | 1.2 | 29.6 | 5.4 |
| PM | 2.6 | 62.6 | 11.4 |

(1) *See Mill emissions for ore unloading at crusher*

**Ore Reloading (Long-Term Stockpile)** [(1)] **(EU ID: 118)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.1 | 3.4 | 0.6 |
| PM10 | 0.9 | 22.5 | 4.1 |
| PM | 2.0 | 47.6 | 8.7 |

(1) *See Mill emissions for ore unloading at crusher*

**Waste (including OVB and PAG) Loading (In-Pit) (EU ID: 119)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 3.2 | 76.3 | 13.9 |
| PM10 | 21.0 | 503.7 | 91.9 |
| PM | 44.4 | 1,065.0 | 194.4 |

*Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

**Waste (including OVB*) Unloading (Waste Dump) (EU ID: 120)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 3.2 | 76.7 | 14.0 |
| PM10 | 21.1 | 506.4 | 92.4 |
| PM | 44.6 | 1,070.7 | 195.4 |

*Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

** Includes stockpiled OVB for reclamation*

**OVB Unloading (OVB Stockpile)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.0 | 0.0 |
| PM | 0.0 | 0.0 | 0.0 |

**OVB Reloading (OVB Stockpile)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.0 | 0.4 | 0.1 |
| PM10 | 0.1 | 2.9 | 0.5 |
| PM | 0.3 | 6.1 | 1.1 |

**PAG Unloading (PAG Stockpile)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.1 | 0.0 |
| PM | 0.0 | 0.3 | 0.1 |

**PAG Reloading (PAG Stockpile)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.0 | 0.0 |
| PM | 0.0 | 0.0 | 0.0 |

**Backfill (PAG and In-Pit Waste) Unloading (In-Pit)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.0 | 0.0 |
| PM | 0.0 | 0.0 | 0.0 |

**Waste Unloading (Tails Dam)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.0 | 0.0 |
| PM | 0.0 | 0.0 | 0.0 |

*Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

**Sample Calculations**

**PM10 - Ore Loading**

| | (Activity) | (PM10 EF) | (Conversion) |
|---|---|---|---|
| 12.0 *ton/yr* | 16,049,018 ~~ton~~ / *yr* | 0.0015 ~~lb~~ / ~~ton~~ | *ton* / 2,000 ~~lb~~ |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 19

**Material Hauling (EU ID: 160)**

**Activity Information**

| | | | | | |
|---|---|---|---|---|---|
| | Ore Hauled (from Pit and Stockpile) | 19,537,758 | *t/yr* | *Donlin* | OPSUM_P1 |
| | | 21,536,666 | *ton/yr* | | |
| Ore-VKT | | 601,694 | *VKT/yr* | *Donlin* | |
| | | 373,876 | *VMT/yr* | | |
| | Waste Hauled* (from Pit and Stockpile) | 112,076,559 | *t/yr* | *Donlin* | |
| | ** Includes OVB and PAG* | 123,543,112 | *ton/yr* | | |
| Watste-VKT | | 6,993,016 | *VKT/yr* | *Donlin* | |
| | | 4,345,270 | *VMT/yr* | | |
| | Operation | 365 | *days/yr* | | |
| | | 24 | *hr/day* | | |
| | Control Type | Water/Chemical Application | | | |
| | Control Efficiency | 90% | | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06. See note below.* | |

**Truck Hauling Fraction Calculation**

| | | | | | | |
|---|---|---|---|---|---|---|
| 351- | Liebherr T282B | 7,237,451 | *t-km* | 95.3% | *Donlin* | APP_C4_23 |
| 131- | Caterpillar 785C | 357,259 | *t-km* | 4.7% | *Donlin* | |

**Haul Truck Information**

| **Make and Model** | Empty (*ton*) | Payload (*ton*) | Total (*ton*) | |
|---|---|---|---|---|
| Liebherr T282B | 261 | 400 | 661 | *Liebherr, BK-RP LME 1100398-web-08.10* |
| Caterpillar 785C | 116 | 159 | 275 | *Caterpillar, AEHQ5320-02 (4-02)* |

**Emission Factor(s)**

| | | | |
|---|---|---|---|
| Emission Factor Equation | $E = k(s/12)^a (W/3)^b [(365-P)/365]$ | | *AP-42, Sec. 13.2.2, Eqs. 1a and 2, 11/06* |
| s = Surface material silt content | 3.8 | % | (2) |
| W = Mean vehicle weight | 448.5 | *ton* | *Average of empty and full weights of fleet.* |
| P = Days/year with ≥0.01 in precip. | 129 | | *American Ridge, 2007-08, 2010-12* |

(2) *AP-42, Chapter 13.2-2, Related Information "r13s0202_dec03.xls" (http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html)*

| | PM2.5 | PM10 | PM | | |
|---|---|---|---|---|---|
| k = Size-specific empirical constant | 0.15 | 1.5 | 4.9 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| a = Size-specific empirical constant | 0.9 | 0.9 | 0.7 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| b = Size-specific empirical constant | 0.45 | 0.45 | 0.45 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| E = Size-specific emission factor | 0.33 | 3.28 | 13.48 | *lb/VMT* | |

**Ore Hauling**

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| PM2.5 | 1.4 | 33.6 | 6.1 |
| PM10 | 14.0 | 336.0 | 61.3 |
| PM | 57.6 | 1,381.2 | 252.1 |

*Note:*
*In section 13.2.2 of AP-42, Figures 13.2.2-2 and 13.2.2-5 provide estimated unpaved road control efficiencies for water application and chemical dust suppressants.*
*These figures provide a range of up to 95 percent control for water application only and a range of up to 91 percent control for chemical application only.*
*Donlin will apply a combination of water (or snow, as applicable) and chemical dust suppressant. In addition, see Section 2.18 of Appendix C and Section 3.7.1 of Appendix D*

| | | |
|---|---|---|
| Conversion(s): | 2,000 | *lb/ton* |
| | 1.1023 | *ton/t* |
| | 1.609 | *km/mi* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 19

**Material Hauling (EU ID: 160) - continued**

**Waste Hauling**

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| PM2.5 | 16.3 | 390.5 | 71.3 |
| PM10 | 162.7 | 3,904.5 | 712.6 |
| PM | 668.9 | 16,052.9 | 2,929.6 |

**Sample Calculations**

**PM10 - Waste Hauling**

| | (Activity) | (PM10 EF) | (Conversion) | (Control) |
|---|---|---|---|---|
| 712.6 *ton/yr* | 4,345,270 ~~*VMT*~~ / *yr* | 3.3 ~~*lb*~~ / ~~*VMT*~~ | *ton* / 2,000 ~~*lb*~~ | (1 - 0.9) |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 19

**Maintenance Equipment (EU ID: 121-123)**

**Activity Information**

| | | | | |
|---|---|---|---|---|
| DOZ Dozer Use | 75,495 | *hr/yr* | *Donlin* | APP_C4_23 |
| GRA Grader Use | 45,653 | *hr/yr* | *Donlin* | |
| Eqp Water Truck Use | 11,795 | *hr/yr* | *Donlin* | |
| HT_ Water Truck Speed | 18.58 | *kph* | *Average haul truck speed* | HaulDist AirModel |
| | 136,168 | VMT | | |
| Operation | 365 | *days/yr* | | |
| | 24 | *hr/day* | | |

**Control and Efficiency**

| | | | |
|---|---|---|---|
| Dozer Use | None | 0% | |
| Grader Use | None | 0% | |
| Water Truck Use | Water/Chemical Application | 90% | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06. See note below.* |

**Dozer Use**

**Emission Factor(s)**

Emission Factor Equation

TSP (*lb/hr*) = $5.7\ (s)^{1.2} / (M)^{1.3}$ — *AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)*

PM15 (*lb/hr*) = $1\ (s)^{1.5} / (M)^{1.4}$ — *AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)*

| | | | |
|---|---|---|---|
| M = Material moisture content | 2.5 | % | *Donlin* |
| s = Surface material silt content | 3.8 | % | (2) |

(2) *AP-42, Chapter 13.2-2, Related Information "r13s0202_dec03.xls" (http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html)*

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.105 | *AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)* |
| PM10 | 0.75 | *AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)* |

**Estimated Emission Factors**

| | | |
|---|---|---|
| PM2.5 | 0.9 | *lb/hr* |
| PM10 | 1.54 | *lb/hr* |
| PM | 8.60 | *lb/hr* |

**Dozer Use** **(EU ID: 122)**

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| PM2.5 | 7.78 | 186.7 | 34.1 |
| PM10 | 13.28 | 318.6 | 58.1 |
| PM | 74.08 | 1,777.9 | 324.5 |

**Sample Calculations**

| **PM10 - Dozer Use** | (Activity) | (PM10 EF) | (Conversion) | (Control) |
|---|---|---|---|---|
| 58.1 *ton/yr* | 75,495 ~~*hr*~~ / *yr* | 1.5 ~~*lb*~~ / ~~*hr*~~ | *ton* / 2,000 ~~*lb*~~ | (1 - 0) |

**Grader Use**

**Emission Factor(s)**

Emission Factor Equation

TSP (*lb/VMT*) = $0.04\ (S)^{2.5}$ — *AP-42, Tab. 11.9-1, 07/98, (grading)*

PM15 (*lb/VMT*) = $0.051\ (S)^{2}$ — *AP-42, Tab. 11.9-1, 07/98, (grading)*

S = Mean vehicle speed — 3 *mph* — *Donlin*

*Note:*

*In section 13.2.2 of AP-42, Figures 13.2.2-2 and 13.2.2-5 provide estimated unpaved road control efficiencies for water application and chemical dust suppressants.*
*These figures provide a range of up to 95 percent control for water application only and a range of up to 91 percent control for chemical application only.*
*Donlin will apply a combination of water (or snow, as applicable) and chemical dust suppressant. In addition, see Section 2.18 of Appendix C and Section 3.7.1 of Appendix D*

Conversion(s): 2,000 *lb/ton*

1.609 *km/mi*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 19

**Maintenance Equipment (EU ID: 121-123) - continued**

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.031 | *AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)* |
| PM10 | 0.6 | *AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)* |

**Estimated Emission Factors**

| | | |
|---|---|---|
| PM2.5 | 0.02 | *lb/VMT* |
| PM10 | 0.28 | *lb/VMT* |
| PM | 0.62 | *lb/VMT* |

**Grader Use** **(EU ID: 123)**

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| PM2.5 | 0.30 | 7.3 | 1.3 |
| PM10 | 4.31 | 103.3 | 18.9 |
| PM | 9.75 | 234.0 | 42.7 |

**Sample Calculations**

**PM10 - Grader Use**

| | (Activity) | (PM10 EF) | (Speed) | (Conversion) | (Control) |
|---|---|---|---|---|---|
| 18.9 *ton/yr* | 45,653 *~~hr~~* / *yr* | 0.3 *~~lb~~* / *~~VMT~~* | 3 *~~VMT~~* / *~~hr~~* | *ton* / 2,000 *~~lb~~* | (1 - 0) |

**Water Truck Use**

**Truck Specifications**

| **Make and Model** | Empty (*ton*) | Payload (*ton*) | Total (*ton*) | |
|---|---|---|---|---|
| Caterpillar 785C | 116 | 134 | 249 | *Caterpillar, AEHQ5320-02 (4-02)* |
| | | 32,000 *gal* | | |

**Emission Factor(s)**

Emission Factor Equation $E = k(s/12)^a (W/3)^b [(365-P)/365]$ *AP-42, Sec. 13.2.2, Eqs. 1a and 2, 11/06*

s = Surface material silt content 3.8 % [(1)]

[(1)] *AP-42, Chapter 13.2-2, Related Information "r13s0202_dec03.xls" (http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html)*

W = Mean vehicle weight 183 *ton* *Average of empty and full weights*

P = Days/year with ≥0.01 in precip. 129 *American Ridge, 2007-08, 2010-12*

| | PM2.5 | PM10 | PM | | |
|---|---|---|---|---|---|
| k = Size-specific empirical constant | 0.15 | 1.5 | 4.9 | *lb/VMT* | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| a = Size-specific empirical constant | 0.9 | 0.9 | 0.7 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| b = Size-specific empirical constant | 0.45 | 0.45 | 0.45 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| E = Size-specific emission factor | 0.22 | 2.19 | 9.00 | *lb/VMT* | |

**Water Truck Use** **(EU ID: 121)**

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| PM2.5 | 0.3 | 8.2 | 1.5 |
| PM10 | 3.4 | 81.7 | 14.9 |
| PM | 14.0 | 335.8 | 61.3 |

**Sample Calculations**

**PM10 - Water Truck Use**

| | (Activity) | (PM10 EF) | (Conversion) | (Control) |
|---|---|---|---|---|
| 14.9 *ton/yr* | 136,168 *~~VMT~~* / *yr* | 2.2 *~~lb~~* / *~~VMT~~* | *ton* / 2,000 *~~lb~~* | (1 - 0.9) |

Conversion(s): 2,000 *lb/ton*

8.345 *lb/gal water*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | | BY: E. Memon |
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| AIR EMISSION CALCULATIONS | SUBJECT: Mining Activity Emissions | DATE: October 14, 2021 | | |

Calculations for LOM: 19

**Wind Erosion of Exposed Surfaces (EU ID: 161)**

**Exposed Flat Surfaces**

| | | | | | | |
|---|---|---|---|---|---|---|
| TA Tailings Beach (Dry) | 862.5 | *acre* | *Donlin* | | | |
| Haul Roads | | | Haul Road Width | 29 | m | *Donlin* |
| Inside Pit | 130.5 | *acre* | 18,206 *meters* | | | |
| Outside Pit | 84.2 | *acre* | 11,749 *meters* | | | |
| Access Roads | | | Access Road Width | 9 | m | *Donlin* |
| Camp to Mine Site (EU ID: 158) | 15.0 | *acre* | | | | |
| Airport to Camp (EU ID: 159) | 22.4 | *acre* | | | | |
| Jungjuk Port to Mine Site | 105.5 | *acre* | | | | |
| Operation | 365 | *days/yr* | | | | |
| | 24 | *hr/day* | | | | |

**Control and Efficiency**

| | | | |
|---|---|---|---|
| Tailings Beach (Dry) | None | 0% | |
| Haul Roads | Water/Chemical Application | 90% | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06. See note below.* |
| Access Roads | Water/Chemical Application | 90% | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06. See note below.* |

**Emission Factor(s)**

TSP - Wind Erosion - Road Surfaces 0.0834 *ton/acre-yr* *AP-42, Sec. 13.2.5, 11/06 (industrial wind erosion)* [1]

[1] *Hourly emission calculations provided in Wind_Calcs*

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.075 | *AP-42, Sec. 13.2.5, Pg. 3, 11/06* |
| PM10 | 0.5 | *AP-42, Sec. 13.2.5, Pg. 3, 11/06* |

| Emissions | PM2.5 | | | PM10 | | | PM | | |
|---|---|---|---|---|---|---|---|---|---|
| | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| TA Tailings Beach (Dry) [1][2] | 0.07 | 1.64 | 0.30 | 0.45 | 10.92 | 1.99 | 0.91 | 21.83 | 3.98 |
| Haul Road - Inside Pit | 0.02 | 0.45 | 0.08 | 0.12 | 2.98 | 0.54 | 0.25 | 5.96 | 1.09 |
| Haul Road - Outside Pit | 0.01 | 0.29 | 0.05 | 0.08 | 1.92 | 0.35 | 0.16 | 3.85 | 0.70 |
| Access Road - Camp to Mine Site (EU ID: 158) | 0.00 | 0.05 | 0.01 | 0.01 | 0.34 | 0.06 | 0.03 | 0.69 | 0.13 |
| Access Road - Airport to Camp (EU ID: 159) | 0.00 | 0.08 | 0.01 | 0.02 | 0.51 | 0.09 | 0.04 | 1.03 | 0.19 |
| Access Road - Jungjuk Port to Mine Site | 0.02 | 0.36 | 0.07 | 0.10 | 2.41 | 0.44 | 0.20 | 4.82 | 0.88 |

[1] *AP-42, Sec. 13.2.5, 11/06 (industrial wind erosion), hourly emission calculations provided in Wind_Calcs*

[2] *Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

*Note:*

*In section 13.2.2 of AP-42, Figures 13.2.2-2 and 13.2.2-5 provide estimated unpaved road control efficiencies for water application and chemical dust suppressants.*
*These figures provide a range of up to 95 percent control for water application only and a range of up to 91 percent control for chemical application only.*
*Donlin will apply a combination of water (or snow, as applicable) and chemical dust suppressant. In addition, see Section 2.18 of Appendix C and Section 3.7.1 of Appendix D*

Conversion(s): 2,000 *lb/ton*
4,047 *$m^2$/acre*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
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Calculations for LOM: 19

**Wind Erosion of Exposed Surfaces (EU ID: 161) - continued**

**Exposed Stockpile/Waste Rock Facility**

| | **Emissions** [1] | **PM2.5** | | | **PM10** | | | **PM** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| *WA* | Waste Rock Facility [2] | 0.36 | 8.61 | 1.57 | 2.39 | 57.39 | 10.47 | 4.78 | 114.79 | 20.95 |
| *STI* | Short-term Stockpile | 0.01 | 0.13 | 0.02 | 0.04 | 0.90 | 0.16 | 0.07 | 1.79 | 0.33 |
| *LTI* | Long-term Stockpile West | 0.01 | 0.16 | 0.03 | 0.04 | 1.04 | 0.19 | 0.09 | 2.08 | 0.38 |
| *LTI* | Long-term Stockpile East (& PAG) | 0.01 | 0.27 | 0.05 | 0.07 | 1.78 | 0.33 | 0.15 | 3.57 | 0.65 |
| *OV* | Overburden Stockpile South | 0.003 | 0.08 | 0.02 | 0.02 | 0.56 | 0.10 | 0.05 | 1.12 | 0.20 |

(1) *AP-42, Sec. 13.2.5, 11/06 (industrial wind erosion), hourly emission calculations provided in Wind_Calcs*

(2) *Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

*Sample emission calculations provided on page: 98*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: Mobile Machinery Tailpipes | DATE: October 14, 2021 | | |

Calculations for LOM: 19

**Mobile Machinery Tailpipes Emissions Summary** *(ton/yr)*

| Machinery Type | Output (*hp-hr/yr*) | CO | NOx | PM | SO2 | VOC |
|---|---|---|---|---|---|---|
| Hydraulic Shovel | 9,954,953 | 28.64 | 28.64 | 0.33 | 0.05 | 1.55 |
| Front-End Loader | 11,594,785 | 33.36 | 33.36 | 0.38 | 0.06 | 1.81 |
| Haul Truck | 594,518,171 | 1,710.42 | 1,710.42 | 19.55 | 3.23 | 92.85 |
| Drill | 30,233,452 | 86.98 | 79.16 | 0.94 | 0.16 | 4.72 |
| Track Dozer | 27,401,903 | 78.83 | 55.94 | 0.75 | 0.15 | 4.28 |
| Wheel Dozer | 11,963,331 | 34.42 | 34.42 | 0.39 | 0.07 | 1.87 |
| Grader | 10,220,103 | 29.40 | 3.36 | 0.17 | 0.06 | 1.60 |
| Water Truck | 5,794,339 | 16.67 | 16.67 | 0.19 | 0.03 | 0.90 |
| Hydraulic Excavator | 4,519,036 | 13.00 | 9.96 | 0.13 | 0.02 | 0.71 |
| Fuel Truck | 2,089,431 | 6.01 | 6.01 | 0.07 | 0.01 | 0.33 |
| Service Truck | 171,440 | 0.49 | 0.06 | 0.003 | 0.001 | 0.03 |
| Mobile Crane | 214,301 | 0.62 | 0.07 | 0.004 | 0.001 | 0.03 |
| Low Boy Truck | 1,000,069 | 2.88 | 0.33 | 0.02 | 0.01 | 0.16 |
| Tire Handler | 1,428,671 | 4.11 | 0.47 | 0.02 | 0.01 | 0.22 |
| Light Plant | 3,428,810 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | | **2,045.83** | **1,978.87** | **22.95** | **3.87** | **111.06** |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 19

**Mobile Machinery**
**Machinery Specifications**

APP_C4_23
_FuelCons
_Units

| | Make and Model [1] | Type | Engine | Rating (*hp*) [1] | Units [1] |
|---|---|---|---|---|---|
| Eqp | Komatsu PC8000 | Hydraulic Shovel | 2 X Komatsu SDA16V160 | 4,020 | 1 |
| Eqp | LeTourneau L2350 | Front-End Loader | MTU/DD 16V4000 | 2,300 | 2 |
| Eqp | Caterpillar 994F | Front-End Loader | Cat 3516B | 1,577 | 1 |
| Eqp | Liebherr T282C | Haul Truck | MTU/DD 20V4000 | 3,755 | 69 |
| Eqp | Caterpillar 785C | Haul Truck | Cat 3512B | 1,450 | 8 |
| Eqp | Atlas Copco PV 275 | Drill | Cat C32 ACERT | 950 | 5 |
| Eqp | Atlas Copco DML | Drill | Cat C27 ACERT | 800 | 14 |
| Eqp | Atlas Copco L8 | Drill | | 540 | 5 |
| Eqp | Caterpillar D11T | Track Dozer | Cat C27 ACERT | 850 | 6 |
| Eqp | Caterpillar D10T | Track Dozer | Cat C32 ACERT | 646 | 4 |
| Eqp | Caterpillar 854G | Wheel Dozer | Cat C32 ACERT | 904 | 6 |
| Eqp | Caterpillar 24H | Grader | Cat C13 ACERT | 533 | 3 |
| Eqp | Caterpillar 16H | Grader | Cat C18 ACERT | 297 | 7 |
| Eqp | Caterpillar 785C | Water Truck | Cat 3512B | 1,450 | 4 |
| Eqp | Caterpillar 390DL | Hydraulic Excavator | Cat C18 ATAAC | 523 | 1 |
| Eqp | Komatsu PC2000 | Hydraulic Excavator | | 976 | 2 |
| Eqp | Caterpillar 777F | Fuel Truck | Cat C32 ACERT | 1,016 | 2 |
| Eqp | QTE Body on Peterbilt Chassis | Service Truck | | 300 | 1 |
| Eqp | Grove GMK6350 (200T) | Mobile Crane | Benz OM906LA | 563 | 1 |
| Eqp | QTE Body on Peterbilt Chassis | Low Boy Truck | | 300 | 1 |
| Eqp | Caterpillar 988 | Tire Handler | | 501 | 2 |
| Eqp | Terex LT7000 | Light Plant | | 25 | 20 |

(1) *Donlin*

Operation 365 *day/yr*
24 *hr/day*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 3 | OF: 4 | SHEET: Machines |
| AIR EMISSION CALCULATIONS | SUBJECT: Mobile Machinery Tailpipes | DATE: October 14, 2021 | | |

Calculations for LOM: 19

**Machinery Operation, Fuel, and Output** / **Applicable Tier 4 Emission Standards (*g/kW-hr*)**

| | Make and Model | EF Lookup ID | Operation (*hr*) [1] | Fuel (*L/hr*) [1] | Output (*hp-hr*) [2] | Output (*kW-hr*) | PM | NOx | NMHC | CO | SO2 [3] | Fuel (*gal/yr*) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Eqr | Komatsu PC8000 | 5 | 3,685 | 550 | 9,954,953 | 7,423,419 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 535,348 |
| Eqr | LeTourneau L2350 | 5 | 9,581 | 213 | 10,024,506 | 7,475,284 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 539,089 |
| Eqr | Caterpillar 994F | 5 | 1,937 | 165 | 1,570,280 | 1,170,959 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 84,445 |
| Eqr | Liebherr T282C | 5 | 390,690 | 303 | 582,269,268 | 434,198,795 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 31,312,736 |
| Eqr | Caterpillar 785C | 5 | 18,100 | 138 | 12,248,903 | 9,134,020 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 658,710 |
| Eqr | Atlas Copco PV 275 | 5 | 20,327 | 75 | 7,488,916 | 5,584,492 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 402,732 |
| Eqr | Atlas Copco DML | 5 | 53,405 | 75 | 19,675,857 | 14,672,307 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 1,058,110 |
| Eqr | Atlas Copco L8 | 4 | 18,373 | 34 | 3,068,680 | 2,288,318 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 165,025 |
| Eqr | Caterpillar D11T | 5 | 28,841 | 130 | 18,417,946 | 13,734,281 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 990,463 |
| Eqr | Caterpillar D10T | 4 | 18,662 | 98 | 8,983,957 | 6,699,346 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 483,131 |
| Eqr | Caterpillar 854G | 5 | 27,993 | 87 | 11,963,331 | 8,921,068 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 643,353 |
| Eqr | Caterpillar 24H | 4 | 10,034 | 76 | 3,745,974 | 2,793,377 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 201,448 |
| Eqr | Caterpillar 16H | 4 | 35,620 | 37 | 6,474,128 | 4,827,764 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 348,160 |
| Eqr | Caterpillar 785C | 5 | 11,795 | 100 | 5,794,339 | 4,320,844 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 311,603 |
| Eqr | Caterpillar 390DL | 4 | 3,235 | 75 | 1,192,020 | 888,890 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 64,103 |
| Eqr | Komatsu PC2000 | 5 | 5,644 | 120 | 3,327,017 | 2,480,960 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 178,917 |
| Eqr | Caterpillar 777F | 5 | 6,544 | 65 | 2,089,431 | 1,558,091 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 112,363 |
| Eqr | QTE Body on Peterbilt Chassis | 4 | 2,181 | 16 | 171,440 | 127,843 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 9,220 |
| Eqr | Grove GMK6350 (200T) | 4 | 2,181 | 20 | 214,301 | 159,804 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 11,524 |
| Eqr | QTE Body on Peterbilt Chassis | 4 | 1,454 | 140 | 1,000,069 | 745,753 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 53,781 |
| Eqr | Caterpillar 988 | 4 | 3,635 | 80 | 1,428,671 | 1,065,361 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 76,830 |
| Eqr | Terex LT7000 | 1 | 58,166 | 12 | 3,428,810 | 2,556,867 | 0.4 | 7.5 | 7.5 | 6.6 | 0.00661 | 184,391 |

(1) *Donlin*

(2) *Based on: Fuel heating value of:* 130,167 *Btu/gal* *Donlin*

*Diesel engine efficiency of:* 7,000 *Btu/hp-hr* *AP-42 Default*

(3) *Not a 40 CFR 1039 standard. Calculated from fuel use and sulfur content, provided on next page.*

**Tier 4 Emission Standards (*g/kW-hr*)** *40 CFR 1039, Table 1 of § 1039.101, current as of 03/07/13*

| Engine Rating | | | Lookup ID | PM | NOx | NMHC | CO |
|---|---|---|---|---|---|---|---|
| 1 | ≤ hp < | 25.5 | 1 | 0.40 | 7.50 | 7.50 | 6.60 |
| 25.5 | ≤ hp < | 75.1 | 2 | 0.03 | 4.70 | 4.70 | 5.00 |
| 75.1 | ≤ hp < | 174.3 | 3 | 0.02 | 0.40 | 0.19 | 5.00 |
| 174.3 | ≤ hp < | 751 | 4 | 0.02 | 0.40 | 0.19 | 3.50 |
| 751 | < hp | | 5 | 0.04 | 3.50 | 0.19 | 3.50 |

Total Machinery Fuel Consumption 145,456,199 *L/yr*

38,425,481 *gal/yr*

**Sample Calculations**

**SO2 Emission Factor**

| 15 *lb-S* | 6.74 *lb-Fuel* | *gal Fuel* | 7,000 *Btu* | 1.34102 *hp* | 453.592 *g* | " |
|---|---|---|---|---|---|---|
| 1.00E+06 *lb-Fuel* | *gal Fuel* | 130,167 *Btu* | *hp-hr* | *kW* | *lb* | |

* 2 *g SO2* / *g-S* = 0.00661 *g SO2* / *kW-hr*

Conversion(s):

3.78541 *L/gal*

1.34102 *hp/kW*

453.592 *g/lb*

2,000 *lb/ton*

907,184 *g/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 4 | OF: 4 | SHEET: Machines |
| AIR EMISSION CALCULATIONS | SUBJECT: Mobile Machinery Tailpipes | DATE: October 14, 2021 | | |

Calculations for LOM: 19

**Machine-Specific Emissions** *(ton/yr)*

| Make and Model | PM | NOx | NMHC | CO | SO2 [1] | |
|---|---|---|---|---|---|---|
| Komatsu PC8000 | 0.33 | 28.64 | 1.55 | 28.64 | 0.05 | |
| LeTourneau L2350 | 0.33 | 28.84 | 1.57 | 28.84 | 0.05 | |
| Caterpillar 994F | 0.05 | 4.52 | 0.25 | 4.52 | 0.01 | |
| Liebherr T282C | 19.14 | 1,675.18 | 90.94 | 1,675.18 | 3.17 | |
| Caterpillar 785C | 0.40 | 35.24 | 1.91 | 35.24 | 0.07 | |
| Atlas Copco PV 275 | 0.25 | 21.55 | 1.17 | 21.55 | 0.04 | |
| Atlas Copco DML | 0.65 | 56.61 | 3.07 | 56.61 | 0.11 | |
| Atlas Copco L8 | 0.05 | 1.01 | 0.48 | 8.83 | 0.02 | |
| Caterpillar D11T | 0.61 | 52.99 | 2.88 | 52.99 | 0.10 | |
| Caterpillar D10T | 0.15 | 2.95 | 1.40 | 25.85 | 0.05 | |
| Caterpillar 854G | 0.39 | 34.42 | 1.87 | 34.42 | 0.07 | |
| Caterpillar 24H | 0.06 | 1.23 | 0.59 | 10.78 | 0.02 | |
| Caterpillar 16H | 0.11 | 2.13 | 1.01 | 18.63 | 0.04 | |
| Caterpillar 785C | 0.19 | 16.67 | 0.90 | 16.67 | 0.03 | |
| Caterpillar 390DL | 0.02 | 0.39 | 0.19 | 3.43 | 0.01 | |
| Komatsu PC2000 | 0.11 | 9.57 | 0.52 | 9.57 | 0.02 | |
| Caterpillar 777F | 0.07 | 6.01 | 0.33 | 6.01 | 0.01 | |
| QTE Body on Peterbilt Chassis | 0.003 | 0.06 | 0.03 | 0.49 | 0.001 | |
| Grove GMK6350 (200T) | 0.004 | 0.07 | 0.03 | 0.62 | 0.001 | |
| QTE Body on Peterbilt Chassis | 0.02 | 0.33 | 0.16 | 2.88 | 0.01 | |
| Caterpillar 988 | 0.02 | 0.47 | 0.22 | 4.11 | 0.01 | |
| Terex LT7000 | | | | | | *Set to zero per ADEC 3/16/2015* |
| **Total Emissions** | **22.95** | **1,978.87** | **111.06** | **2,045.83** | **3.87** | |

(1) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 1 | OF: 7 | SHEET: Summary |
| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

Calculations for LOM: 20

**Facility-Wide Emissions Summary** *(ton/yr)*

| Activity | CO | NOx | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|
| Mining Activities | 1,921.0 | 51.6 | 161.9 | 1,307.1 | 4,600.5 | 0.2 | |
| Power Generation | 367.0 | 1,032.8 | 564.2 | 564.2 | 564.2 | 11.5 | 1,123.7 |
| Emergency Equipment | 18.7 | 33.3 | 1.1 | 1.1 | 1.1 | 0.03 | 33.3 |
| Mobile Machinery | 1,965.9 | 1,897.7 | 22.0 | 22.0 | 22.0 | 3.7 | 106.7 |
| Processing Operations | 774.9 | 0.1 | 64.5 | 80.6 | 101.8 | 9.8 | 2.3 |
| Boilers | 94.9 | 158.1 | 8.9 | 9.5 | 20.9 | 1.4 | 6.5 |
| Incinerators | 0.4 | 0.8 | 0.3 | 0.3 | 0.3 | 0.53 | -- |
| Access Roads | 4.5 | 2.3 | 4.3 | 43.2 | 174.2 | 0.01 | 0.2 |
| Tanks | | | | | | | 1.8 |
| Process and Ancillary Source Subtotal | 1,256 | 1,225 | 639 | 656 | 688 | 23 | 1,168 |
| Mining Activity (including access roads) Subtotal | 1,925 | 54 | 166 | 1,350 | 4,775 | 0 | 0 |
| Mobile Machinery Subtotal | 1,966 | 1,898 | 22 | 22 | 22 | 4 | 107 |
| **Facility Total** | **5,147** | **3,177** | **827** | **2,028** | **5,485** | **27** | **1,275** |

Assessable PTE 11,115 ton/yr

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 20

**Detailed Emissions Summary** *(ton/yr)*

| Activity | Rate | | CO | NOx | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|---|---|
| **Mining Activities - Subtotal** | | | **1,921** | **52** | **162** | **1,307** | **4,601** | **0.17** | **0.00** |
| Drilling (EU ID: 113) | 158,920 | *holes/yr* | | | 3.10 | 53.71 | 103.30 | | |
| Blasting (EU ID: 114) | 521 | *blasts/yr* | 1,921 | 51.61 | 4.55 | 78.83 | 151.60 | 0.17 | |
| **Material Handling (Loading and Unloading) (EU ID: 115-120)** | | | | | | | | | |
| Ore Loading (In-Pit) | 17,058,389 | *ton/yr* | | | 1.93 | 12.77 | 26.99 | | |
| Ore Unloading (Short-Term Stockpile) | 7,672,868 | *ton/yr* | | | 0.87 | 5.74 | 12.14 | | |
| Ore Unloading (Long-Term Stockpile) | 7,572 | *ton/yr* | | | 0.00 | 0.01 | 0.01 | | |
| Ore Reloading (Long-Term Stockpile) | 4,585,798 | *ton/yr* | | | 0.52 | 3.43 | 7.26 | | |
| Waste (incl. OVB/PAG) Loading (In-Pit) | 148,288,108 | *ton/yr* | | | 16.80 | 111.0 | 234.6 | | |
| Waste (incl. OVB/PAG) Un- & Re-loading | 153,389,715 | *ton/yr* | | | 17.38 | 114.8 | 242.7 | | |
| **Material Hauling (EU ID: 160)** | | | | | | | | | |
| Ore Hauling | 406,810 | *VMT/yr* | | | 6.70 | 67.01 | 275.5 | | |
| Waste Hauling | 4,618,097 | *VMT/yr* | | | 76.07 | 760.7 | 3,127 | | |
| **Maintenance Equipment (EU ID: 121-123)** | | | | | | | | | |
| Dozer Use | 64,028 | *hr/yr* | | | 28.90 | 49.31 | 275.2 | | |
| Grader Use | 45,653 | *hr/yr* | | | 1.32 | 18.86 | 42.70 | | |
| Water Truck Use | 13,953 | *hr/yr* | | | 1.86 | 18.57 | 76.33 | | |
| **Wind Erosion of Exposed Surfaces (EU ID: 161)** | | | | | | | | | |
| Tailings Beach (Dry) | 878 | *acre* | | | 0.30 | 2.01 | 4.01 | | |
| Haul Roads | 215 | *acre* | | | 0.13 | 0.90 | 1.79 | | |
| Access Roads | 143 | *acre* | | | 0.09 | 0.60 | 1.19 | | |
| Waste Rock Facility | variable | *acre* | | | 1.22 | 8.17 | 16.33 | | |
| Short-term Stockpile | variable | *acre* | | | 0.03 | 0.17 | 0.34 | | |
| Long-term Stockpile West | variable | *acre* | | | 0.0285 | 0.1901 | 0.380 | | |
| Long-term Stockpile East (& PAG) | variable | *acre* | | | 0.0490 | 0.3264 | 0.653 | | |
| Overburden Stockpile South | variable | *acre* | | | 0.0153 | 0.1021 | 0.204 | | |
| **Power Generation - Subtotal** | | | **367.0** | **1,033** | **564.2** | **564.2** | **564.2** | **11.54** | **1,124** |
| Power Plant Generators (12) | 204,912 | *kWe* | 350.1 | 1,031 | 564.1 | 564.1 | 564.1 | 11.51 | 1,123 |
| Airport Generators (2) | 400 | *kWe* | 16.90 | 1.93 | 0.097 | 0.097 | 0.097 | 0.026 | 0.92 |
| **Mobile Machinery - Subtotal** | | | **1,966** | **1,898** | **22.03** | **22.03** | **22.03** | **3.71** | **106.7** |
| Hydraulic Shovel | 11,046,049 | *hp-hr/yr* | 31.78 | 31.78 | 0.36 | 0.36 | 0.36 | 0.06 | 1.73 |
| Front-End Loader | 12,683,216 | *hp-hr/yr* | 36.49 | 36.49 | 0.42 | 0.42 | 0.42 | 0.07 | 1.98 |
| Haul Truck | 562,694,041 | *hp-hr/yr* | 1,619 | 1,619 | 18.50 | 18.50 | 18.50 | 3.06 | 87.88 |
| Drill | 37,261,674 | *hp-hr/yr* | 107.20 | 98.16 | 1.17 | 1.17 | 1.17 | 0.20 | 5.82 |
| Track Dozer | 20,079,105 | *hp-hr/yr* | 57.77 | 34.87 | 0.51 | 0.51 | 0.51 | 0.11 | 3.14 |
| Wheel Dozer | 11,963,331 | *hp-hr/yr* | 34.42 | 34.42 | 0.39 | 0.39 | 0.39 | 0.07 | 1.87 |
| Grader | 10,220,103 | *hp-hr/yr* | 29.40 | 3.36 | 0.17 | 0.17 | 0.17 | 0.06 | 1.60 |
| Water Truck | 6,854,052 | *hp-hr/yr* | 19.72 | 19.72 | 0.23 | 0.23 | 0.23 | 0.04 | 1.07 |
| Hydraulic Excavator | 5,703,012 | *hp-hr/yr* | 16.41 | 13.18 | 0.17 | 0.17 | 0.17 | 0.03 | 0.89 |
| Fuel Truck | 2,089,431 | *hp-hr/yr* | 6.01 | 6.01 | 0.07 | 0.07 | 0.07 | 0.01 | 0.33 |
| Service Truck | 171,440 | *hp-hr/yr* | 0.49 | 0.056 | 0.0028 | 0.0028 | 0.0028 | 0.0009 | 0.027 |
| Mobile Crane | 116,187 | *hp-hr/yr* | 0.33 | 0.038 | 0.0019 | 0.0019 | 0.0019 | 0.0006 | 0.018 |
| Low Boy Truck | 1,000,069 | *hp-hr/yr* | 2.88 | 0.33 | 0.016 | 0.016 | 0.016 | 0.0054 | 0.16 |
| Tire Handler | 1,428,671 | *hp-hr/yr* | 4.11 | 0.47 | 0.023 | 0.023 | 0.023 | 0.0078 | 0.22 |
| Light Plant | 857,202 | *hp-hr/yr* | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 3 | OF: 7 | SHEET: Summary |
| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

Calculations for LOM: 20

**Detailed Emissions Summary (*ton/yr*) - continued**

| Activity | Rate | CO | NOx | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|---|
| **Emergency Equipment - Subtotal** | | **18.74** | **33.29** | **1.07** | **1.07** | **1.07** | **0.03** | **33.29** |
| Black Start Generators (2) | 1,200 *kWe* | 2.89 | 5.29 | 0.17 | 0.17 | 0.17 | 0.0044 | 5.29 |
| Emergency Generators (4) | 6,000 *kWe* | 14.47 | 26.46 | 0.83 | 0.83 | 0.83 | 0.022 | 26.46 |
| Fire Pumps (3) | 756 *hp* | 1.38 | 1.54 | 0.079 | 0.079 | 0.079 | 0.00205 | 1.54 |
| **Processing Operations - Subtotal** | | **774.88** | **0.08** | **64.50** | **80.63** | **101.81** | **9.79** | **2.30** |
| ROM Ore Discharge and Crushing | 5,100 *ton/hr* | | | 10.92 | 19.456 | 30.67 | | |
| Coarse Ore Transfer | 5,100 *ton/hr* | | | 9.26 | 14.081 | 20.41 | | |
| Pebble Crushers and Recycle | 660 *ton/hr* | | | 11.76 | 14.529 | 18.16 | | |
| Reagents Handling and Mixing | | | | 12.61 | 12.613 | 12.61 | | |
| Refinery Sources | | 774.9 | 0.1 | 10.71 | 10.71 | 10.71 | 9.79 | 2.30 |
| Laboratories | | | | 8.11 | 8.11 | 8.11 | | |
| Water Treatment Plant | | | | 1.13 | 1.13 | 1.13 | | |
| **Boilers - Subtotal** | | **94.94** | **158.14** | **8.87** | **9.49** | **20.90** | **1.36** | **6.52** |
| POX Boilers (2) | 58.58 *MMBtu/hr* | 21.13 | 39.42 | 1.91 | 1.97 | 6.50 | 0.40 | 1.38 |
| Oxygen Plant Boiler | 20.66 *MMBtu/hr* | 7.45 | 13.91 | 0.67 | 0.70 | 2.29 | 0.14 | 0.49 |
| Carbon Elution Heater | 16 *MMBtu/hr* | 5.77 | 10.77 | 0.52 | 0.54 | 1.78 | 0.11 | 0.38 |
| Power Plant Auxiliary Heaters (2) | 33 *MMBtu/hr* | 11.90 | 22.21 | 1.08 | 1.11 | 3.66 | 0.22 | 0.78 |
| SO2 Burner | 2 *MMBtu/hr* | 0.72 | 0.86 | 0.07 | 0.07 | 0.07 | 0.01 | 0.05 |
| Auxiliary SO2 Burner | 2 *MMBtu/hr* | 0.34 | 1.35 | 0.02 | 0.07 | 0.22 | 0.01 | 0.02 |
| Building Heaters (138) | 24.15 *MMBtu/hr* | 4.15 | 9.75 | 0.79 | 0.79 | 0.79 | 0.06 | 0.57 |
| Air Handlers (19) | 95 *MMBtu/hr* | 34.27 | 40.79 | 3.10 | 3.10 | 3.10 | 0.24 | 2.24 |
| Air Handlers (7) | 17.5 *MMBtu/hr* | 6.31 | 7.51 | 0.57 | 0.57 | 0.57 | 0.05 | 0.41 |
| Portable Heaters (20) | 17.2 *MMBtu/hr* | 2.89 | 11.58 | 0.14 | 0.58 | 1.91 | 0.12 | 0.20 |
| **Incinerators - Subtotal** | | **0.361** | **0.84** | **0.33** | **0.33** | **0.33** | **0.531** | |
| Camp Waste Incinerator (EU ID: 27) | 0.50 *ton/hr* | 0.351 | 0.78 | 0.32 | 0.32 | 0.32 | 0.5197 | |
| Sewage Sludge Incinerator (EU ID: 28) | 0.007 *ton/hr* | 0.0096 | 0.064 | 0.0089 | 0.0089 | 0.0089 | 0.0110 | |
| **Access Roads - Subtotal** | | **4.47** | **2.29** | **4.30** | **43.18** | **174.15** | **0.0091** | **0.183** |
| Camp to Mine Site (EU ID: 158) | | 0.344 | 0.113 | 0.32 | 3.22 | 13.09 | 0.00069 | 0.0118 |
| Airport to Camp (EU ID: 159) | | 0.297 | 0.049 | 0.186 | 1.88 | 7.55 | 0.00038 | 0.0113 |
| Jungjuk Port to Mine Site | | 3.83 | 2.13 | 3.79 | 38.08 | 153.51 | 0.0080 | 0.160 |
| **Tanks - Subtotal** | | | | | | | | **1.840** |
| Mine Site Tanks | | | | | | | | 1.57 |
| Power Plant Tanks | | | | | | | | 0.018 |
| Camp Site Tanks | | | | | | | | 0.002 |
| Airport Tanks | | | | | | | | 0.249 |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 4 | OF: 7 | SHEET: Summary |
| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

**Life-of-Mine Mining Activity, Machinery Tailpipes, Wind Erosion, and Access Roads Emissions Summary** ***(ton/yr)***

| LOM | CO | NOX | PM2.5 | PM10 | PM | SO2 | VOC | Total |
|---|---|---|---|---|---|---|---|---|
| 4 | 3,097.4 | 1,159.0 | 140.7 | 967.6 | 3,241.6 | 2.40 | 63.80 | 8,672 |
| 5 | 3,240.5 | 1,302.9 | 151.3 | 1,059.9 | 3,579.6 | 2.67 | 71.57 | 9,408 |
| 6 | 3,296.9 | 1,354.7 | 165.6 | 1,162.4 | 3,945.9 | 2.77 | 74.63 | 10,003 |
| 7 | 3,411.3 | 1,465.4 | 160.6 | 1,111.1 | 3,694.8 | 2.99 | 80.85 | 9,927 |
| 8 | 3,568.3 | 1,622.5 | 174.0 | 1,230.8 | 4,192.8 | 3.29 | 89.37 | 10,881 |
| 9 | 3,702.0 | 1,752.5 | 182.6 | 1,306.3 | 4,505.3 | 3.54 | 96.63 | 11,549 |
| 10 | 3,484.2 | 1,539.9 | 161.1 | 1,110.2 | 3,722.6 | 3.13 | 84.80 | 10,106 |
| 11 | 3,487.7 | 1,547.0 | 169.6 | 1,193.9 | 4,072.5 | 3.13 | 84.99 | 10,559 |
| 12 | 3,602.4 | 1,664.9 | 166.6 | 1,149.6 | 3,883.6 | 3.35 | 91.22 | 10,562 |
| 13 | 3,692.2 | 1,755.7 | 176.8 | 1,243.7 | 4,278.9 | 3.52 | 96.09 | 11,247 |
| 14 | 3,764.3 | 1,829.3 | 176.4 | 1,226.7 | 4,194.0 | 3.66 | 100.01 | 11,294 |
| 15 | 3,868.1 | 1,930.2 | 181.7 | 1,271.3 | 4,371.9 | 3.85 | 105.64 | 11,733 |
| 16 | 3,967.8 | 2,031.7 | **192.4** | 1,364.1 | 4,741.4 | 4.04 | 111.06 | **12,413** |
| 17 | 3,900.3 | 1,961.9 | 190.0 | 1,351.5 | 4,702.9 | 3.91 | 107.39 | 12,218 |
| 18 | 3,894.6 | 1,958.2 | 183.7 | 1,296.9 | 4,534.0 | 3.90 | 107.08 | 11,978 |
| 19 | **3,971.3** | **2,032.8** | 182.3 | 1,280.6 | 4,518.4 | **4.05** | **111.24** | 12,101 |
| 20 | 3,891.3 | 1,951.6 | 188.2 | **1,372.3** | **4,796.7** | 3.90 | 106.90 | 12,311 |
| 21 | 3,559.2 | 1,621.3 | 183.2 | 1,319.9 | 4,577.1 | 3.27 | 88.88 | 11,353 |
| 22 | 2,749.4 | 829.9 | 123.3 | 844.7 | 2,784.6 | 1.74 | 44.91 | 7,379 |
| 23 | 2,522.8 | 616.3 | 91.5 | 614.4 | 2,059.2 | 1.31 | 32.61 | 5,938 |
| 24 | 2,551.2 | 643.7 | 80.9 | 535.1 | 1,863.7 | 1.36 | 34.15 | 5,710 |
| 25 | 2,199.0 | 309.0 | 46.7 | 286.5 | 1,022.7 | 0.70 | 15.03 | 3,880 |
| 26 | 2,013.3 | 141.8 | 15.1 | 129.4 | 473.7 | 0.35 | 4.95 | 2,779 |
| 27 | 2,001.7 | 130.1 | 13.8 | 118.5 | 435.0 | 0.33 | 4.32 | 2,704 |

*Red numbers represent the highest values*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

TOT_MINING_FU( TOT_MINING_FUG_NO> TOT_MINING_FUG_ TOT_MINING_FU( TOT_MINING_I TOT_MINING_FUG_SO2

**Life-of-Mine Mining Activity Fugitive Emissions Summary (*ton/yr*)**

APP_C4_23

| LOM | CO | NOX | PM2.5 | PM10 | PM | SO2 |
|---|---|---|---|---|---|---|
| 4 | **1,921** | **51.61** | 121.4 | 897.7 | 3,027 | **0.17** |
| 5 | **1,921** | **51.61** | 130.3 | 988.5 | 3,364 | **0.17** |
| 6 | **1,921** | **51.61** | 143.8 | 1,089.0 | 3,727 | **0.17** |
| 7 | **1,921** | **51.61** | 137.5 | 1,036.2 | 3,474 | **0.17** |
| 8 | **1,921** | **51.61** | 149.1 | 1,154.0 | 3,970 | **0.17** |
| 9 | **1,921** | **51.61** | 156.4 | 1,228.9 | 4,283 | **0.17** |
| 10 | **1,921** | **51.61** | 137.1 | 1,034.4 | 3,501 | **0.17** |
| 11 | **1,921** | **51.61** | 145.6 | 1,117.9 | 3,850 | **0.17** |
| 12 | **1,921** | **51.61** | 141.2 | 1,072.2 | 3,660 | **0.17** |
| 13 | **1,921** | **51.61** | 150.5 | 1,166.2 | 4,056 | **0.17** |
| 14 | **1,921** | **51.61** | 149.1 | 1,147.3 | 3,968 | **0.17** |
| 15 | **1,921** | **51.61** | 153.3 | 1,190.6 | 4,145 | **0.17** |
| 16 | **1,921** | **51.61** | **162.8** | 1,282.2 | 4,513 | **0.17** |
| 17 | **1,921** | **51.61** | 161.3 | 1,271.4 | 4,477 | **0.17** |
| 18 | **1,921** | **51.61** | 155.1 | 1,216.5 | 4,307 | **0.17** |
| 19 | **1,921** | **51.61** | 152.9 | 1,199.7 | 4,292 | **0.17** |
| 20 | **1,921** | **51.61** | 160.0 | **1,294.6** | **4,576** | **0.17** |
| 21 | **1,921** | **51.61** | 159.2 | 1,248.8 | 4,365 | **0.17** |
| 22 | **1,921** | **51.61** | 108.4 | 782.9 | 2,582 | **0.17** |
| 23 | **1,921** | **51.61** | 79.2 | 555.3 | 1,860 | **0.17** |
| 24 | **1,921** | **51.61** | 68.2 | 475.5 | 1,664 | **0.17** |
| 25 | **1,921** | **51.61** | 38.0 | 230.9 | 827 | **0.17** |
| 26 | **1,921** | **51.61** | 8.4 | 75.9 | 280 | **0.17** |
| 27 | **1,921** | **51.61** | 7.3 | 65.8 | 243 | **0.17** |

*Red numbers represent the highest values*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
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TOT_MACHINES_FUG_C TOT_MACHINES_FU TOT_MACHINES_ TOT_MACHINE TOT_MACHINES_FUG_NMHC

**Life-of-Mine Machinery Tailpipes Emissions Summary (*ton/yr*)**

APP_C4_23

| LOM | CO | NOx | PM | SO2 | VOC |
|---|---|---|---|---|---|
| 4 | 1,172 | 1,105 | 12.96 | 2.21 | 63.6 |
| 5 | 1,315 | 1,249 | 14.60 | 2.48 | 71.4 |
| 6 | 1,371 | 1,301 | 15.22 | 2.59 | 74.5 |
| 7 | 1,486 | 1,412 | 16.50 | 2.81 | 80.7 |
| 8 | 1,643 | 1,569 | 18.30 | 3.10 | 89.2 |
| 9 | 1,777 | 1,699 | 19.80 | 3.36 | 96.4 |
| 10 | 1,559 | 1,486 | 17.34 | 2.95 | 84.6 |
| 11 | 1,562 | 1,493 | 17.41 | 2.95 | 84.8 |
| 12 | 1,677 | 1,611 | 18.74 | 3.17 | 91.0 |
| 13 | 1,767 | 1,702 | 19.77 | 3.34 | 95.9 |
| 14 | 1,839 | 1,775 | 20.61 | 3.47 | 99.8 |
| 15 | 1,943 | 1,876 | 21.77 | 3.67 | 105.5 |
| 16 | 2,042 | 1,978 | 22.92 | 3.86 | 110.9 |
| 17 | 1,975 | 1,908 | 22.14 | 3.73 | 107.2 |
| 18 | 1,969 | 1,904 | 22.09 | 3.72 | 106.9 |
| 19 | **2,046** | **1,979** | **22.95** | **3.87** | **111.1** |
| 20 | 1,966 | 1,898 | 22.03 | 3.71 | 106.7 |
| 21 | 1,634 | 1,567 | 18.24 | 3.09 | 88.7 |
| 22 | 824 | 776 | 9.11 | 1.56 | 44.7 |
| 23 | 597 | 562 | 6.60 | 1.13 | 32.4 |
| 24 | 626 | 590 | 6.92 | 1.18 | 34.0 |
| 25 | 274 | 255 | 3.01 | 0.52 | 14.9 |
| 26 | 88 | 88 | 1.00 | 0.17 | 4.8 |
| 27 | 76 | 76 | 0.87 | 0.14 | 4.1 |

*Red numbers represent the highest values*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 7 | OF: 7 | SHEET: Summary |
| AIR EMISSION CALCULATIONS | SUBJECT: Emissions Summary | DATE: October 14, 2021 | | |

**Life-of-Mine Wind Erosion and Access Road Fugitive Emissions Summary (*ton/yr*)**

| LOM | CO | NOX | PM2.5 | PM10 | PM | SO2 | VOC |
|---|---|---|---|---|---|---|---|
| 4 | **4.47** | **2.29** | 6.37 | 56.95 | 201.70 | **0.01** | **0.18** |
| 5 | **4.47** | **2.29** | 6.35 | 56.82 | 201.43 | **0.01** | **0.18** |
| 6 | **4.47** | **2.29** | 6.55 | 58.14 | 204.09 | **0.01** | **0.18** |
| 7 | **4.47** | **2.29** | 6.58 | 58.33 | 204.47 | **0.01** | **0.18** |
| 8 | **4.47** | **2.29** | 6.60 | 58.49 | 204.77 | **0.01** | **0.18** |
| 9 | **4.47** | **2.29** | 6.47 | 57.60 | 203.00 | **0.01** | **0.18** |
| 10 | **4.47** | **2.29** | 6.60 | 58.47 | 204.74 | **0.01** | **0.18** |
| 11 | **4.47** | **2.29** | 6.61 | 58.55 | 204.90 | **0.01** | **0.18** |
| 12 | **4.47** | **2.29** | 6.62 | 58.62 | 205.04 | **0.01** | **0.18** |
| 13 | **4.47** | **2.29** | 6.49 | 57.74 | 203.28 | **0.01** | **0.18** |
| 14 | **4.47** | **2.29** | 6.64 | 58.79 | 205.38 | **0.01** | **0.18** |
| 15 | **4.47** | **2.29** | 6.66 | 58.87 | 205.55 | **0.01** | **0.18** |
| 16 | **4.47** | **2.29** | **6.67** | **58.98** | **205.76** | **0.01** | **0.18** |
| 17 | **4.47** | **2.29** | 6.51 | 57.91 | 203.63 | **0.01** | **0.18** |
| 18 | **4.47** | **2.29** | 6.58 | 58.33 | 204.46 | **0.01** | **0.18** |
| 19 | **4.47** | **2.29** | 6.51 | 57.91 | 203.63 | **0.01** | **0.18** |
| 20 | **4.47** | **2.29** | 6.17 | 55.63 | 199.05 | **0.01** | **0.18** |
| 21 | **4.47** | **2.29** | 5.75 | 52.84 | 193.48 | **0.01** | **0.18** |
| 22 | **4.47** | **2.29** | 5.73 | 52.70 | 193.21 | **0.01** | **0.18** |
| 23 | **4.47** | **2.29** | 5.70 | 52.51 | 192.81 | **0.01** | **0.18** |
| 24 | **4.47** | **2.29** | 5.72 | 52.60 | 192.99 | **0.01** | **0.18** |
| 25 | **4.47** | **2.29** | 5.71 | 52.55 | 192.89 | **0.01** | **0.18** |
| 26 | **4.47** | **2.29** | 5.71 | 52.56 | 192.91 | **0.01** | **0.18** |
| 27 | **4.47** | **2.29** | 5.60 | 51.84 | 191.48 | **0.01** | **0.18** |

*Red numbers represent the highest values*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 1 | OF: 11 | SHEET: Mining |
| AIR EMISSION CALCULATIONS | SUBJECT: Mining Activity Emissions | DATE: October 14, 2021 | | |

Calculations for LOM: 20 Max Daily Ore: Yes

**Mining Activity Emissions Summary**

**Particulate Emissions**

| Activity | Rate | | PM2.5 | | PM2.5 HgDustPM2.5 | PM10 | | PM10 HgDustPM10 | PM HgDust |
|---|---|---|---|---|---|---|---|---|---|
| | | | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(ton/yr)* |
| Drilling (EU ID: 113) | 158,920 | *holes/yr* | 0.71 | 16.98 | 3.10 | 12.26 | 294.33 | 53.71 | 103.3 |
| Blasting (EU ID: 114) | 521 | *blasts/yr* | 87.30 | 87.30 | 4.55 | 1,513.12 | 1,513.12 | 78.83 | 151.6 |
| **Material Handling (Loading and Unloading) (EU ID: 115-120)** | | | | | - | | | - | - |
| Ore Loading (In-Pit) | 17,058,389 | *ton/yr* | 1.16 | 27.74 | 1.93 | 7.63 | 183.19 | 12.77 | 27.0 |
| Ore Unloading (Short-Term Stockpile) | 7,672,868 | *ton/yr* | 0.20 | 4.76 | 0.87 | 1.31 | 31.46 | 5.74 | 12.1 |
| Ore Unloading (Long-Term Stockpile) | 7,572 | *ton/yr* | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.01 | 0.0 |
| Ore Reloading (Long-Term Stockpile) | 4,585,798 | *ton/yr* | 0.12 | 2.85 | 0.52 | 0.78 | 18.80 | 3.43 | 7.3 |
| Waste (incl. OVB/PAG) Loading (In-Pit) | 148,288,108 | *ton/yr* | 3.84 | 92.07 | 16.80 | 25.33 | 608.04 | 110.97 | 234.6 |
| Waste (incl. OVB/PAG) Un- & Re-loading | 153,389,715 | *ton/yr* | 3.97 | 95.24 | 17.38 | 26.21 | 628.96 | 114.78 | 242.7 |
| **Material Hauling (EU ID: 160)** | | | | | - | | | - | - |
| Ore Hauling | 406,810 | *VMT/yr* | 1.53 | 36.72 | 6.70 | 15.30 | 367.16 | 67.01 | 275.5 |
| Waste Hauling | 4,618,097 | *VMT/yr* | 17.37 | 416.80 | 76.07 | 173.67 | 4,167.99 | 760.66 | 3,127.3 |
| **Maintenance Equipment (EU ID: 121-123)** | | | | | - | | | - | - |
| Dozer Use | 64,028 | *hr/yr* | 6.60 | 158.33 | 28.90 | 11.26 | 270.21 | 49.31 | 275.2 |
| Grader Use | 45,653 | *hr/yr* | 0.30 | 7.25 | 1.32 | 4.31 | 103.34 | 18.86 | 42.7 |
| Water Truck Use | 13,953 | *hr/yr* | 0.42 | 10.17 | 1.86 | 4.24 | 101.73 | 18.57 | 76.3 |
| **Wind Erosion of Exposed Surfaces (EU ID: 161)** | | | | | - | | | - | - |
| Tailings Beach (Dry) | 878.3 | *acre* | 0.07 | 1.65 | 0.30 | 0.46 | 10.99 | 2.01 | 4.01 |
| Haul Roads | 214.7 | *acre* | 0.03 | 0.74 | 0.13 | 0.20 | 4.91 | 0.90 | 1.79 |
| Access Roads | 143.0 | *acre* | 0.02 | 0.49 | 0.09 | 0.14 | 3.27 | 0.60 | 1.19 |
| Waste Rock Facility | *variable* | *acre* | 0.28 | 6.71 | 1.22 | 1.86 | 44.75 | 8.17 | 16.33 |
| Short-term Stockpile | *variable* | *acre* | 0.01 | 0.14 | 0.03 | 0.04 | 0.92 | 0.17 | 0.34 |
| Long-term Stockpile West | *variable* | *acre* | 0.0065 | 0.16 | 0.029 | 0.043 | 1.04 | 0.19 | 0.38 |
| Long-term Stockpile East (& PAG) | *variable* | *acre* | 0.0112 | 0.27 | 0.049 | 0.075 | 1.79 | 0.33 | 0.65 |
| Overburden Stockpile South | *variable* | *acre* | 0.0035 | 0.08 | 0.015 | 0.023 | 0.56 | 0.10 | 0.20 |
| **Total** | | | **123.93** | **966.45** | **161.86** | **1,798.26** | **8,356.59** | **1,307.10** | **4,600.55** |

**Other Emissions**

| Activity | CO | | | NOx | | | SO2 | | |
|---|---|---|---|---|---|---|---|---|---|
| | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| Blasting (EU ID: 114) | 36,870.7 | 36,870.7 | 1,921.0 | 990.56 | 990.56 | 51.61 | 3.30 | 3.30 | 0.17 |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | | | BY: E. Memon |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 2 | OF: 11 | SHEET: Mining |
| AIR EMISSION CALCULATIONS | SUBJECT: Mining Activity Emissions | DATE: October 14, 2021 | | |

Calculations for LOM: 20

**Drilling (EU ID: 113)**

**Activity Information**

| | | | | |
|---|---|---|---|---|
| Tota Total Drilling | 2,161,301 | *m/yr* | *Donlin* | APP_C4_23 |
| Drill Hole Depth | 13.6 | *m* | *Donlin* | |
| No. of Holes | 158,920 | *holes/yr* | | |
| Operation | 365 | *days/yr* | | |
| | 24 | *hr/day* | | |

**Emission Factor(s)**

| | | | |
|---|---|---|---|
| TSP | 1.3 | *lb/hole* | *AP-42, Tab. 11.9-4, 7/98 (overburden)* |
| **PM Scaling Factors (SF)** | | | |
| PM2.5 | 0.03 | | *AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)* |
| PM10 | 0.52 | | *AP-42, Tab. 11.9-1, 7/98 (blasting, overburden)* |
| PM | 1 | | |

| **Emissions** | ***(lb/hole)*** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|---|
| PM2.5 | 0.039 | 0.7 | 17.0 | 3.1 |
| PM10 | 0.676 | 12.3 | 294.3 | 53.7 |
| PM | 1.3 | 23.6 | 566.0 | 103.3 |

**Sample Calculations**

| **PM10** | (Activity) | (TSP EF) | (Conversion) | (SF) |
|---|---|---|---|---|
| 53.7 *ton/yr* | 158,920 ~~*hole*~~ | 1.3 ~~*lb*~~ | *ton* | 0.52 |
| | *yr* | ~~*hole*~~ | 2,000 ~~*lb*~~ | |

Conversion(s): 2,000 *lb/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 20

**Blasting (EU ID: 114)**

**Activity Information**

| | | | | | |
|---|---|---|---|---|---|
| Tota | Material Mined | | 149,999,997 | t/yr | Donlin | APP_C4_23 |
| BVol | | | 56,571,849 | $m^3$/yr | Donlin |
| Con: | Blasting Agent Use | | 60,000 | t/yr | Donlin (11/08/2016) |
| | Excluding Water | (13.3%) | 52,020 | t/yr | Donlin |
| | | | 57,342 | ton/yr | |
| Blas | No. of Blasts | | 521 | blasts/yr | Donlin |
| | Bench Height | | 12 | m | Donlin |
| | Operation | | 365 | days/yr | |
| | | | 24 | hr/day | |

**Emission Factor(s)**

| | | | |
|---|---|---|---|
| Emission Factor Equation | TSP (lb/blast) = 0.000014 x $A^{1.5}$ | | AP-42, Tab. 11.9-1, 7/98 (blasting, overburden) |
| Where, A = Area per Blast | 120,000 | $ft^2$ | Donlin (11/08/2016) |
| TSP | 582.0 | lb/blast | |
| CO | 67 | lb/ton-ANFO | AP-42, Tab. 13.3-1, 2/80 (ANFO) |
| NOx | 0.9 | kg/t-ANFO | CSIRO |
| | 1.80 | lb/ton-ANFO | |
| SO2 | 0.006 | lb/ton-ANFO | Based on 15 ppm S in FO and a maximum of 10% FO in ANFO |

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.03 | AP-42, Tab. 11.9-1, 7/98 (blasting, overburden) |
| PM10 | 0.52 | AP-42, Tab. 11.9-1, 7/98 (blasting, overburden) |

| Emissions | (lb/blast) | (lb/hr) [(1)] | (lb/day) [(1)] | (ton/yr) |
|---|---|---|---|---|
| PM2.5 | 17.46 | 87.30 | 87.30 | 4.55 |
| PM10 | 302.62 | 1,513.12 | 1,513.12 | 78.83 |
| PM | 581.97 | 2,909.85 | 2,909.85 | 151.60 |
| CO | 7,374.14 | 36,870.68 | 36,870.68 | 1,920.96 |
| NOx | 198.11 | 990.56 | 990.56 | 51.61 |
| SO2 | 0.66 | 3.30 | 3.30 | 0.17 |

(1) *Based on:* 5 *blasts/day, occurring in 1 hour*

**Sample Calculations**

**PM10**

| | (Activity) | (TSP EF) | (SF) | (Conversion) |
|---|---|---|---|---|
| 78.8 ton/yr | 521 ~~blast~~ / yr | 582.0 ~~lb~~ / ~~blast~~ | 0.52 | ton / 2,000 ~~lb~~ |

**SO2 Emission Factor**

| | | | | |
|---|---|---|---|---|
| 0.006 lb/ton-ANFO | 0.000015 ~~lb S~~ / ~~lb FO~~ | 2 lb SO2 / ~~lb S~~ | 10% ~~lb FO~~ / ~~lb~~ ANFO | 2,000 ~~lb~~ / ton |

Conversion(s):

| | |
|---|---|
| 2,000 | lb/ton |
| 1.1023 | ton/t |
| 2.2046 | lb/kg |
| 3.2808 | ft/m |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

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Calculations for LOM: 20

**Material Handling (Loading and Unloading) (EU ID: 115-120)**

**Activity Information**

| | | | | | |
|---|---|---|---|---|---|
| OreM | In-Pit Ore Removed | 15,475,129 | *t/yr* | *Donlin* | APP_C4_23 |
| | | 17,058,389 | *ton/yr* | | |
| | | 122,400 | *ton/day (daily maximum ore processing rate)* | | |
| M2ST | Long-Term Ore Stockpiled | 6,869 | *t/yr* | *Donlin* | |
| | | 7,572 | *ton/yr* | | |
| STS2 | Short-Term Ore Stockpiled | 6,960,717 | *t/yr* | *Donlin* | |
| | | 7,672,868 | *ton/yr* | | |
| S2PT | Long-Term Stockpile Ore Processed (to Crusher) | 4,160,171 | *t/yr* | *Donlin* | |
| | | 4,585,798 | *ton/yr* | | |
| Wast | In-Pit Waste (including OVB and PAG) Removed | 134,524,869 | *t/yr* | *Donlin* | |
| | | 148,288,108 | *ton/yr* | | |
| W&C | Waste (including OVB) Deposited to Waste Dump | 62,479,357 | *t/yr* | *Donlin* | |
| | | 68,871,620 | *ton/yr* | | |
| OVB- | OVB Stockpiled | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |
| PAG- | PAG Stockpiled | 45,515 | *t/yr* | *Donlin* | |
| | | 50,171 | *ton/yr* | | |
| OVB- | Stockpiled OVB to Waste Dump Reclamation | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |
| PAG- | Stockpiled PAG to In-Pit Backfill | 2,314,053 | *t/yr* | *Donlin* | |
| | | 2,550,804 | *ton/yr* | | |
| W-BI | In-Pit Waste to In-Pit Backfill | 71,999,997 | *t/yr* | *Donlin* | |
| | | 79,366,317 | *ton/yr* | | |
| W-TI | Waste Deposited to Tails Dam | 0 | *t/yr* | *Donlin* | |
| | | 0 | *ton/yr* | | |

Operation 365 *days/yr*
24 *hr/day*

**Emission Factor(s)**

| | | | | | |
|---|---|---|---|---|---|
| Emission Factor Equation | $E = 0.0032k(U/5)^{1.3}/(M/2)^{1.4}$ | | | *AP-42, Sec. 13.2.4, Eq. 1, 11/06* | |
| U = Mean wind speed | 7.947 *mph* | | | *American Ridge* | *07/05 - 06-10* |
| M = Material moisture content | 2.5 *%* | | | *Donlin* | |
| | PM2.5 | PM10 | PM | | |
| k = Particle size multiplier | 0.053 | 0.35 | 0.74 | *AP-42, Sec. 13.2.4, Pg. 4, 11/06* | |
| E = Emission factor | 0.000227 | 0.001497 | 0.003164 | *lb/ton* | |

**Ore Loading (In-Pit) (EU ID: 115)**

| Emissions | *(lb/hr)** | *(lb/day)** | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 1.2 | 27.7 | 1.9 |
| PM10 | 7.6 | 183.2 | 12.8 |
| PM | 16.1 | 387.3 | 27.0 |

*Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

* *Based on the daily maximum ore processing rate.*

**Ore Unloading (Long-Term Stockpile) (EU ID: 117)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 0.00 | 0.0 | 0.00 |
| PM10 | 0.00 | 0.0 | 0.01 |
| PM | 0.00 | 0.1 | 0.01 |

Conversion(s): 2,000 *lb/ton*
1.1023 *ton/t*
2.2369 *mph/mps*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| Air Sciences Inc. | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
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Calculations for LOM: 20

**Material Handling (Loading and Unloading) (EU ID: 115-120) - continued**

**Ore Unloading (Short-Term Stockpile)** [1] **(EU ID: 116)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.2 | 4.8 | 0.9 |
| PM10 | 1.3 | 31.5 | 5.7 |
| PM | 2.8 | 66.5 | 12.1 |

(1) *See Mill emissions for ore unloading at crusher*

**Ore Reloading (Long-Term Stockpile)** [1] **(EU ID: 118)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.1 | 2.8 | 0.5 |
| PM10 | 0.8 | 18.8 | 3.4 |
| PM | 1.7 | 39.8 | 7.3 |

(1) *See Mill emissions for ore unloading at crusher*

**Waste (including OVB and PAG) Loading (In-Pit) (EU ID: 119)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 3.8 | 92.1 | 16.8 |
| PM10 | 25.3 | 608.0 | 111.0 |
| PM | 53.6 | 1,285.6 | 234.6 |

*Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

**Waste (including OVB*) Unloading (Waste Dump) (EU ID: 120)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 1.8 | 42.8 | 7.8 |
| PM10 | 11.8 | 282.4 | 51.5 |
| PM | 24.9 | 597.1 | 109.0 |

*Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

** Includes stockpiled OVB for reclamation*

**OVB Unloading (OVB Stockpile)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.0 | 0.0 |
| PM | 0.0 | 0.0 | 0.0 |

**OVB Reloading (OVB Stockpile)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.0 | 0.0 |
| PM | 0.0 | 0.0 | 0.0 |

**PAG Unloading (PAG Stockpile)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.2 | 0.0 |
| PM | 0.0 | 0.4 | 0.1 |

**PAG Reloading (PAG Stockpile)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.1 | 1.6 | 0.3 |
| PM10 | 0.4 | 10.5 | 1.9 |
| PM | 0.9 | 22.1 | 4.0 |

**Backfill (PAG and In-Pit Waste) Unloading (In-Pit)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 2.1 | 50.9 | 9.3 |
| PM10 | 14.0 | 335.9 | 61.3 |
| PM | 29.6 | 710.2 | 129.6 |

**Waste Unloading (Tails Dam)**

| Emissions | (lb/hr) | (lb/day) | (ton/yr) |
|---|---|---|---|
| PM2.5 | 0.0 | 0.0 | 0.0 |
| PM10 | 0.0 | 0.0 | 0.0 |
| PM | 0.0 | 0.0 | 0.0 |

*Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

**Sample Calculations**

**PM10 - Ore Loading**

| | (Activity) | (PM10 EF) | (Conversion) |
|---|---|---|---|
| 12.8 *ton/yr* | 17,058,389 ~~ton~~ / *yr* | 0.0015 ~~lb~~ / ~~ton~~ | *ton* / 2,000 ~~lb~~ |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

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Calculations for LOM: 20

**Material Hauling (EU ID: 160)**

**Activity Information**

| | | | | | |
|---|---|---|---|---|---|
| | Ore Hauled (from Pit and Stockpile) | 19,635,299 | *t/yr* | *Donlin* | OPSUM_P1 |
| | | 21,644,187 | *ton/yr* | | |
| Ore-VKT | | 654,695 | *VKT/yr* | *Donlin* | |
| | | 406,810 | *VMT/yr* | | |
| | Waste Hauled* (from Pit and Stockpile) | 136,838,922 | *t/yr* | *Donlin* | |
| | ** Includes OVB and PAG* | 150,838,912 | *ton/yr* | | |
| Watste-VKT | | 7,432,088 | *VKT/yr* | *Donlin* | |
| | | 4,618,097 | *VMT/yr* | | |

| | | | |
|---|---|---|---|
| Operation | 365 | *days/yr* | |
| | 24 | *hr/day* | |
| Control Type | Water/Chemical Application | | |
| Control Efficiency | 90% | | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06. See note below.* |

**Truck Hauling Fraction Calculation**

| | | | | | | |
|---|---|---|---|---|---|---|
| 351- | Liebherr T282B | 7,840,654 | *t-km* | 97.0% | *Donlin* | APP_C4_23 |
| 131- | Caterpillar 785C | 246,129 | *t-km* | 3.0% | *Donlin* | |

**Haul Truck Information**

| **Make and Model** | Empty (*ton*) | Payload (*ton*) | Total (*ton*) | |
|---|---|---|---|---|
| Liebherr T282B | 261 | 400 | 661 | *Liebherr, BK-RP LME 1100398-web-08.10* |
| Caterpillar 785C | 116 | 159 | 275 | *Caterpillar, AEHQ5320-02 (4-02)* |

**Emission Factor(s)**

| | | | |
|---|---|---|---|
| Emission Factor Equation | $E = k(s/12)^a (W/3)^b [(365-P)/365]$ | | *AP-42, Sec. 13.2.2, Eqs. 1a and 2, 11/06* |
| s = Surface material silt content | 3.8 | % | (2) |
| W = Mean vehicle weight | 452.9 | *ton* | *Average of empty and full weights of fleet.* |
| P = Days/year with ≥0.01 in precip. | 129 | | *American Ridge, 2007-08, 2010-12* |

(2) *AP-42, Chapter 13.2-2, Related Information "r13s0202_dec03.xls" (http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html)*

| | PM2.5 | PM10 | PM | | |
|---|---|---|---|---|---|
| k = Size-specific empirical constant | 0.15 | 1.5 | 4.9 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| a = Size-specific empirical constant | 0.9 | 0.9 | 0.7 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| b = Size-specific empirical constant | 0.45 | 0.45 | 0.45 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| E = Size-specific emission factor | 0.33 | 3.29 | 13.54 | *lb/VMT* | |

**Ore Hauling**

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| PM2.5 | 1.5 | 36.7 | 6.7 |
| PM10 | 15.3 | 367.2 | 67.0 |
| PM | 62.9 | 1,509.5 | 275.5 |

*Note:*
*In section 13.2.2 of AP-42, Figures 13.2.2-2 and 13.2.2-5 provide estimated unpaved road control efficiencies for water application and chemical dust suppressants.*
*These figures provide a range of up to 95 percent control for water application only and a range of up to 91 percent control for chemical application only.*
*Donlin will apply a combination of water (or snow, as applicable) and chemical dust suppressant. In addition, see Section 2.18 of Appendix C and Section 3.7.1 of Appendix D*

| Conversion(s): | | |
|---|---|---|
| | 2,000 | *lb/ton* |
| | 1.1023 | *ton/t* |
| | 1.609 | *km/mi* |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 20

**Material Hauling (EU ID: 160) - continued**

**Waste Hauling**

| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
|---|---|---|---|
| PM2.5 | 17.4 | 416.8 | 76.1 |
| PM10 | 173.7 | 4,168.0 | 760.7 |
| PM | 714.0 | 17,136.1 | 3,127.3 |

**Sample Calculations**

| **PM10 - Waste Hauling** | (Activity) | (PM10 EF) | (Conversion) | (Control) |
|---|---|---|---|---|
| 760.7 *ton/yr* | 4,618,097 ~~*VMT*~~ / *yr* | 3.3 ~~*lb*~~ / ~~*VMT*~~ | *ton* / 2,000 ~~*lb*~~ | (1 - 0.9) |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 20

**Maintenance Equipment (EU ID: 121-123)**

**Activity Information**

| | | | | | |
|---|---|---|---|---|---|
| DOZ | Dozer Use | 64,028 | *hr/yr* | *Donlin* | APP_C4_23 |
| GRA | Grader Use | 45,653 | *hr/yr* | *Donlin* | |
| Eqp | Water Truck Use | 13,953 | *hr/yr* | *Donlin* | |
| HT_ | Water Truck Speed | 19.56 | *kph* | *Average haul truck speed* | HaulDist AirModel |
| | | 169,623 | VMT | | |

Operation 365 *days/yr*

24 *hr/day*

**Control and Efficiency**

| | | | |
|---|---|---|---|
| Dozer Use | None | 0% | |
| Grader Use | None | 0% | |
| Water Truck Use | Water/Chemical Application | 90% | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06. See note below.* |

**Dozer Use**

**Emission Factor(s)**

Emission Factor Equation $TSP\ (lb/hr) = 5.7\ (s)^{1.2} / (M)^{1.3}$ *AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)*

$PM15\ (lb/hr) = 1\ (s)^{1.5} / (M)^{1.4}$ *AP-42, Tab. 11.9-1, 07/98, (bulldozing, overburden)*

M = Material moisture content 2.5 % *Donlin*

s = Surface material silt content 3.8 % (2)

(2) *AP-42, Chapter 13.2-2, Related Information "r13s0202_dec03.xls" (http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html)*

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.105 | *AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)* |
| PM10 | 0.75 | *AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)* |

**Estimated Emission Factors**

| | | |
|---|---|---|
| PM2.5 | 0.9 | *lb/hr* |
| PM10 | 1.54 | *lb/hr* |
| PM | 8.60 | *lb/hr* |

**Dozer Use** **(EU ID: 122)**

| Emissions | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
|---|---|---|---|
| PM2.5 | 6.60 | 158.3 | 28.9 |
| PM10 | 11.26 | 270.2 | 49.3 |
| PM | 62.83 | 1,507.9 | 275.2 |

**Sample Calculations**

| **PM10 - Dozer Use** | (Activity) | (PM10 EF) | (Conversion) | (Control) |
|---|---|---|---|---|
| 49.3 *ton/yr* | 64,028 *~~hr~~* / *yr* | 1.5 *~~lb~~* / *~~hr~~* | *ton* / 2,000 *~~lb~~* | (1 - 0) |

**Grader Use**

**Emission Factor(s)**

Emission Factor Equation $TSP\ (lb/VMT) = 0.04\ (S)^{2.5}$ *AP-42, Tab. 11.9-1, 07/98, (grading)*

$PM15\ (lb/VMT) = 0.051\ (S)^{2}$ *AP-42, Tab. 11.9-1, 07/98, (grading)*

S = Mean vehicle speed 3 *mph* *Donlin*

*Note:*

*In section 13.2.2 of AP-42, Figures 13.2.2-2 and 13.2.2-5 provide estimated unpaved road control efficiencies for water application and chemical dust suppressants.*

*These figures provide a range of up to 95 percent control for water application only and a range of up to 91 percent control for chemical application only.*

*Donlin will apply a combination of water (or snow, as applicable) and chemical dust suppressant. In addition, see Section 2.18 of Appendix C and Section 3.7.1 of Appendix D*

Conversion(s): 2,000 *lb/ton*

1.609 *km/mi*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 20

**Maintenance Equipment (EU ID: 121-123) - continued**

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.031 | *AP-42, Tab. 11.9-1, 07/98, (applies to TSP EF, footnote e)* |
| PM10 | 0.6 | *AP-42, Tab. 11.9-1, 07/98, (applies to PM15 EF, footnote d)* |

**Estimated Emission Factors**

| | | |
|---|---|---|
| PM2.5 | 0.02 | *lb/VMT* |
| PM10 | 0.28 | *lb/VMT* |
| PM | 0.62 | *lb/VMT* |

| **Grader Use** | | | **(EU ID: 123)** |
|---|---|---|---|
| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
| PM2.5 | 0.30 | 7.3 | 1.3 |
| PM10 | 4.31 | 103.3 | 18.9 |
| PM | 9.75 | 234.0 | 42.7 |

**Sample Calculations**

**PM10 - Grader Use**

| | (Activity) | (PM10 EF) | (Speed) | (Conversion) | (Control) |
|---|---|---|---|---|---|
| 18.9 *ton/yr* | 45,653 ~~*hr*~~ / *yr* | 0.3 ~~*lb*~~ / ~~*VMT*~~ | 3 ~~*VMT*~~ / ~~*hr*~~ | *ton* / 2,000 ~~*lb*~~ | (1 - 0) |

**Water Truck Use**

**Truck Specifications**

| **Make and Model** | Empty (*ton*) | Payload (*ton*) | Total (*ton*) | |
|---|---|---|---|---|
| Caterpillar 785C | 116 | 134 | 249 | *Caterpillar, AEHQ5320-02 (4-02)* |
| | | 32,000 *gal* | | |

**Emission Factor(s)**

| | | | | | |
|---|---|---|---|---|---|
| Emission Factor Equation | $E = k(s/12)^a (W/3)^b [(365-P)/365]$ | | | | *AP-42, Sec. 13.2.2, Eqs. 1a and 2, 11/06* |
| s = Surface material silt content | 3.8 % | | | | [1] |

[1] *AP-42, Chapter 13.2-2, Related Information "r13s0202_dec03.xls" (http://www.epa.gov/ttn/chief/ap42/ch13/related/c13s02-2.html)*

| | PM2.5 | PM10 | PM | | |
|---|---|---|---|---|---|
| W = Mean vehicle weight | 183 *ton* | | | | *Average of empty and full weights* |
| P = Days/year with ≥0.01 in precip. | 129 | | | | *American Ridge, 2007-08, 2010-12* |
| k = Size-specific empirical constant | 0.15 | 1.5 | 4.9 | *lb/VMT* | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| a = Size-specific empirical constant | 0.9 | 0.9 | 0.7 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| b = Size-specific empirical constant | 0.45 | 0.45 | 0.45 | | *AP-42, Tab. 13.2.2-2, Eqs. 1a and 2, 11/06* |
| E = Size-specific emission factor | 0.22 | 2.19 | 9.00 | *lb/VMT* | |

| **Water Truck Use** | | | **(EU ID: 121)** |
|---|---|---|---|
| **Emissions** | ***(lb/hr)*** | ***(lb/day)*** | ***(ton/yr)*** |
| PM2.5 | 0.4 | 10.2 | 1.9 |
| PM10 | 4.2 | 101.7 | 18.6 |
| PM | 17.4 | 418.3 | 76.3 |

**Sample Calculations**

**PM10 - Water Truck Use**

| | (Activity) | (PM10 EF) | (Conversion) | (Control) |
|---|---|---|---|---|
| 18.6 *ton/yr* | 169,623 ~~*VMT*~~ / *yr* | 2.2 ~~*lb*~~ / ~~*VMT*~~ | *ton* / 2,000 ~~*lb*~~ | (1 - 0.9) |

Conversion(s): 2,000 *lb/ton*
8.345 *lb/gal water*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| **Air Sciences Inc.** | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
|---|---|---|---|---|
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| **AIR EMISSION CALCULATIONS** | SUBJECT: Mining Activity Emissions | DATE: October 14, 2021 | | |

Calculations for LOM: 20

**Wind Erosion of Exposed Surfaces (EU ID: 161)**

**Exposed Flat Surfaces**

| | | | | | |
|---|---|---|---|---|---|
| *TA* Tailings Beach (Dry) | 878.3 *acre* | *Donlin* | | | |
| | | | | | |
| Haul Roads | | Haul Road Width | 29 m | *Donlin* | |
| Inside Pit | 130.5 *acre* | 18,206 *meters* | | | |
| Outside Pit | 84.2 *acre* | 11,749 *meters* | | | |
| | | | | | |
| Access Roads | | Access Road Width | 9 m | *Donlin* | |
| Camp to Mine Site (EU ID: 158) | 15.0 *acre* | | | | |
| Airport to Camp (EU ID: 159) | 22.4 *acre* | | | | |
| Jungjuk Port to Mine Site | 105.5 *acre* | | | | |
| | | | | | |
| Operation | 365 *days/yr* | | | | |
| | 24 *hr/day* | | | | |

**Control and Efficiency**

| | | | |
|---|---|---|---|
| Tailings Beach (Dry) | None | 0% | |
| Haul Roads | Water/Chemical Application | 90% | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06. See note below.* |
| Access Roads | Water/Chemical Application | 90% | *Based on AP-42, Figures 13.2.2-2 & 13.2.2-5, 11/06. See note below.* |

**Emission Factor(s)**

TSP - Wind Erosion - Road Surfaces 0.0834 *ton/acre-yr* *AP-42, Sec. 13.2.5, 11/06 (industrial wind erosion)* [(1)]

(1) *Hourly emission calculations provided in Wind_Calcs*

**PM Scaling Factors (SF)**

| | | |
|---|---|---|
| PM2.5 | 0.075 | *AP-42, Sec. 13.2.5, Pg. 3, 11/06* |
| PM10 | 0.5 | *AP-42, Sec. 13.2.5, Pg. 3, 11/06* |

| **Emissions** | **PM2.5** | | | **PM10** | | | **PM** | | |
|---|---|---|---|---|---|---|---|---|---|
| | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| *TA* Tailings Beach (Dry) [(1)(2)] | 0.07 | 1.65 | 0.30 | 0.46 | 10.99 | 2.01 | 0.92 | 21.98 | 4.01 |
| Haul Road - Inside Pit | 0.02 | 0.45 | 0.08 | 0.12 | 2.98 | 0.54 | 0.25 | 5.96 | 1.09 |
| Haul Road - Outside Pit | 0.01 | 0.29 | 0.05 | 0.08 | 1.92 | 0.35 | 0.16 | 3.85 | 0.70 |
| Access Road - Camp to Mine Site (EU ID: 158) | 0.00 | 0.05 | 0.01 | 0.01 | 0.34 | 0.06 | 0.03 | 0.69 | 0.13 |
| Access Road - Airport to Camp (EU ID: 159) | 0.00 | 0.08 | 0.01 | 0.02 | 0.51 | 0.09 | 0.04 | 1.03 | 0.19 |
| Access Road - Jungjuk Port to Mine Site | 0.02 | 0.36 | 0.07 | 0.10 | 2.41 | 0.44 | 0.20 | 4.82 | 0.88 |

(1) *AP-42, Sec. 13.2.5, 11/06 (industrial wind erosion), hourly emission calculations provided in Wind_Calcs*

(2) *Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

*Note:*

*In section 13.2.2 of AP-42, Figures 13.2.2-2 and 13.2.2-5 provide estimated unpaved road control efficiencies for water application and chemical dust suppressants.*

*These figures provide a range of up to 95 percent control for water application only and a range of up to 91 percent control for chemical application only.*

*Donlin will apply a combination of water (or snow, as applicable) and chemical dust suppressant. In addition, see Section 2.18 of Appendix C and Section 3.7.1 of Appendix D*

Conversion(s): 2,000 *lb/ton*

4,047 *$m^2$/acre*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

Calculations for LOM: 20

**Wind Erosion of Exposed Surfaces (EU ID: 161) - continued**

**Exposed Stockpile/Waste Rock Facility**

| | **Emissions** [1] | PM2.5 | | | PM10 | | | PM | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* | *(lb/hr)* | *(lb/day)* | *(ton/yr)* |
| WA | Waste Rock Facility [2] | 0.28 | 6.71 | 1.22 | 1.86 | 44.75 | 8.17 | 3.73 | 89.49 | 16.33 |
| STI | Short-term Stockpile | 0.01 | 0.14 | 0.03 | 0.04 | 0.92 | 0.17 | 0.08 | 1.85 | 0.34 |
| LTI | Long-term Stockpile West | 0.01 | 0.16 | 0.03 | 0.04 | 1.04 | 0.19 | 0.09 | 2.08 | 0.38 |
| LTI | Long-term Stockpile East (& PAG) | 0.01 | 0.27 | 0.05 | 0.07 | 1.79 | 0.33 | 0.15 | 3.58 | 0.65 |
| OV | Overburden Stockpile South | 0.003 | 0.08 | 0.02 | 0.02 | 0.56 | 0.10 | 0.05 | 1.12 | 0.20 |

(1) *AP-42, Sec. 13.2.5, 11/06 (industrial wind erosion), hourly emission calculations provided in Wind_Calcs*

(2) *Note: For modeling, emissions from this activity are adjusted hourly based on wind speed and modeled using an hourly file.*

*Sample emission calculations provided on page: 98*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

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Calculations for LOM: 20

**Mobile Machinery Tailpipes Emissions Summary** ***(ton/yr)***

| Machinery Type | Output (*hp-hr/yr*) | CO | NOx | PM | SO2 | VOC |
|---|---|---|---|---|---|---|
| Hydraulic Shovel | 11,046,049 | 31.78 | 31.78 | 0.36 | 0.06 | 1.73 |
| Front-End Loader | 12,683,216 | 36.49 | 36.49 | 0.42 | 0.07 | 1.98 |
| Haul Truck | 562,694,041 | 1,618.86 | 1,618.86 | 18.50 | 3.06 | 87.88 |
| Drill | 37,261,674 | 107.20 | 98.16 | 1.17 | 0.20 | 5.82 |
| Track Dozer | 20,079,105 | 57.77 | 34.87 | 0.51 | 0.11 | 3.14 |
| Wheel Dozer | 11,963,331 | 34.42 | 34.42 | 0.39 | 0.07 | 1.87 |
| Grader | 10,220,103 | 29.40 | 3.36 | 0.17 | 0.06 | 1.60 |
| Water Truck | 6,854,052 | 19.72 | 19.72 | 0.23 | 0.04 | 1.07 |
| Hydraulic Excavator | 5,703,012 | 16.41 | 13.18 | 0.17 | 0.03 | 0.89 |
| Fuel Truck | 2,089,431 | 6.01 | 6.01 | 0.07 | 0.01 | 0.33 |
| Service Truck | 171,440 | 0.49 | 0.06 | 0.003 | 0.001 | 0.03 |
| Mobile Crane | 116,187 | 0.33 | 0.04 | 0.002 | 0.001 | 0.02 |
| Low Boy Truck | 1,000,069 | 2.88 | 0.33 | 0.02 | 0.01 | 0.16 |
| Tire Handler | 1,428,671 | 4.11 | 0.47 | 0.02 | 0.01 | 0.22 |
| Light Plant | 857,202 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | | **1,965.87** | **1,897.75** | **22.03** | **3.71** | **106.72** |

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

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Calculations for LOM: 20

**Mobile Machinery**
**Machinery Specifications**

APP_C4_23
_FuelCons
_Units

| | Make and Model [1] | Type | Engine | Rating (*hp*) [1] | Units [1] |
|---|---|---|---|---|---|
| Eqp | Komatsu PC8000 | Hydraulic Shovel | 2 X Komatsu SDA16V160 | 4,020 | 1 |
| Eqp | LeTourneau L2350 | Front-End Loader | MTU/DD 16V4000 | 2,300 | 2 |
| Eqp | Caterpillar 994F | Front-End Loader | Cat 3516B | 1,577 | 1 |
| Eqp | Liebherr T282C | Haul Truck | MTU/DD 20V4000 | 3,755 | 69 |
| Eqp | Caterpillar 785C | Haul Truck | Cat 3512B | 1,450 | 8 |
| Eqp | Atlas Copco PV 275 | Drill | Cat C32 ACERT | 950 | 5 |
| Eqp | Atlas Copco DML | Drill | Cat C27 ACERT | 800 | 14 |
| Eqp | Atlas Copco L8 | Drill | | 540 | 5 |
| Eqp | Caterpillar D11T | Track Dozer | Cat C27 ACERT | 850 | 6 |
| Eqp | Caterpillar D10T | Track Dozer | Cat C32 ACERT | 646 | 4 |
| Eqp | Caterpillar 854G | Wheel Dozer | Cat C32 ACERT | 904 | 6 |
| Eqp | Caterpillar 24H | Grader | Cat C13 ACERT | 533 | 3 |
| Eqp | Caterpillar 16H | Grader | Cat C18 ACERT | 297 | 7 |
| Eqp | Caterpillar 785C | Water Truck | Cat 3512B | 1,450 | 4 |
| Eqp | Caterpillar 390DL | Hydraulic Excavator | Cat C18 ATAAC | 523 | 1 |
| Eqp | Komatsu PC2000 | Hydraulic Excavator | | 976 | 2 |
| Eqp | Caterpillar 777F | Fuel Truck | Cat C32 ACERT | 1,016 | 2 |
| Eqp | QTE Body on Peterbilt Chassis | Service Truck | | 300 | 1 |
| Eqp | Grove GMK6350 (200T) | Mobile Crane | Benz OM906LA | 563 | 1 |
| Eqp | QTE Body on Peterbilt Chassis | Low Boy Truck | | 300 | 1 |
| Eqp | Caterpillar 988 | Tire Handler | | 501 | 2 |
| Eqp | Terex LT7000 | Light Plant | | 25 | 10 |

(1) *Donlin*

Operation 365 *day/yr*
24 *hr/day*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

| **Air Sciences Inc.** | PROJECT TITLE: Donlin Gold | BY: E. Memon | | |
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Calculations for LOM: 20

**Machinery Operation, Fuel, and Output** — **Applicable Tier 4 Emission Standards (*g/kW-hr*)**

| Make and Model | EF Lookup ID | Operation (*hr*) (1) | Fuel (*L/hr*) (1) | Output (*hp-hr*) (2) | Output (*kW-hr*) | PM | NOx | NMHC | CO | SO2 (3) | Fuel (*gal/yr*) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Eqr Komatsu PC8000 | 5 | 4,088 | 550 | 11,046,049 | 8,237,050 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 594,024 |
| Eqr LeTourneau L2350 | 5 | 10,575 | 213 | 11,064,720 | 8,250,973 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 595,028 |
| Eqr Caterpillar 994F | 5 | 1,997 | 165 | 1,618,496 | 1,206,914 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 87,038 |
| Eqr Liebherr T282C | 5 | 406,594 | 280 | 559,699,738 | 417,368,673 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 30,099,013 |
| Eqr Caterpillar 785C | 5 | 6,740 | 90 | 2,994,303 | 2,232,855 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 161,025 |
| Eqr Atlas Copco PV 275 | 5 | 25,237 | 75 | 9,298,087 | 6,933,593 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 500,024 |
| Eqr Atlas Copco DML | 5 | 66,272 | 75 | 24,416,229 | 18,207,207 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 1,313,033 |
| Eqr Atlas Copco L8 | 4 | 21,239 | 34 | 3,547,359 | 2,645,269 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 190,767 |
| Eqr Caterpillar D11T | 5 | 17,374 | 130 | 11,095,148 | 8,273,663 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 596,665 |
| Eqr Caterpillar D10T | 4 | 18,662 | 98 | 8,983,957 | 6,699,346 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 483,131 |
| Eqr Caterpillar 854G | 5 | 27,993 | 87 | 11,963,331 | 8,921,068 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 643,353 |
| Eqr Caterpillar 24H | 4 | 10,034 | 76 | 3,745,974 | 2,793,377 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 201,448 |
| Eqr Caterpillar 16H | 4 | 35,620 | 37 | 6,474,128 | 4,827,764 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 348,160 |
| Eqr Caterpillar 785C | 5 | 13,953 | 100 | 6,854,052 | 5,111,074 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 368,591 |
| Eqr Caterpillar 390DL | 4 | 3,439 | 75 | 1,266,989 | 944,795 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 68,135 |
| Eqr Komatsu PC2000 | 5 | 7,525 | 120 | 4,436,022 | 3,307,946 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 238,556 |
| Eqr Caterpillar 777F | 5 | 6,544 | 65 | 2,089,431 | 1,558,091 | 0.04 | 3.5 | 0.19 | 3.5 | 0.00661 | 112,363 |
| Eqr QTE Body on Peterbilt Chassis | 4 | 2,181 | 16 | 171,440 | 127,843 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 9,220 |
| Eqr Grove GMK6350 (200T) | 4 | 1,183 | 20 | 116,187 | 86,641 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 6,248 |
| Eqr QTE Body on Peterbilt Chassis | 4 | 1,454 | 140 | 1,000,069 | 745,753 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 53,781 |
| Eqr Caterpillar 988 | 4 | 3,635 | 80 | 1,428,671 | 1,065,361 | 0.02 | 0.4 | 0.19 | 3.5 | 0.00661 | 76,830 |
| Eqr Terex LT7000 | 1 | 14,542 | 12 | 857,202 | 639,217 | 0.4 | 7.5 | 7.5 | 6.6 | 0.00661 | 46,098 |

(1) *Donlin*

(2) *Based on: Fuel heating value of:* 130,167 *Btu/gal* *Donlin*
*Diesel engine efficiency of:* 7,000 *Btu/hp-hr* *AP-42 Default*

(3) *Not a 40 CFR 1039 standard. Calculated from fuel use and sulfur content, provided on next page.*

**Tier 4 Emission Standards (*g/kW-hr*)** *40 CFR 1039, Table 1 of § 1039.101, current as of 03/07/13*

| Engine Rating | | | Lookup ID | PM | NOx | NMHC | CO |
|---|---|---|---|---|---|---|---|
| 1 | ≤ hp < | 25.5 | 1 | 0.40 | 7.50 | 7.50 | 6.60 |
| 25.5 | ≤ hp < | 75.1 | 2 | 0.03 | 4.70 | 4.70 | 5.00 |
| 75.1 | ≤ hp < | 174.3 | 3 | 0.02 | 0.40 | 0.19 | 5.00 |
| 174.3 | ≤ hp < | 751 | 4 | 0.02 | 0.40 | 0.19 | 3.50 |
| 751 | < hp | | 5 | 0.04 | 3.50 | 0.19 | 3.50 |

Total Machinery Fuel Consumption 139,274,806 *L/yr*
36,792,529 *gal/yr*

**Sample Calculations**
**SO2 Emission Factor**

$$\frac{15\ \text{lb S}}{1.00\text{E}+06\ \text{lb Fuel}} \times \frac{6.74\ \text{lb Fuel}}{\text{gal Fuel}} \times \frac{\text{gal Fuel}}{130{,}167\ \text{Btu}} \times \frac{7{,}000\ \text{Btu}}{\text{hp-hr}} \times \frac{1.34102\ \text{hp}}{\text{kW}} \times \frac{453.592\ \text{g}}{\text{lb}} \times \frac{2\ \text{g SO2}}{\text{g S}} = \frac{0.00661\ \text{g SO2}}{\text{kW-hr}}$$

Conversion(s):
3.78541 *L/gal*
1.34102 *hp/kW*
453.592 *g/lb*
2,000 *lb/ton*
907,184 *g/ton*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

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Calculations for LOM: 20

**Machine-Specific Emissions** *(ton/yr)*

| Make and Model | PM | NOx | NMHC | CO | SO2 (1) |
|---|---|---|---|---|---|
| Komatsu PC8000 | 0.36 | 31.78 | 1.73 | 31.78 | 0.06 |
| LeTourneau L2350 | 0.36 | 31.83 | 1.73 | 31.83 | 0.06 |
| Caterpillar 994F | 0.05 | 4.66 | 0.25 | 4.66 | 0.01 |
| Liebherr T282C | 18.40 | 1,610.25 | 87.41 | 1,610.25 | 3.04 |
| Caterpillar 785C | 0.10 | 8.61 | 0.47 | 8.61 | 0.02 |
| Atlas Copco PV 275 | 0.31 | 26.75 | 1.45 | 26.75 | 0.05 |
| Atlas Copco DML | 0.80 | 70.25 | 3.81 | 70.25 | 0.13 |
| Atlas Copco L8 | 0.06 | 1.17 | 0.55 | 10.21 | 0.02 |
| Caterpillar D11T | 0.36 | 31.92 | 1.73 | 31.92 | 0.06 |
| Caterpillar D10T | 0.15 | 2.95 | 1.40 | 25.85 | 0.05 |
| Caterpillar 854G | 0.39 | 34.42 | 1.87 | 34.42 | 0.07 |
| Caterpillar 24H | 0.06 | 1.23 | 0.59 | 10.78 | 0.02 |
| Caterpillar 16H | 0.11 | 2.13 | 1.01 | 18.63 | 0.04 |
| Caterpillar 785C | 0.23 | 19.72 | 1.07 | 19.72 | 0.04 |
| Caterpillar 390DL | 0.02 | 0.42 | 0.20 | 3.65 | 0.01 |
| Komatsu PC2000 | 0.15 | 12.76 | 0.69 | 12.76 | 0.02 |
| Caterpillar 777F | 0.07 | 6.01 | 0.33 | 6.01 | 0.01 |
| QTE Body on Peterbilt Chassis | 0.003 | 0.06 | 0.03 | 0.49 | 0.001 |
| Grove GMK6350 (200T) | 0.002 | 0.04 | 0.02 | 0.33 | 0.001 |
| QTE Body on Peterbilt Chassis | 0.02 | 0.33 | 0.16 | 2.88 | 0.01 |
| Caterpillar 988 | 0.02 | 0.47 | 0.22 | 4.11 | 0.01 |
| Terex LT7000 | | | | | |
| **Total Emissions** | **22.03** | **1,897.75** | **106.72** | **1,965.87** | **3.71** |

*Set to zero per ADEC 3/16/2015* (Terex LT7000)

(1) *Based on* 15 *ppm S content and diesel density of* 6.74 *lb/gal* *MSDS - Ultra Low Sulfur Diesel No. 1*

*Numbers in blue are direct entries. Green text/numbers are lookup codes or results.*

# Appendix C – Best Available Control Technology Review

AIR SCIENCES INC.

DENVER • PORTLAND

# Best Available Control Technology Review

# Donlin Gold Project, Alaska

PREPARED FOR:
DONLIN GOLD LLC

PROJECT NO. 281-21B-1
OCTOBER 27, 2021

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**Tables**

**Attachments**

# LIST OF ABBREVIATIONS

| | |
|---|---|
| AAC | Alaska Administrative Code |
| ADEC | Alaska Department of Environmental Conservation |
| Air Permit | Air Quality Control Construction Permit No. AQ0934CPT01 issued June 30, 2017 |
| ANFO | Ammonium Nitrate and Fuel Oil |
| BACT | Best Available Control Technology |
| Btu | British Thermal Unit |
| °C | Degrees Celsius |
| CCS | Carbon Capture and Sequestration |
| CFR | Code of Federal Regulations |
| $CH_4$ | Methane |
| CO | Carbon Monoxide |
| $CO_2$ | Carbon Dioxide |
| $CO_2e$ | Carbon Dioxide Equivalent |
| Donlin Gold | Donlin Gold LLC |
| dscf | Dry Standard Cubic Foot |
| dscfm | Dry Standard Cubic Feet per Minute |
| dscm | Dry Standard Cubic Meter |
| EPA | U.S. Environmental Protection Agency |
| ESP | Electrostatic Precipitator |
| EW | Electrowinning |
| °F | Degrees Fahrenheit |
| g | Gram |
| GC | Gyratory Crusher |
| GHG | Greenhouse Gas |
| gr | Grain |
| $H_2S$ | Hydrogen Sulfide |
| hp | Horsepower |
| hr | Hour |
| in. W.C. | Inches of Water Column |
| kg | Kilogram |
| kW | Kilowatt |

| | |
|---|---|
| LAER | Lowest Achievable Emission Rate |
| lb | Pound |
| mg | Milligram |
| mm | Millimeter |
| MMBtu | Million British Thermal Units |
| mph | Miles per Hour |
| MW | Megawatt |
| NG | Natural Gas |
| $NO_X$ | Oxides of Nitrogen |
| NSCR | Non-selective catalytic reduction |
| NSPS | New Source Performance Standards |
| NSR | New Source Review |
| $O_2$ | Oxygen |
| $O_3$ | Ozone |
| PAX | Xanthate |
| Pb | Lead |
| PM | Particulate Matter |
| $PM_{2.5}$ | Particulate Matter Less than 2.5 Microns in Diameter |
| $PM_{10}$ | Particulate Matter Less than 10 Microns in Diameter |
| POX | Pressure Oxidation |
| ppm | Parts Per Million |
| ppmvd | Parts Per Million, Volumetric Dry |
| Project | Donlin Gold project |
| PSD | Prevention of Significant Deterioration |
| PTE | Potential to Emit |
| RACT | Reasonably Available Control Technology |
| RBLC | RACT/BACT/LAER Clearinghouse |
| SAG | Semi-Autogenous Grinding |
| scf | Standard Cubic Foot |
| SCR | Selective Catalytic Reduction |
| SNCR | Selective Non-Catalytic Reduction |
| $SO_2$ | Sulfur Dioxide |
| ULSD | Ultra-Low-Sulfur Diesel |
| VOC | Volatile Organic Compound |

# 1.0 BACT APPLICABILITY

Donlin Gold LLC (Donlin Gold) is proposing to construct and operate the Donlin Gold mine: a hard rock, open pit, gold mine (Project). The Project is located in southwest Alaska, approximately 280 miles west of Anchorage. Donlin Gold is an Alaskan operated company that is owned by Barrick Gold U.S. Inc., a subsidiary of Barrick Gold Corporation, and NovaGold Resources Alaska Inc., a subsidiary of NovaGold Resources, Inc.

With regards to air pollutant emissions, the Project is a major stationary source subject to the Prevention of Significant Deterioration (PSD) regulations of 40 Code of Federal Regulations (CFR) 52.21, adopted by reference in 18 Alaska Administrative Code (AAC) 50.040(h). In accordance with the PSD regulations under 40 CFR 51.21(j)(2), Donlin Gold has conducted a Best Available Control Technology (BACT) review to determine the BACT controls and emission limits for each regulated New Source Review (NSR) pollutant with the potential to emit in significant amounts from the Project's air emission sources.

Table 1-1 provides the facility-wide total potential emissions for each NSR pollutant compared to the significant level. As shown by Table 1-1, a BACT review is required for carbon monoxide (CO), oxides of nitrogen ($NO_X$), particulate matter (PM), particulate matter less than 10 microns in diameter ($PM_{10}$), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), ozone ($O_3$),[1] and greenhouse gases (GHG).

The Alaska Department of Environmental Conservation (ADEC) issued Air Quality Control Construction Permit No. AQ0934CPT01 for the Project on June 30, 2017 (Air Permit). The following BACT review validates and remains consistent with the BACT controls and emission limits currently established in the Air Permit.

[1] "Volatile organic compounds (VOC) and nitrogen oxides are precursors to $O_3$ in all attainment and unclassifiable areas." 40 CFR §52.21(b)(50)(i)(b)(1)

**Table 1-1. Facility-Wide PTE of NSR Pollutants**

| NSR Pollutant | Facility-Wide PTE (ton/yr)* | Significant Level (ton/yr)** | BACT Required |
|---|---|---|---|
| CO | 1,256 | 100 | Yes |
| $NO_X$ | 1,230 | 40 | Yes |
| $PM_{2.5}$ | 643 | 10 | Yes |
| $PM_{10}$ | 660 | 15 | Yes |
| PM | 693 | 25 | Yes |
| $SO_2$ | 23 | 40 | No |
| $O_3$ | 1,168 VOC<br>1,230 $NO_X$ | 40<br>(VOC or $NO_X$) | Yes |
| Pb | 0.043 | 0.6 | No |
| Fluorides | 0 | 3 | No |
| $H_2S$ | 2.8 | 10 | No |
| Total Reduced Sulfur | 2.8 | 10 | No |
| $CO_{2e}$<br>GHG*** | 1,731,120<br>1,726,426 | 75,000<br>-- | Yes<br>-- |

* The Facility-Wide PTE includes stationary source non-fugitive emissions. "The fugitive emissions of a stationary source shall not be included in determining for any of the purposes of this section whether it is a major stationary source, unless the source belongs to one of the following categories of stationary sources…" 40 CFR §52.21(b)(1)(iii). The Project does not belong to a listed category.
** 40 CFR §52.21(b)(23)(i) and (b)(49)(iv)(a)
*** GHG is a regulated pollutant per 40 CFR §52.21(b)(49)(iv)(a) and is subject to BACT review if the facility is a major stationary source and if the $CO_{2e}$ potential emissions exceed 75,000 tons per year (ton/yr).

## 1.1 Emission Units Subject to BACT

Pollutants emitted in significant amounts requiring a BACT review are CO, $NO_X$, PM, $PM_{10}$, $PM_{2.5}$, $O_3$ (VOC), and GHG. The emission units that emit one or more of these pollutants are identified in the list below, along with the pollutants emitted requiring a BACT review. This list is divided between the larger emission units requiring permitting under a Title V operating permit after startup, per 18 Alaska Administrative Code (AAC) 50.326, and the smaller, insignificant emission units that do not require permitting under Title V. The BACT reviews provided in Section 2.0 are more comprehensive for the larger Title V emission units. In addition, BACT reviews are provided for fugitive sources (unpaved roads, material loading and unloading, wind erosion, drilling, and blasting) per guidance received from the ADEC (ADEC 2015).

Emission units subject to Title V permitting:

- Main Power Plant – CO, $NO_X$, Particulates,[2] VOC, GHG
- Ore Crushing – Particulates
- Autoclaves – CO, Particulates, VOC, GHG
- Boilers and Heaters – CO, $NO_X$, Particulates, VOC, GHG
- Black Start and Emergency Diesel Engines – CO, $NO_X$, Particulates, VOC, GHG
- Small Diesel Engines – CO, $NO_X$, Particulates, VOC, GHG
- Carbon Regeneration Kiln – CO, $NO_X$, Particulates, VOC
- Induction Melting Furnace – Particulates
- Pressure Oxidation Hot Cure – Particulates
- Electrowinning Cells – Particulates
- Retort – Particulates
- Laboratories – Particulates
- Reagent Handling for Water Treatment – Particulates
- Mill Reagents Handling – Particulates
- Fuel Tanks – VOC
- Incinerators – CO, $NO_X$, Particulates, GHG
- Acidulation Tanks and Neutralization Tanks – GHG

Fugitive emission sources:

- Fugitive Dust from Unpaved Roads – Particulates
- Fugitive Dust from Material Loading and Unloading – Particulates
- Fugitive Dust from Wind Erosion – Particulates

---

[2] Particulates include PM, $PM_{10}$, and $PM_{2.5}$.

- Fugitive Dust from Drilling and Blasting – Particulates
- Fugitive Combustion Emissions from Blasting – CO, $NO_X$, GHG

Title V insignificant emission units:

- Portable Building Heaters – CO, $NO_X$, Particulates, VOC, GHG
- Building Heaters – CO, $NO_X$, Particulates, VOC, GHG
- $SO_2$ Burners – CO, $NO_X$, Particulates, VOC, GHG
- Air Handler Heaters – CO, $NO_X$, Particulates, VOC, GHG
- Tanks ≤10,000 gallons – VOC

A complete list of each individual emission unit and its identifier are provided in Appendix A of the PSD Construction Permit Application Report.

# 2.0 BACT REVIEW

This section provides a BACT review for each emission unit and pollutant described in Section 1.0. The BACT review process requires determination of BACT on a case-by-case basis and consideration of the unique aspects of each emission unit. The following sections contain the required review and BACT determination using the guidelines from Chapter B of the U.S. Environmental Protection Agency (EPA) guidance document, *New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting, Draft* (EPA 1990). The review was conducted using the following five steps:

1. Identification of all possible control technologies
2. Elimination of technologically infeasible technologies
3. Ranking the technologies by control effectiveness
4. Evaluation of the most effective control technology considering economic, energy, and environmental impacts
5. Selection of BACT

The proposed BACT determinations provided herein for the Project sources are compared to the applicable New Source Performance Standards (NSPS). "[C]omparing control options to an NSPS is to determine whether the control option would result in an emissions level less stringent than the NSPS. If so, the option is unacceptable" (EPA 1990). For many of the Project sources, the top (most effective) control option is selected as BACT. This eliminates the need for providing "cost and other detailed information in regard to other control options" (EPA 1990).

Each of the following sections provides a BACT review for a specific process at the Project. A summary of the results for each step of the BACT review for each source is provided in Attachment C1. The search results downloaded from the EPA RACT/BACT/LAER Clearinghouse (RBLC) (EPA 2021) and used for Step 1 are provided in Attachment C2. Control technology cost-effectiveness calculations used for Step 4 are provided in Attachment C3.

## 2.1 Main Power Plant [EU ID 1-12]

Electric power for the mine will be generated from a dual-fuel (natural gas [NG] and ultra-low-sulfur diesel [ULSD]) reciprocating-engine onsite power plant with a steam turbine utilizing waste heat recovered from the engines (combined cycle power plant). The combined cycle power plant will consist of 12 Wärtsilä Model 18V50DF engines, each rated at approximately 17 megawatts (MW), for a total of 205 MW (gross) from the engines and an additional 15 MW (gross) from the steam turbine. The total gross power output from the plant will be 220 MW.

The power plant will emit CO, $NO_X$, $SO_2$, particulates, VOC, and GHG. The following sections provide a BACT review for each of these pollutants (except $SO_2$) for each fuel type.

## 2.1.1 CO

Possible CO emission control technologies for large engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process codes 17.100 to 17.190, Large Internal Combustion Engines (>500 horsepower [hp]). The search results for gas-fired and oil-fired engines are summarized in Table 2-1 and Table 2-2, respectively.

**Table 2-1. CO Control Options for Large Engines (Gas-Fired)**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
|---|---|---|
| Oxidation catalyst | 22* | 0.08 to 1.0 |
| NSCR | 1 | 0.30 |
| NSPS JJJJ | 5 | 2.8 to 4.4 |
| Good combustion practices | 15 | 3.3 to 5.2 |
| No control specified | 22 | 0.13 to 5.0 |

* Includes the Project's BACT determination of oxidation catalyst (0.09 g/hp-hr) from its air permit issued in 2017.

**Table 2-2. CO Control Options for Large Engines (Oil-Fired)**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
|---|---|---|
| Oxidation catalyst | 3* | 0.13 to 3.3 |
| NSPS IIII | 23 | 0.16 to 2.6 |
| Good combustion practices | 74 | 0.31 to 3.7 |
| No control specified | 47 | 0.13 to 23.2** |

* Includes the Project's BACT determination of oxidation catalyst (0.13 g/hp-hr) from its air permit issued in 2017.
** Listed as 7.3 lb/MMBtu in the RBLC and converted to g/hp-hr assuming 7,000 Btu/hp-hr.

Control options for the 18V50DF Wärtsilä engines for both NG firing and oil firing modes are as follows:

- Good combustion practices. Complete and efficient combustion reduces the formation of incomplete combustion by-products such as CO.
- Oxidation catalyst. An oxidation catalyst is an add-on control technology that oxidizes incomplete combustion by-products.

- Non-selective catalytic reduction (NSCR) is an effective NOx-reduction technology for rich-burn, spark-ignited stationary gas engines. The catalyst promotes the low temperature (approximately 850°F) reduction of $NO_X$ into nitrogen, the oxidation of CO into carbon dioxide ($CO_2$), and the oxidation of VOCs (MECA 2015).

NSCR catalyst efficiency is directly related to the air/fuel mixture and temperature of the exhaust. Efficient operation of the catalyst typically requires the engine exhaust gases contain no more than 0.5% oxygen ($O_2$) (MECA 2015). To obtain the proper exhaust gas $O_2$ across the operating range, an air/fuel ratio controller is installed that measures the oxygen concentration in the exhaust and adjusts the inlet air/fuel ratio to meet the proper 0.5% $O_2$ exhaust requirement for varying engine load conditions, engine speed conditions, and ambient conditions (MECA 2015). This control technology is not applicable to the lean-burn combustion technology of the Wärtsilä engines.

Donlin Gold proposes to select the top control option of an oxidation catalyst (combined with good combustion practices) as BACT to reduce CO emissions from both NG and ULSD firing. The resulting BACT CO emission rates are 0.12 g/kW-hr (0.09 g/hp-hr) for NG firing and 0.18 g/kW-hr (0.13 g/hp-hr) for ULSD firing. The total capital cost for installing one oxidation catalyst and one selective catalytic reduction (SCR) system on each of the 12 engines is $20 million (Wärtsilä 2013c). The SCR system is discussed in Section 2.1.2.

The BACT emission rates are below the applicable NSPS:

- NSPS JJJJ for NG firing mode – 2 g/hp-hr [§ 60.4233(e) and Table 1 to NSPS JJJJ]

- NSPS IIII for ULSD firing mode – No limit established for CO emissions

The oxidation catalyst will reduce CO emissions and will result in minimal energy and environmental impacts. The oxidation catalyst requires no consumables and does not produce waste effluents or by-products (other than catalyst replacement/recycling every few years). Back pressure from the catalyst system is expected to be minimal and thus will have a minimal effect on engine efficiency.

### 2.1.2 $NO_X$

Possible $NO_X$ emission control technologies for large engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process codes 17.100 to 17.190, Large Internal Combustion Engines (>500 hp). The search results for gas-fired and oil-fired engines are summarized in Table 2-3 and Table 2-4, respectively.

**Table 2-3. $NO_X$ Control Options for Large Engines (Gas-Fired)**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
| --- | --- | --- |
| SCR | 8* | 0.05 to 0.5 |
| NSCR | 2 | 0.2 to 0.5 |
| NSPS JJJJ | 5 | 0.5 to 2.0 |
| Good combustion practices | 20 | 0.08 to 2.0 |
| No control specified | 34 | 0.7 to 2.0 |

* Includes the Project's BACT determination of SCR (0.06 g/hp-hr) from its air permit issued in 2017.

**Table 2-4. $NO_X$ Control Options for Large Engines (Oil-Fired)**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
| --- | --- | --- |
| SCR | 3* | 0.4 to 2.1 |
| NSPS IIII | 21 | 0.5 to 8.9 |
| Good combustion practices | 76 | 0.3 to 19.4 |
| No control specified | 67 | 0.5 to 7.3 |

* Includes the Project's BACT determination of SCR (0.40 g/hp-hr) from its air permit issued in 2017.

Control options for the 18V50DF Wärtsilä engines for both gas and liquid fuel firing modes are as follows:

<u>Gas firing</u>

- Lean-burn combustion technology. In the lean-burn process, NG and air are pre-mixed before being introduced into the cylinders. This low fuel/air ratio—lean-burn—reduces $NO_X$ emissions due to a lower combustion temperature (Wärtsilä 2013a).
- Selective Catalytic Reduction. SCR is an add-on control that converts $NO_X$ to nitrogen and water vapor by reacting the $NO_X$ with ammonia or urea in the presence of a catalyst.

<u>Liquid fuel firing</u>

- Low $NO_X$ combustion. This process entails the following elements for suppressing the combustion peak temperatures to reduce $NO_X$ formation: late fuel injection start, high compression ratio, optimized combustion chamber, optimized fuel injection rate profile, early inlet valve closing (Miller concept), and high boost pressure (Wärtsilä 2013b).
- SCR. See description above.

Theoretically, up to 40 percent reduction in $NO_X$ emissions can be achieved by application of direct water injection at a rate of 50 to 60 percent of the fuel consumption (Nystén 2011). Very high-quality water is required to achieve this magnitude of $NO_X$ reduction and avoid damaging the engine. Water injection is not a viable control option for the Wärtsilä Model 18V50DF engines because Wärtsilä currently does not offer this technology for these engines (Nystén 2011).

As discussed in Section 2.1.1, NSCR is not applicable to the lean-burn combustion technology of the Wärtsilä engines.

Donlin Gold proposes to select the top control option of SCR (combined with good combustion practices) as BACT to reduce $NO_X$ emissions from both NG and ULSD firing. The resulting BACT $NO_X$ emission rates are 0.08 g/kW-hr (0.06 g/hp-hr) for NG firing and 0.53 g/kW-hr (0.40 g/hp-hr) for ULSD firing. The total capital cost for installing one oxidation catalyst and one SCR system on each of the 12 engines is $20 million (Wärtsilä 2013c). The oxidation catalyst system is discussed in Section 2.1.1.

The BACT emission rates are below the applicable NSPS:

- NSPS JJJJ for gas firing mode – 1 g/hp-hr [§ 60.4233(e) and Table 1 to NSPS JJJJ]
- NSPS IIII for ULSD firing mode – 2.597 g/kW-hr (1.933 g/hp-hr) [§ 60.4204(c)(3)]

The SCR system will reduce $NO_X$ emissions, but it will also result in the following energy and environmental impacts:

- SCR systems add exhaust back pressure,[3] reducing plant electrical efficiency. Thus, additional fuel (energy) is required to produce the same amount of electricity.
- The SCR catalyst loses activity over time and must be periodically replaced. This results in energy impacts from the recycling of the catalyst metals and a waste stream from the disposal of the non-recyclable materials.
- SCR systems emit ammonia from the inherent ammonia slip of the system. The ammonia slip is expected to be less than or equal to 9 parts per million (ppm) (Wärtsilä 2011).

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[3] The pressure drop for SCR duct work is 3 inches of water column (in. W.C.), and the pressure drop for each SCR catalyst layer is 1 in. W.C. (EPA 2002).

### 2.1.3 Particulates

Possible PM emission control technologies for large engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process codes 17.100 to 17.190, Large Internal Combustion Engines (>500 hp). The search results for gas-fired and oil-fired engines are summarized in Table 2-5 and Table 2-6, respectively.

**Table 2-5. PM Control Options for Large Engines (Gas-Fired)**

| Control Technology | Number of Determinations* | Emission Limit (g/hp-hr) |
|---|---|---|
| Coalescing Filter | 3 | 0.23*** |
| NSPS JJJJ | 2 | 0.15 to 0.23 |
| Good combustion practices | 20** | 0.0003 to 0.24 |
| Clean fuels | 4 | 0.038 to 0.34 |
| No control specified | 15 | 0.0001 to 0.2 |

* Separate determinations for different types of PM (PM, $PM_{10}$, $PM_{2.5}$, filterable, etc.) for the same engine were counted as one determination.
** Includes the Project's BACT determination of good combustion practices and clean fuels (0.10 g/hp-hr) from its air permit issued in 2017.
*** Listed as 1.2 lb/hr and 16.5 MMBtu/hr in the RBLC, which is 0.073 lb/MMBtu. This was converted to g/hp-hr assuming 7,000 Btu/hp-hr.

**Table 2-6. PM Control Options for Large Engines (Oil-Fired)**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
|---|---|---|
| Particulate Filter | 2 | 0.15 |
| NSPS IIII | 15 | 0.025 to 0.24 |
| Good combustion practices | 78* | 0.015 to 0.32 |
| Clean fuels | 14 | 0.03 to 0.30 |
| No control specified | 47 | 0.02 to 0.37 |

* Includes the Project's BACT determination of good combustion practices and clean fuels (0.22 g/hp-hr) from its air permit issued in 2017.

Control options identified for the 18V50DF Wärtsilä engines for both gas and liquid fuel firing modes are filters, NSPS-certified engine, clean fuels, good combustion practices, or unspecified. Additional possible add-on control technologies include an electrostatic precipitator (ESP) and a wet scrubber. However, these controls are ineffective at capturing the very fine particulates generated from NG and ULSD combustion. Therefore, they are not considered viable control options.

The coalescing filter determinations in Table 2-5 are for three small landfill gas-fired engines (16.5 MMBtu/hr each). However, the emission limits for these engines are significantly higher than the Project's BACT emission limit of 0.13 g/kW-hr (0.097 g/hp-hr) for gas firing. The particulate filter determinations in Table 2-6 are for two 1,341 hp emergency generators with a per cylinder displacement of <10 liters and subject to the Tier 2 standard for filterable particulate of 0.2 g/kW-hr (0.149 g/hp-hr). This emission limit is higher than the Project's BACT emission limit for filterable particulate of 0.15 g/kW-hr (0.11 g/hp-hr)[4] for oil firing.

Donlin Gold proposes to select clean fuels and good combustion practices as BACT for particulates. The resulting BACT particulate (PM, $PM_{10}$, and $PM_{2.5}$) emission rates are 0.13 g/kW-hr (0.10 g/hp-hr) for NG firing, 0.15 g/kW-hr (0.11 g/hp-hr) for front-half particulate, and 0.29 g/kW-hr (0.22 g/hp-hr) for total front-half and condensable particulate for ULSD firing. Natural gas is the cleanest fossil fuel available with regard to particulate emissions. The ULSD used will be fuel oil No. 1 grade, which has negligible ash content, thus resulting in low particulate emissions.

The BACT emission rates comply with the applicable NSPS:

- NSPS JJJJ for gas firing mode – No limit established for PM emissions
- NSPS IIII for ULSD firing mode – 0.15 g/kW-hr (0.11 g/hp-hr) [§ 60.4204(c)(4)]

There are no significant energy or environmental impacts associated with the use of clean fuels for particulate control.

## 2.1.4 VOC

Possible VOC emission control technologies for large engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process codes 17.100 to 17.190, Large Internal Combustion Engines (>500 hp). The search results for gas-fired and oil-fired engines are summarized in Table 2-7 and Table 2-8, respectively.

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[4] NSPS IIII limit for particulates (front half only) [40 CFR §60.4204(c)(4)].

**Table 2-7. VOC Control Options for Large Engines (Gas-Fired)**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
|---|---|---|
| Oxidation catalyst | 22* | 0.07 to 0.50 |
| NSCR | 1 | 0.20 |
| NSPS JJJJ | 4 | 1.0 |
| Good combustion practices | 4 | 1.0 |
| No control specified | 20 | 0.07** to 5.8 |

* Includes the Project's BACT determination of oxidation (0.07 g/hp-hr) from its air permit issued in 2017.
** Listed as 20 ppmvd at 3% $O_2$ in the RBLC and converted to g/hp-hr assuming 8,710 dscf/MMBtu and 7,000 Btu/hp-hr.

**Table 2-8. VOC Control Options for Large Engines (Oil-Fired)**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
|---|---|---|
| Oxidation catalyst | 2* | 0.16 to 0.18 |
| NSPS IIII | 17 | 0.03 to 4.8 |
| Good combustion practices | 56 | 0.011 to 4.8 |
| No control specified | 42 | 0.01 to 4.8 |

* Includes the Project's BACT determination of oxidation (0.16 g/hp-hr) from its air permit issued in 2017.

Control options for the 18V50DF Wärtsilä engines for both gas and liquid fuel firing modes are as follows:

- Good combustion practices
- Oxidation catalyst

Donlin Gold proposes to select the top control option of an oxidation catalyst (combined with good combustion practices) as BACT to reduce VOC emissions from both NG and ULSD firing. The resulting BACT VOC (as $CH_4$ [methane]) emission rates are 0.09 g/kW-hr (0.07 g/hp-hr) for NG firing and 0.21 g/kW-hr (0.16 g/hp-hr) for ULSD firing. The cost, energy, and environmental impacts of this control option are discussed in Section 2.1.1.

The proposed BACT emission rates are below the applicable NSPS:

- NSPS JJJJ for gas firing mode – 0.7 g/hp-hr [§ 60.4233(e) and Table 1 to NSPS JJJJ]

- NSPS IIII for ULSD firing mode – No limit established for VOC emissions

### 2.1.5 Startup Emissions

Upon engine startup, there is a short period before the emission control system (SCR and oxidation catalysts described in the previous sections) reaches its full emission abatement efficiency, and this period must be considered in evaluating the effectiveness of a control. The startup period varies for "warm" startup and "cold" startup. A warm startup is defined as a start where the temperature of the emission control system is at a minimum temperature of 270 degrees Celsius (°C) at the time of the start. Typically, this condition is fulfilled if the engine is started within four to eight hours after the engine is stopped. A cold startup is defined as a start where the temperature of the emission control system is not at a minimum temperature of 270°C at the time of the start.

For warm start conditions, the engine will typically reach steady-state conditions and the emission control system will reach its full abatement efficiency within 15 minutes of the start. For cold start conditions, the engine will reach steady-state conditions and the emission control system will typically reach its full abatement efficiency within 30 minutes of the start.

The estimated cumulative flue gas emissions expressed as kilograms (kg) per a start period (30 minutes) of one Wärtsilä 18V50DF engine are given in Table 2-9 for warm and cold startups.

**Table 2-9. Startup Emissions**

| | Gas (kg/start) | | Oil (kg/start) | |
|---|---|---|---|---|
| **Pollutant** | **Cold** | **Warm** | **Cold** | **Warm** |
| CO | 10 | 2 | 8 | 4 |
| $NO_X$ | 10 | 5 | 70 | 30 |
| VOC (as $CH_4$) | 7 | 2.5 | 6 | 4 |
| PM, $PM_{10}$, $PM_{2.5}$ | 1.5 | 1.2 | 3.5 | 3.5 |

(Wärtsilä 2011)

### 2.1.6 GHG

Possible GHG emission control technologies for large engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process codes 17.100 to 17.190, Large Internal Combustion Engines (>500 hp). The search results for gas-fired and oil-fired engines consisted of good combustion practices (or no control specified). The combustion efficiency in terms of g/hp-hr of $CO_2$ ranged from 157 to 601 for gas-fired engines, and from 364 to 618 for oil-fired engines.

A possible add-on control option for GHG is carbon capture and sequestration (CCS). Carbon sequestration is a geo-engineering technique used to remove the $CO_2$ from an exhaust gas stream and store it permanently in underground reservoirs (typically depleted oil or gas reservoirs) or other geological features. The technology captures $CO_2$ before it enters the atmosphere, compresses the $CO_2$ to a near liquid state, and transports it via pipeline to a site where it is injected deep underground. The deep geological formations that receive and hold $CO_2$ must be far below freshwater aquifers and below an impermeable rock cap or seal so that $CO_2$ cannot contaminate potable groundwater or escape to the atmosphere. Alternative sequestration techniques include converting $CO_2$ to baking soda or algae-based carbon capture. The long-term storage of $CO_2$ is a relatively new concept and has mostly been demonstrated on a pilot-scale. Transport and storage challenges include a lack of existing infrastructure (e.g., pipelines) and sites for secure, long-term $CO_2$ storage.

CCS is an emerging technology that has had limited successful application on an industrial scale, particularly for NG- and oil-fired power plants. There are currently no CCS systems commercially available for full-scale power plants in the United States. For BACT purposes, it is considered an innovative control option. "Innovative controls that have not been demonstrated on any source type similar to the proposed source need not be considered in the BACT analysis" (EPA 1990). Furthermore, CCS has not been demonstrated as available for the proposed remote Project location.

Donlin Gold proposes new energy efficient Wärtsilä 18V50DF engines operated in combined cycle as BACT for GHG. The power plant will recover the waste heat from the engines to enhance power output efficiency. The heat rate of the combined cycle plant will be 6,953 Btu/kW-hr (gross) for NG firing and 7,366 Btu/kW-hr (gross) for ULSD firing. This results in a GHG emissions of 882,130 ton/yr for NG firing and 1,229,630 ton/yr for ULSD firing. There are no adverse energy or environmental impacts from energy efficient combustion practices.

## 2.2 Ore Crushing and Transfers [EU ID 38-39, 41-46, 48, 50, 52, 54-56, 58]

The Project ore crushing circuit includes run-of-mine ore gyratory crushing, coarse ore transfers, and recycle pebble crushing. Particulate emissions are generated by the crushing and handling of the ore.

Mined ore will be loaded through a dump pocket (with a rock breaker) to the gyratory crusher (GC). The GC discharges through a surge pocket and apron feeder to a conveyor system. The run-of-mine ore discharge and crushing emission sources are as follows:

- GC dump pocket and rock breaker
- Gyratory crusher

- Surge pocket
- Apron feeder
- GC discharge conveyor

Ore will be carried by conveyor to the coarse ore stockpile. The coarse ore stockpile will be reclaimed by four apron feeders and transferred to the semi-autogenous grinding (SAG) mill feed conveyor. Coarse ore transfer emission sources are as follows:

- Stockpile feed conveyor
- Coarse ore reclaim apron feeders 1 to 4
- SAG mill feed conveyor

The SAG mill feed conveyor transfers ore to the SAG mill. The SAG mill is a wet process and does not generate particulate emissions. Material discharged from the SAG mill will be washed and screened, and the oversize material will be sent to the pebble crushers. After crushing, the ore will be discharged to the pebble discharge conveyor, which transfers to the SAG mill feed conveyor. The pebble crushers and transfer emission sources are as follows:

- Pebble crushers
- Pebble discharge conveyor

The BACT review for particulate emissions from the sources described above is provided in the following section.

### 2.2.1 Particulates

Possible particulate emission control technologies for ore crushing operations were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process name description containing the keywords "crush" or "conveyor," and under the process codes 80 to 90.999, Metallurgical Industry and Mineral Products. The search results are summarized in Table 2-10. For determinations that included more than one emission limit (i.e., separate emission limits for PM, $PM_{10}$, and $PM_{2.5}$), only the PM limit is shown in Table 2-10 to avoid duplicate control determinations.

**Table 2-10. PM Control Options for Crushing Circuit Sources**

| Control Technology | Number of Determinations | Emission Limit (gr/dscf) | Emission Limit (lb/ton) |
|---|---|---|---|
| ***Crushers*** | | | |
| Dust collector[1] | 12[2] | 0.002 to 0.010 | 0.0007 |
| Water sprays | 1 | No data | No data |
| Enclosure | 1[3] | 0.0005 | No data |
| ***Conveyors*** | | | |
| Dust collector[1] | 19 | 0.0005 to 0.005 | 0.0002 |
| Enclosure | 1 | No data | 0.00004 |
| Wet scrubber | 3 | 0.0025 to 0.0079 | No data |
| No control specified | 1 | No data | 0.00002 |

[1] Dust collector, fabric filter, or cartridge filter
[2] Includes the Project's BACT determination of dust collector (0.01 gr/dscf) from its air permit issued in 2017.
[3] Includes the Project's BACT determination of enclosure (0.005 gr/dscf) from its air permit issued in 2017.

An additional possible control option for crushers and conveyors not found in the RBLC search is an ESP. Control effectiveness rankings for the possible control technologies, from highest to lowest, are (1) dust collector, (2) ESP, (3) wet scrubber, (4) enclosure, and (5) water sprays or dust suppressant.[5]

Proposed BACT for the ore crushing particulate emission sources are listed in Table 2-11.

[5] EPA (1995) gives control efficiencies for all these emission control technologies except enclosures, which are addressed in AP-42 Section 13.2.4.3. Using AP-42 Section 13.2.4.3, Equation 1, and comparing the result with the average monitored wind speed at Donlin (8 miles per hour [mph]) versus the same calculation using the minimum wind speed for this equation (1.3 mph to account for the wind break created by the enclosure), the control efficiency is 91 percent.

**Table 2-11. Proposed BACT for Ore Crushing Particulate Emission Sources**

| Emission Source | Proposed BACT | BACT PM Emission Rate |
|---|---|---|
| ***Run-of-Mine Ore Discharge and Crushing*** | | |
| GC dump pocket and rock breaker | Enclosure | 0.00048 lb/ton |
| Gyratory crusher<br>Surge pocket<br>Apron feeder | Dust collector | 0.01 $gr/ft^3$ |
| GC discharge conveyor | Enclosure | 0.00048 lb/ton |
| ***Coarse Ore Transfer*** | | |
| Stockpile feed conveyor | Enclosure | 0.00048 lb/ton |
| Coarse ore reclaim apron feeders 1 to 4 | Dust collector | 0.01 $gr/ft^3$ |
| SAG mill feed conveyor | Enclosure | 0.00048 lb/ton |
| ***Pebble Crushers*** | | |
| Pebble crushers | Dust collector | 0.01 $gr/ft^3$ |
| Pebble discharge conveyor | Enclosure | 0.00048 lb/ton |

The top particulate emission control technology for crushers and conveyors is a dust collector. As shown in Table 2-11, dust collectors are proposed as BACT for all crushers and several transfer points. For the transfer points where a dust capture and control system are not feasible (as described below), an enclosure is proposed as BACT.

At the GC dump pocket, there will be an enclosure with openings (entry ways) to allow haul trucks to enter and dump ore into the GC dump pocket. When a haul truck is in position to unload its ore, the truck and enclosure together form a partial enclosure that surrounds the dump pocket. This enclosure reduces particulate emissions by blocking cross winds that can cause windblown dust and by forming a partial containment around the emission point. Because of the openings required for the trucks, add-on control options (dust collector, ESP, or wet scrubber) are ineffective due to the inability to fully enclose and capture the fugitive emissions from this source. Therefore, an enclosure is considered the top control option and proposed as BACT.

Fugitive dust capture and control systems are also considered infeasible for the GC discharge conveyor, stockpile feed conveyor, SAG mill feed conveyor, and pebble discharge conveyor. These conveyor transfer points have low emissions (0.00048 lb/ton of PM) and are too far from the dust collectors discussed above to be tied into these systems without excessive ducting. In case of the stockpile feed conveyor, the transfer point is both elevated and movable providing further dust capture problems. Therefore, an enclosure is proposed as BACT for these transfer points.

The proposed BACT for the run-of-mine ore discharge and crushing emission sources includes a single dust collector for the GC, surge pocket, and apron feeder; and enclosures for the GC dump pocket (with a rock breaker), and the GC discharge conveyor. The capital cost for the dust collector is $229,662 (AMEC 2013). The capital cost of the enclosures is negligible. Other costs include electricity for the dust collector fan and maintenance costs. Environmental impacts from the dust collector include disposal of waste generated by the dust collector (i.e., worn-out or broken bags).

The proposed BACT for the coarse ore transfer emission sources includes a dust collector for each apron feeder and enclosures for the stockpile feed conveyor and SAG mill feed conveyor. The capital cost is $94,952 for each dust collector, or $379,808 for all four dust collectors (AMEC 2013). The cost for the enclosures is negligible. Energy costs and environmental impacts of dust collectors are discussed above.

The proposed BACT for the pebble crushers emission sources consists of a dust collector for the crushers and an enclosure for the pebble discharge conveyor. The capital cost for the dust collector is $258,353 (AMEC 2013). The capital cost of the enclosures is negligible. Energy costs and environmental impacts of dust collectors and enclosures are discussed above.

The BACT emission rates for the dust collectors of 0.01 gr/dscf are below the applicable NSPS LL emission standard of 0.05 grams per dry standard cubic meter (0.02 gr/dscf) [§ 60.382(a)(1)]. For process fugitive sources, the NSPS LL limit is 10 percent opacity. The enclosures proposed as BACT for the process fugitive sources shown in Table 2-11 are expected to control opacity from dust emissions to well below 10 percent opacity. The proposed BACT emission rate for these fugitive sources is only 0.00048 lb/ton.

## 2.3 Autoclaves [EU ID 77, 81]

Concentrate POX will be carried out within the autoclave circuit. This circuit includes two autoclaves operating in parallel. POX refers to the oxidation of gold-bearing sulfide minerals to metal sulfates using a combination of heat, acid, and oxygen sparging in a specifically designed pressure vessel (i.e., autoclave). The oxidation of the sulfide minerals effectively releases the gold locked within the mineral matrix, rendering it amenable to leaching by cyanidation.

Each autoclave will have a design processing rate of 210 ton/hr of ore concentrate and will emit CO, particulates, VOC, $SO_2$, $H_2S$, and GHG. The following sections provide a BACT review for each of these pollutants except $SO_2$ and $H_2S$.

The RBLC was searched for all determinations in the last 10 years under the process name description containing the keyword "autoclave." The RBLC contains one determination for an ore autoclaving process, which is the Project's BACT determination from its permit issued in 2017. The only other determination found was for an autoclave used for pitch impregnation. This determination is not applicable to the Project's autoclaves.

### 2.3.1 CO

As discussed above, the only RBLC determinations for ore autoclaves is from the Project. There are, however, two similar ore autoclaving processes in Nevada:

- Barrick Goldstrike Mines, Inc. (six autoclaves)
- Newmont Mining Corporation – Twin Creeks Mine (two autoclaves)

None of these autoclaves employ any control for CO emissions. The previous determination listed for the Project in the RBLC is the use of good operating practices.

Possible add-on control options for CO include thermal and catalytic oxidation. The level of control that may be achieved by thermal and catalytic oxidation systems is unknown as there are no applications of these controls on ore autoclaves. In addition, because there are no commercial installations of these controls on this source type, they are not considered viable control options.

Donlin Gold proposes good operating practices for CO emissions. The resulting BACT CO emission rate is 88 pounds per hour (lb/hr) per autoclave.

These sources are not subject to an emission limit for CO under NSPS.

### 2.3.2 Particulates

The only RBLC determinations for ore autoclaves is from the Project (see Section 2.3). There are, however, two similar ore autoclaving processes in Nevada:

- Barrick Goldstrike Mines, Inc. (six autoclaves)
- Newmont Mining Corporation – Twin Creeks Mine (two autoclaves)

The particulate controls for these autoclaves are provided in Table 2-12.

**Table 2-12. Particulate Control Options for Autoclaves**

| Facility/Source | Controls | Emission Limit (lb/hr) |
|---|---|---|
| ***Barrick Goldstrike*** (NDEP 2020a) | | |
| Autoclave 1 | Venturi scrubber | 2.28 (per autoclave) |
| Autoclaves 2-3 | Venturi scrubber | 7 (per autoclave) |
| Autoclaves 4-6 | Primary and secondary venturi scrubbers | 2 (combined for all three autoclaves) |
| ***Newmont Twin Creeks*** (NDEP 2020b) | | |
| Autoclaves 1-2 | Primary and secondary venturi scrubbers | 8.4 (per autoclave) |
| ***Donlin Gold*** | | |
| Autoclaves 1-2 | Venturi scrubber | 0.22 |

Other possible add-on control technologies for particulates include a dust collector and ESP. Because of the high moisture content in the autoclave exhaust, dust collectors are not technically feasible due to plugging. A wet ESP may be technically feasible but is not expected to provide better control efficiency than venturi wet scrubbers.

Donlin Gold proposes to select the top control option of a venturi scrubber on each autoclave stack as BACT to reduce particulate emissions. The resulting BACT particulate (PM, $PM_{10}$, and $PM_{2.5}$) emission rate is 0.22 lb/hr per autoclave.

The capital cost for both venturi scrubbers is $355,200 (CGS 2011). Other costs include electricity for the scrubber water pumps and maintenance costs. Environmental impacts from the scrubbers include managing the scrubber effluent water.

These sources are not subject to an emission limit for particulates under NSPS.

### 2.3.3 VOC

The only RBLC determinations for ore autoclaves is from the Project (see Section 2.3). There are, however, two similar ore autoclaving processes in Nevada:

- Barrick Goldstrike Mines, Inc. (six autoclaves)
- Newmont Mining Corporation – Twin Creeks Mine (two autoclaves)

These autoclaves employ carbon adsorption for mercury control, which also controls for VOC emissions.

Possible add-on control options for VOC include thermal and catalytic oxidation, and carbon adsorption. The level of control that may be achieved by thermal and catalytic oxidation systems is unknown as there are no applications of these controls on ore autoclaves. In addition, because there are no commercial installations of these controls on this source type, they are not considered viable control options.

Donlin Gold proposes to select the top control option of a carbon adsorber on each autoclave stack as BACT to reduce VOC emissions. The resulting BACT VOC emission rate is 0.04 lb/hr per autoclave.

The capital cost for both carbon adsorbers with carbon is $919,200 (Hatch Ltd. 2011). Other costs include electricity for the adsorber fans, spent carbon replacement and disposal costs, and maintenance costs. Environmental impacts from the adsorbers include the disposal and/or recycling of the spent carbon.

These sources are not subject to an emission limit for VOC under NSPS.

### 2.3.4 GHG

Based on a mass balance analysis, the autoclaves will have a PTE of 37,659 ton/yr of GHG emissions from the oxidation of carbonaceous matter in the ore concentrate. As discussed in Section 2.1.6, the possible add-on control option for $CO_2$ is CCS. CCS is an emerging technology that has had limited successful application on an industrial scale. There are currently no CCS systems commercially available in the United States. For BACT purposes, it is considered an innovative control option. "Innovative controls that have not been demonstrated on any source type similar to the proposed source need not be considered in the BACT analysis" (EPA 1990). Furthermore, CCS has not been demonstrated as available for the proposed remote Project location.

Donlin Gold proposes good operating practices for GHG emissions.

## 2.4 Boilers and Heaters [EU ID 15-20, 24]

The Project will include three boilers and three heaters that will be fueled by NG or ULSD, and 19 air handler heaters that will be fired by NG only. The boilers and heaters will primarily burn NG; they will burn ULSD during periods when NG is unavailable. The boilers and heaters and their design heat input rates are as follows:

- POX boilers (2 units) – 29.29 MMBtu/hr, each
- Oxygen plant boiler – 20.66 MMBtu/hr
- Carbon elution heater – 16 MMBtu/hr

- Power plant auxiliary heaters (2 units) – 16.5 MMBtu/hr, each
- Air handler heaters (19 units) – 5 MMBtu/hr, each

During autoclave heat-up, high-pressure steam will be supplied to autoclaves by the POX boilers. High-pressure steam is not required for normal operation. The POX boilers produce steam, which is injected directly into the autoclaves along with oxygen, to promote the oxidation reaction. The oxygen plant boiler will produce steam for the regeneration of the oxygen plant's molecular sieves. The carbon elution heater will provide heat for the carbon stripping circuit. The power plant auxiliary heaters will provide space heating for the power plant buildings and auxiliary heat for the Wärtsilä engines during cold startups. The air handler heaters will provide heat for buildings. These sources will emit CO, $NO_X$, $SO_2$, particulates, VOC, and GHG. The following sections provide a BACT review for each of these pollutants except $SO_2$.

The POX boilers are defined as process heaters[6] and are thus exempt from NSPS Dc. The air handler heaters are also not subject to NSPS Dc because they do not heat "any heat transfer medium" (40 CFR §60.41c) across a physical barrier (i.e., heat exchanger). The oxygen plant boiler, carbon elution heater, and power plant auxiliary heaters are subject to NSPS Dc, but they are not subject to a limit under NSPS for any pollutants that require a BACT review.

The annual emissions discussed in this section for each pollutant are based on the worst-case scenario, i.e., NG or ULSD combustion, except for the air handlers, which are only fueled by NG.

## 2.4.1 CO

Possible CO emission control technologies for the boilers and heaters were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under process code 13, Commercial/Institutional-Size Boilers/Furnaces (<100 million Btu/hr), subcategories 13.31 Gaseous Fuel & Gaseous Fuel Mixtures and 13.22, Distillate Fuel Oil. The results of the RBLC search are summarized in Table 2-13.

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[6] "Process heater means a device that is primarily used to heat a material to initiate or promote a chemical reaction in which the material participates as a reactant or catalyst." [40 CFR §60.41c] In this case, the POX boilers produce steam (i.e., "heat a material"), which is injected directly into the autoclaves along with oxygen, to promote the oxidation reaction.

**Table 2-13. CO Control Options for Commercial Boilers**

| Control Technology | Number of Determinations Gas-fired | Number of Determinations Oil-fired | Emission Limit (lb/MMBtu) Gas-fired | Emission Limit (lb/MMBtu) Oil-fired |
|---|---|---|---|---|
| Oxidation catalyst | 5 | | 0.0035 to 0.28 | |
| Good combustion practices | 137 | 3 | 0.0075 to 0.11 | 0.036 to 0.084 |
| No control specified | 30 | 1 | 0.036 to 0.15 | 0.036 |

A possible control option for boilers and heaters is an oxidation catalyst. However, because there is only one BACT determination in the RBLC for this add-on control option, and it is for a much larger 60 MMBtu/hr non-dual-fueled boiler, it can be inferred that it is not cost-effective for small, NG- and ULSD-fired external combustion units. Potential annual CO emissions from the Project's boilers and heaters based on 8,760 hours of operations are between 1.8 and 10.6 ton/yr per unit. The estimated equipment cost for an oxidation catalyst system is $95,000 to $254,000 per unit.[7] At this equipment cost, the total annual cost is estimated at $57,000 to $152,000 per year per unit.[8] This yields a cost-effectiveness of $14,000 to $32,000 per ton of CO removed.[9] See Attachment C3 for control cost calculations. At this cost, an oxidation catalyst is not considered cost-effective.

Donlin Gold proposes to use good combustion practices as BACT control for CO emissions from the boilers and heaters. The resulting BACT CO emission rate for the Project's boilers and heaters is 0.0824 lb/MMBtu for NG firing and 0.0384 lb/MMBtu for ULSD firing.

Capital costs, energy costs, and environmental impacts of using good combustion practices are minimal. As discussed at the beginning of this section, these sources are not subject to an emission limit for CO under NSPS.

## 2.4.2 $NO_X$

Possible $NO_X$ emission control technologies for the boilers and heaters were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under process code 13, Commercial/Institutional-Size Boilers/Furnaces (<100 million Btu/hr), subcategories 13.31

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7 These costs are based on Section 3.2, Chapter 2, Figure 2.6 of the EPA Control Cost Manual (EPA 2002) for an exhaust flow rate from the Donlin boilers and heaters of 850 to 5,000 dry standard cubic feet per minute (dscfm). The 1999-dollar values from this figure were converted to 2021 dollars by multiplying by 1.59.

8 Equipment costs were converted to total annual costs using the example provided in Section 3.2, Chapter 2, Tables 2.9 and 2.10, of the EPA Control Cost Manual (EPA 2002), except that a 20-year equipment life (instead of 10) was used in the calculation.

9 Cost calculations were performed for the primary fuel scenario of NG firing.

Gaseous Fuel & Gaseous Fuel Mixtures and 13.22, Distillate Fuel Oil. The results of the RBLC search are summarized in Table 2-14.

**Table 2-14. $NO_X$ Control Options for Commercial Boilers**

| | Number of Determinations | | Emission Limit (lb/MMBtu) | |
|---|---|---|---|---|
| **Control Technology** | Gas-fired | Oil-fired | Gas-fired | Oil-fired |
| SCR | 9 | | 0.006 to 0.15 | |
| Low-$NO_X$ burner | 123 | 2 | 0.0011 to 0.18 | 0.023 to 0.09 |
| Good combustion practices | 18 | 2 | 0.0075 to 0.18 | No data |
| No control specified | 25 | 2 | 0.006 to 0.18 | 0.14 to 0.21 |

As shown in Table 2-14, there are nine determinations for SCR. These determinations are for large boilers with ratings between 36 and 150 MMBtu/hr. For the Project's boilers and heaters, SCR is not cost-effective. Potential annual $NO_X$ emissions from the Project's boilers and heaters based on 8,760 hours of operations are between 2.1 and 19.7 ton/yr per unit. The estimated total capital investment for an SCR system is $398,000 to 1,047,000 per unit, and the total annualized costs are estimated to be $46,000 to 126,000 per year per unit.[10] The resulting cost-effectiveness ranges from $12,000 to $25,000 per ton of $NO_X$ removed. See Attachment C3 for control cost calculations. At this cost, SCR is not considered cost-effective.

Boilers equipped with Low-$NO_X$ burners that are compatible with dual-fuel operation and meet the project specifications are not available for the dual–fueled POX and oxygen plant boilers, or the carbon elution heater. Low-$NO_X$ burners are also not available for the air handler heaters. Therefore, low-$NO_X$ burners are not technically feasible for these boilers and heaters.

Donlin Gold proposes to use good combustion practices as BACT controls for $NO_X$ emissions from the POX and oxygen plant boilers, carbon elution heater, and air handler heaters. The resulting BACT $NO_X$ emission rate for the Project's boilers is 0.098 lb/MMBtu for NG firing and 0.154 lb/MMBtu for ULSD firing.

The power plant auxiliary heaters are available with low-$NO_X$ burners. Donlin Gold proposes to use low-$NO_X$ burners as BACT control for $NO_X$ emissions from these units. The resulting BACT $NO_X$ emission rate for these heaters is 0.098 lb/MMBtu for NG firing and 0.154 lb/MMBtu for ULSD firing.

[10] This cost is based on Section 4.2, Chapter 2 of the EPA Control Cost Manual (EPA 2002). Cost calculations were performed for the primary fuel scenario of NG firing and adjusted to 2021 dollars.

Capital costs, energy costs, and environmental impacts of using good combustion practices are minimal. The capital cost for installing a low-$NO_X$ burner on the power plant auxiliary heaters is expected to be approximately $16,000. The energy costs and environmental impact of using low-$NO_X$ burners are minimal. As discussed at the beginning of this section, these sources are not subject to an emission limit for $NO_X$ under NSPS.

### 2.4.3 Particulates

Possible particulate matter emission control technologies for the boilers and heaters were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under process code 13, Commercial/Institutional-Size Boilers/Furnaces (<100 million Btu/hr), subcategories 13.31 Gaseous Fuel & Gaseous Fuel Mixtures and 13.22, Distillate Fuel Oil. The results of the RBLC search are summarized in Table 2-15.

**Table 2-15. Particulate Matter Control Options for Commercial Boilers**

| | **Number of Determinations** | | **Emission Limit (lb/MMBtu)** | |
|---|---|---|---|---|
| **Control Technology** | Gas-fired | Oil-fired | Gas-fired | Oil-fired |
| Good combustion practices | 109 | 7 | 0.0005 to 0.018 | 0.02 to 1.8 |
| Clean fuels | | 1 | | 0.015 |
| No control specified | 47 | 5 | 0.0003 to 0.01 | 0.0016 to 0.030 |

Additional possible add-on control technologies for particulates include a dust collector and ESP. However, these controls, like a wet scrubber, are ineffective at capturing the very fine particulates generated from ULSD and NG combustion. Therefore, they are not considered viable control options.

Donlin Gold proposes to use good combustion practices and clean fuels as BACT controls for particulate emissions from the boilers and heaters. The resulting BACT particulate emission rate for the Project's boilers and heaters is 0.0075 lb/MMBtu for NG firing and 0.0254 lb/MMBtu for ULSD firing.

Capital costs, energy costs, and environmental impacts of using good combustion practices and clean fuel are minimal. As discussed at the beginning of this section, these sources are not subject to an emission limit for PM under NSPS.

### 2.4.4 VOC

Possible VOC emission control technologies for the boilers and heaters were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under process code 13, Commercial/Institutional-Size Boilers/Furnaces (<100 million Btu/hr), subcategories 13.31

Gaseous Fuel & Gaseous Fuel Mixtures and 13.22, Distillate Fuel Oil. The results of the RBLC search are summarized in Table 2-16.

**Table 2-16. VOC Control Options for Commercial Boilers**

| | Number of Determinations | | Emission Limit (lb/MMBtu) | |
|---|---|---|---|---|
| **Control Technology** | Gas-fired | Oil-fired | Gas-fired | Oil-fired |
| Oxidation catalyst | 3 | | 0.005 | |
| Thermal oxidizer | 2 | | No data | |
| Good combustion practices | 129 | 2 | 0.0014 to 0.14 | No data |
| No control specified | 22 | 2 | 0.0015 to 0.008 | 0.0018 to 0.0041 |

Possible control options for boilers and heaters include thermal oxidation and oxidation catalysts. However, for the same reasons described in Section 2.4.1, thermal and oxidation catalysts are not cost-effective control technologies for VOC emissions from the Project's boilers and heaters.

Donlin Gold proposes to use good combustion practices as BACT control for VOC emissions from the boilers and heaters. The resulting BACT VOC emission rate for the Project boilers and heaters is 0.0054 lb/MMBtu for NG firing and 0.00154 lb/MMBtu for ULSD firing.

Capital costs, energy costs, and environmental impacts of using good combustion practices are minimal. As discussed at the beginning of this section, these sources are not subject to an emission limit for VOC under NSPS.

## 2.4.5 GHG

As discussed in Section 2.1.6, the possible add-on control option for GHG is CCS. CCS is an emerging technology that has had limited successful application on an industrial scale. There are currently no CCS systems commercially available in the United States. For BACT purposes, it is considered an innovative control option. "Innovative controls that have not been demonstrated on any source type similar to the proposed source need not be considered in the BACT analysis" (EPA 1990). Furthermore, CCS has not been demonstrated as available for the proposed remote Project location.

Donlin Gold proposes good combustion practices as BACT control for GHG emissions. Potential annual GHG emissions from the boilers and heaters are 176,347 ton/yr combined.

## 2.5 Black Start and Emergency Diesel Engines [EU ID 29-37]

The Project will include several compression ignition (diesel) engines for emergency use. These include generators for emergency power generation as well as fire pumps. The Project will also include two black start generators, which are diesel generators whose purpose is to restore the Wärtsilä power plant operations in the event of a plant shutdown. All these engines are limited-use engines and will emit CO, $NO_X$, $SO_2$, particulates, VOC, and GHG.

The emergency and black start diesel engines include the following:

- Black start generators (two units, 600 kW each)
- Camp emergency generators (four units, 1,500 kW each)
- Mine site tank farm fire pump (252 hp)
- Mine site mill fire pump (252 hp)
- Camp site fire pump (252 hp)

### 2.5.1 CO

Possible CO emission control technologies for internal combustion engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 17, Internal Combustion Engines. The search results were filtered to include only diesel-fired engines with limited use (i.e., only those determinations with keywords "emergency," "fire," "backup," or "standby" in the process name description were included). The RBLC search results are summarized in Table 2-17.

**Table 2-17. CO Control Options for Emergency Diesel Engines**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
|---|---|---|
| Good combustion practices | 111* | 0.6 to 5.0 |
| NSPS IIII | 39 | 0.21 to 5.5 |
| No control specified | 64 | 0.017 to 5.0 |

* Includes two BACT determinations of good combustion practices from the Project (black start and emergency generators, 4.38 g/kw-hr [3.27 g/hp-hr]; fire pump engines, 4.38 g/kw-hr [3.27 g/hp-hr]) from its air permit issued in 2017.

The BACT determinations from the RBLC include the use of good combustion practices, purchasing engines certified to meet NSPS IIII, or no specified add-on control.

In addition to the controls found in the RBLC search, catalytic oxidation is a possible CO control technology that can be applied to diesel engines. Because of the limited operating hours of the Project's emergency and startup diesel engines[11] discussed in this section, add-on control options are not viable. Annual CO emissions from each engine are less than 4 ton/yr.

Donlin Gold proposes to select the use of good combustion practices and engines certified to meet NSPS IIII as BACT for CO emissions from its emergency and black start diesel engines. The resulting BACT/NSPS IIII emission rates are listed below.[12]

- Black start generators and camp emergency generators: 4.38 g/kW-hr (3.27 g/hp-hr)

  [40 CFR §60.4205(b), §60.4202(a)(2), § 89.112(a) Table 1, emergency generators >560 kW]

- Fire pump engines: 4.38 g/kW-hr (3.27 g/hp-hr)

  [40 CFR §60.4205(c), NSPS IIII Table 4, fire pump engines 130 ≤ kW < 225]

There are no significant energy or environmental impacts associated with good combustion practices and purchasing engines certified to meet NSPS IIII.

## 2.5.2 $NO_X$ and VOC

Possible $NO_X$ and VOC emission control technologies for internal combustion engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 17, Internal Combustion Engines. The search results were filtered to include only diesel-fired engines with limited use (i.e., only those determinations with keywords "emergency," "fire," "backup," or "standby" in the process name description were included). The RBLC search results are summarized in Table 2-18.

**Table 2-18. $NO_X$ and VOC Control Options for Emergency Diesel Engines**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
|---|---|---|
| Good combustion practices | 183* | 0.0037 to 18.9 |
| NSPS IIII | 138 | 0.017 to 12.0 |
| No control specified | 67 | 0.013 to 9.3 |

* Includes two BACT determinations of good combustion practices for $NO_X$ + VOC emissions from the Project (black start and emergency generators, 8 g/kw-hr [6 g/hp-hr]; fire pump engines, 5.0 g/kw-hr [3.7 g/hp-hr]) from its air permit issued in 2017.

[11] "The EPA believes that 500 hours is an appropriate default assumption for estimating the number of hours that an emergency generator could be expected to operate under worst-case conditions" (Seitz 1995).

[12] The NSPS IIIII emission limits have been increase by 1.25 per ADEC to include the not-to-exceed limit per § 60.4205(e) and 60.4212(c) and (d).

The BACT determinations from the RBLC include the use of good combustion practices, purchasing engines certified to meet NSPS IIII, or no specified add-on control.

In addition to the controls found in the RBLC search, SCR and catalytic oxidation are possible $NO_X$ and VOC emission control technologies that can be applied to diesel engines. Because of the limited operating hours of the Project's emergency and startup diesel engines discussed in this section, add-on control options are not viable. Annual $NO_X$ and VOC emissions from each engine are less than 7 ton/yr per pollutant.

Donlin Gold proposes to select the use of clean fuels, good combustion practices, and engines certified to meet NSPS IIII as BACT for $NO_X$ and VOC emissions from its emergency and black start diesel engines. The resulting BACT/NSPS IIII emission rates are listed below.[13]

- Black start generators and camp emergency generators: 8.0 g/kW-hr (6.0 g/hp-hr)

  [40 CFR §60.4205(b), §60.4202(a)(2), § 89.112(a) Table 1, emergency generators >560 kW]

- Fire pump engines: 5.0 g/kW-hr (3.7 g/hp-hr)

  [40 CFR §60.4205(c), NSPS IIII Table 4, fire pump engines 130 ≤ kW < 225]

There are no significant energy or environmental impacts associated with clean fuels, good combustion practices, and purchasing engines certified to meet NSPS IIII.

### 2.5.3 Particulates

Possible PM emission control technologies for internal combustion engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 17, Internal Combustion Engines. The search results were filtered to include only diesel-fired engines with limited use (i.e., only those determinations with keywords "emergency," "fire," and "backup" in the process name description were included). The RBLC search results are summarized in Table 2-19.

[13] The NSPS IIIII emission limits have been increased by 1.25 per ADEC to include the not-to-exceed limit per §60.4205(e) and 60.4212(c) and (d).

**Table 2-19. PM Control Options for Emergency Diesel Engines**

| Control Technology | Number of Determinations* | Emission Limit (g/hp-hr) |
|---|---|---|
| Particulate Filter | 4 | 0.24 to 1.3 |
| Good combustion practices | 110** | 0.02 to 17 |
| NSPS IIII | 30 | 0.033 to 1.1 |
| No control specified | 80 | 0.02 to 0.43 |

* Separate determinations for different types of PM (PM, $PM_{10}$, $PM_{2.5}$, filterable, etc.) for the same engine were counted as one determination.
** Includes two BACT determinations of good combustion practices from the Project (black start and emergency generators, 0.25 g/kw-hr [0.19 g/hp-hr]; fire pump engines, 0.19 g/kw-hr [0.14 g/hp-hr]) from its air permit issued in 2017.

The BACT determinations from the RBLC include the use of particulate filters, good combustion practices, purchasing engines certified to meet NSPS IIII, or no specified add-on control.

Donlin Gold proposes to select the use of clean fuels, good combustion practices, and engines certified to meet NSPS IIII as BACT for PM emissions from its emergency and black start diesel engines. The resulting BACT/NSPS IIII emission rates are listed below.[14] These limits are lower than the BACT limits for particulate filters shown in Table 2-19.

- Black start generators and camp emergency generators: 0.25 g/kW-hr (0.19 g/hp-hr)

  [40 CFR §60.4205(b), §60.4202(a)(2), § 89.112(a) Table 1, emergency generators >560 kW]

- Fire pump engines: 0.25 g/kW-hr (0.19 g/hp-hr)

  [40 CFR §60.4205(c), NSPS IIII Table 4, fire pump engines 130 ≤ kW < 225]

There are no significant energy or environmental impacts associated with clean fuels, good combustion practices, and purchasing engines certified to meet NSPS IIII.

## 2.5.4 GHG

As discussed in Section 2.1.6, the possible add-on control option for GHG is CCS. CCS is an emerging technology that has had limited successful application on an industrial scale. There are currently no CCS systems commercially available in the United States. For BACT purposes, it is considered an innovative control option. "Innovative controls that have not been demonstrated on any source type similar to the proposed source need not be considered in the

[14] The NSPS IIIII emission limits have been increase by 1.25 per ADEC to include the not-to-exceed limit per § 60.4205(e) and 60.4212(c) and (d).

BACT analysis" (EPA 1990). Furthermore, CCS has not been demonstrated as available for the proposed remote Project location.

Donlin Gold proposes good combustion practices as BACT control for GHG emissions. Potential annual GHG emissions from the emergency and black start diesel engines are less than 2,997 ton/yr combined.

## 2.6 Small Diesel Engines [EU ID 13-14]

Small diesel engines will be installed at the Project's airport for electric power generation. There will be two generators, each rated for 200 kW of electric power generating capacity.

### 2.6.1 CO

Possible CO emission control technologies for small diesel engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 17.21, Small Internal Combustion Engines (<500 hp) subcategory Fuel Oil (ASTM #1, 2, includes kerosene, aviation, diesel fuel). The RBLC search results are summarized in Table 2-20.

**Table 2-20. CO Control Options for Small Diesel Engines**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
|---|---|---|
| Good combustion practices | 78 | 0.67 to 5.0 |
| NSPS IIII | 22 | 1.6 to 5.5 |
| No control specified | 35 | 0.60 to 5.0 |

The BACT determinations from the RBLC include the use of good combustion practices, purchasing engines certified to meet NSPS IIII, or no specified add-on control.

In addition to the controls found in the RBLC search, catalytic oxidation is a possible CO emission control technologies that can be applied to diesel engines. However, because there are no BACT determinations in the RBLC for add-on control options, it can be inferred that they are not cost-effective for small diesel generators. Potential CO emissions per engine based on 8,760 hours of operations are 8 ton/yr.

Donlin Gold proposes to select good combustion practices and purchase engines certified to meet NSPS IIII as BACT for CO for its small diesel engines. The resulting BACT/NSPS IIII emission rate is 4.38 g/kW-hr (3.27 g/hp-hr). [15] [40 CFR §60.4204(b), §60.4201(a), §1039.101 Table 1]

There are no significant energy or environmental impacts associated with good combustion practices and purchasing engines certified to meet NSPS IIII.

## 2.6.2 $NO_X$

Possible $NO_X$ emission control technologies for small diesel engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 17.21, Small Internal Combustion Engines (<500 hp) subcategory Fuel Oil (ASTM #1, 2, includes kerosene, aviation, diesel fuel). The RBLC search results are summarized in Table 2-21.

**Table 2-21. $NO_X$ Control Options for Small Diesel Engines**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
|---|---|---|
| Good combustion practices | 74 | 0.4 to 26 |
| NSPS IIII | 20 | 0.4 to 7.5 |
| No control specified | 40 | 1.8 to 9.3 |

The BACT determinations from the RBLC include the use of good combustion practices, purchasing engines certified to meet NSPS IIII, or no specified add-on control.

In addition to the controls found in the RBLC search, SCR is possible $NO_X$ emission control technology that can be applied to diesel engines. However, because there are no BACT determinations in the RBLC for add-on control options, it can be inferred that they are not cost-effective for small diesel generators. Potential $NO_X$ emissions per engine based on 8,760 hours of operations are less than 1 ton/yr.

Donlin Gold proposes to select clean fuels, good combustion practices and purchase engines certified to meet NSPS IIII as BACT for $NO_X$ for its small diesel engines. The resulting BACT/NSPS IIII emission rate is 0.50 g/kW-hr (0.37 g/hp-hr). [40 CFR §60.4204(b), §60.4201(a), §1039.101 Table 1]

There are no significant energy or environmental impacts associated with good combustion practices and purchasing engines certified to meet NSPS IIII.

[15] The NSPS IIIII emission limits have been increased by 1.25 per ADEC to include the not-to-exceed limit per § 60.4204(d) and 60.4212(b).

### 2.6.3 Particulates

Possible PM emission control technologies for small diesel engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 17.21, Small Internal Combustion Engines (<500 hp) subcategory Fuel Oil (ASTM #1, 2, includes kerosene, aviation, diesel fuel). The RBLC search results are summarized in Table 2-22.

**Table 2-22. PM Control Options for Small Diesel Engines**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
|---|---|---|
| Good combustion practices | 165 | 0.02 to 20 |
| NSPS IIII | 40 | 0.20 to 1.2 |
| No control specified | 89 | 0.02 to 0.40 |

The BACT determinations from the RBLC include the use of good combustion practices, purchasing engines certified to meet NSPS IIII, or no specified add-on control.

Donlin Gold proposes to select clean fuels, good combustion practices and purchase engines certified to meet NSPS IIII as BACT for PM for its small diesel engines. The resulting BACT/NSPS IIII emission rate is 0.03 g/kW-hr (0.02 g/hp-hr). [40 CFR §60.4204(b), §60.4201(a), §1039.101 Table 1]

There are no significant energy or environmental impacts associated with good combustion practices and purchasing engines certified to meet NSPS IIII.

### 2.6.4 VOC

Possible VOC emission control technologies for small diesel engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 17.21, Small Internal Combustion Engines (<500 hp) subcategory Fuel Oil (ASTM #1, 2, includes kerosene, aviation, diesel fuel). The RBLC search results are summarized in Table 2-23.

**Table 2-23. VOC Control Options for Small Diesel Engines**

| Control Technology | Number of Determinations | Emission Limit (g/hp-hr) |
|---|---|---|
| Good combustion practices | 66 | 0.067 to 5.0 |
| NSPS IIII | 16 | 0.12 to 7.5 |
| No control specified | 33 | 0.13 to 1.5 |

The BACT determinations from the RBLC include the use of good combustion practices, purchasing engines certified to meet NSPS IIII, or no specified add-on control.

In addition to the controls found in the RBLC search, catalytic oxidation is a possible VOC emission control technology that can be applied to diesel engines. However, because there are no BACT determinations in the RBLC for add-on control options, it can be inferred that they are not cost-effective for small diesel generators. Potential VOC emissions per engine based on 8,760 hours of operations are less than 1 ton/yr.

Donlin Gold proposes to select clean fuels, good combustion practices and purchase engines certified to meet NSPS IIII as BACT for VOC for its small diesel engines. The resulting BACT/NSPS IIII emission rate is 0.24 g/kW-hr (0.18 g/hp-hr). [40 CFR §60.4204(b), §60.4201(a), §1039.101 Table 1]

There are no significant energy or environmental impacts associated with good combustion practices and purchasing engines certified to meet NSPS IIII.

### 2.6.5 GHG

As discussed in Section 2.1.6, the possible add-on control option for GHG is CCS. CCS is an emerging technology that has had limited successful application on an industrial scale. There are currently no CCS systems commercially available in the United States. For BACT purposes, it is considered an innovative control option. "Innovative controls that have not been demonstrated on any source type similar to the proposed source need not be considered in the BACT analysis" (EPA 1990). Furthermore, CCS has not been demonstrated as available for the proposed remote Project location.

Donlin Gold proposes good combustion practices as BACT control for GHG emissions. Potential annual GHG emissions from the small diesel engines are less than 2,682 ton/yr combined.

## 2.7 Carbon Regeneration Kiln [EU ID 88]

Activated carbon is used in the gold recovery process. After use, this carbon sent to the carbon regeneration kiln where it is heated (with electricity) to be reactivated for reuse in the process.

The carbon regeneration kiln has a design process rate of 1.65 tons per hour (ton/hr) of carbon and will emit CO, $NO_X$, particulates, and VOC. The following sections provide a BACT review for these pollutants.

The only determination for a carbon regeneration kiln in the RBLC is for the Project. The RBLC was searched for all determinations in the last 10 years under the process name description containing the keyword "kiln." The only determinations found (other than for the Project) were for mineral processing (lime, cement, gypsum, clay, and ceramic) kilns and wood drying kilns. These determinations are not applicable to the Project's carbon regeneration kiln. The majority of the mineral processing kiln determinations are for lime and cement kilns. These kilns tend to be significantly larger (9 to 390 ton/hr) (EPA 2021), operate at higher temperatures (1,000 to 1,450°C), and produce large quantities of $CO_2$. In these kilns, the raw materials are heated by direct contact with fuel combustion gases. Wood drying kilns are used to dry wood products (e.g., lumber and paper). These kilns operate at much lower temperatures of approximately 100°C.

In addition to the RBLC search, existing gold mining operations in Alaska with minor or Title V permits were searched for carbon regeneration emission sources and controls. The results of this search are listed in Table 2-24.

**Table 2-24. Existing Gold Mining Operations in Alaska**

| Facility | Control Technology for Carbon Regeneration Kiln |
|---|---|
| Fort Knox Mine | No emission controls are listed for the carbon regeneration kiln in the Title V permit. |
| Kensington Mine | Kensington Mine produces concentrate for export. The minor permit does not mention carbon regeneration sources. |
| Pogo Mine | The carbon regeneration kiln is equipped with a wet scrubber. |

The search of existing Alaska gold mines revealed only one carbon regeneration kiln with an add-on emission control technology: the Pogo Mine operates a wet scrubber for particulate emission control on its carbon regeneration kiln.

## 2.7.1 CO

As discussed above, the only determination for a carbon regeneration kiln in the RBLC is for the Project (good operating practices, 0.88 lb/hr), and an additional search of Alaska gold mines did not find any existing controls for CO emissions from carbon regeneration kilns. Possible add-on control options for CO include thermal and catalytic oxidation. Potential annual CO emissions from the carbon regeneration kiln based on 8,760 hours of operations are 4 ton/yr. Because of this low emission level, add-on CO control would not be cost-effective.[16] Therefore, Donlin Gold proposes to select good operating practices as BACT for CO. The resulting BACT emission rate is 0.88 lb/hr.

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[16] See cost information provided in Section 2.4.1. The carbon regeneration kiln exhaust flow rate of 2,400 scfm and the CO emissions are within the range discussed in Section 2.4.1.

Capital costs, energy costs, and environmental impacts of using good operating practices are minimal. This source is not subject to an emission limit for CO under NSPS.

### 2.7.2 $NO_X$

As discussed above, the only determination for a carbon regeneration kiln in the RBLC is for the Project (good operating practices, 0.02 lb/hr), and an additional search of Alaska gold mines did not find any existing controls for $NO_X$ emissions from carbon regeneration kilns. Possible add-on control options for $NO_X$ include SCR. Potential annual $NO_X$ emissions from the carbon regeneration kiln based on 8,760 hours of operations are 0.08 ton/yr. Because of this low emission level, add-on $NO_X$ control would not be cost-effective.[17] Therefore, Donlin Gold proposes to select good operating practices as BACT for $NO_X$. The resulting BACT emission rate is 0.02 lb/hr.

Capital costs, energy costs, and environmental impacts of using good operating practices are minimal. This source is not subject to an emission limit for $NO_X$ under NSPS.

### 2.7.3 Particulates

As discussed above, the only determination for a carbon regeneration kiln in the RBLC is for the Project (wet off-gas cooler, 0.44 lb/hr). An additional search of Alaska gold mines revealed a single carbon regeneration kiln with a wet scrubber to control particulate emissions. Other possible add-on control options for particulates include a dust collector and ESP. Potential annual particulate emissions from the carbon regeneration kiln based on 8,760 hours of operations are 1.9 ton/yr. Because of this low emission level, the above-mentioned add-on particulate controls would not be cost-effective. However, Donlin Gold proposes to employ a wet off-gas cooler on the kiln exhaust. Similar to a wet scrubber, this wet off-gas cooler will control particulate emissions. This cooler is necessary to reduce the exhaust gas temperature prior to entering the carbon bed for mercury control. Therefore, Donlin Gold proposes to select a wet off-gas cooler as BACT for particulates (PM, $PM_{10}$, and $PM_{2.5}$). The resulting BACT emission rate is 0.44 lb/hr.

The capital cost for the wet off-gas cooler is $826,736 (AMEC 2013). Other costs include electricity for the scrubber water pumps and maintenance costs. Environmental impacts from the scrubbers include managing the scrubber effluent water.

This source is not subject to an emission limit for particulates under NSPS.

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[17] See cost information provided in Section 2.4.2. The carbon regeneration kiln exhaust flow rate of 2,400 scfm is within the range discussed in Section 2.4.2, and $NO_X$ emissions are lower.

### 2.7.4 VOC

As discussed above, only determination for a carbon regeneration kiln in the RBLC is for the Project (good operating practices, 0.44 lb/hr), and an additional search of Alaska gold mines did not find any existing controls for VOC emissions from carbon regeneration kilns. Possible add-on control options for VOC include thermal and catalytic oxidation. Potential annual VOC emissions from the carbon regeneration kiln based on 8,760 hours of operations are 1.9 ton/yr. Because of this low emission level, add-on VOC control would not be cost-effective.[18] Therefore, Donlin Gold proposes to select good operating practices as BACT for VOC. The resulting BACT emission rate is 0.44 lb/hr.

Capital costs, energy costs, and environmental impacts of using good operating practices are minimal. This source is not subject to an emission limit for VOC under NSPS.

## 2.8 Induction Melting Furnace [EU ID 100]

The Project will include an induction melting furnace for gold refining. The induction melting furnace will emit particulate emissions. The following section provides a BACT review for particulates.

### 2.8.1 Particulates

Possible particulate emission control technologies for the induction melting furnace were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years with process name containing the keyword "furnace" and the primary fuel as electricity under process codes 80, Metallurgical Industry, and 90, Mineral Products. The results of the RBLC search are summarized in Table 2-25.

**Table 2-25. Particulate Control Options for Furnaces**

| Control Technology | Number of Determinations | Emission Limit (gr/dscf) |
|---|---|---|
| Dust collector | 17* | 0.0018 to 0.0052 |

* Includes the Project's BACT determination of dust collector (0.005 gr/dscf) from its air permit issued in 2017.

Additional possible add-on control technologies not found in the RBLC search for particulate emissions from furnaces are an ESP, a wet scrubber, and an enclosure. However, these controls are less effective at controlling particulate emissions than a dust collector (EPA 1995).

Donlin Gold proposes to select the top control option of a dust collector as BACT to reduce particulate emissions from the induction melting furnace. The resulting BACT particulate (PM,

[18] See cost information provided in Section 2.4.1 for CO emissions.

$PM_{10}$, and $PM_{2.5}$) emission rate is 0.005 gr/scf. At this BACT emission rate, potential annual emissions of particulates based on 8,760 hours of operations are only 4.2 ton/yr.

The capital cost for the dust collector and associated ducting is $106,936 (AMEC 2013). Other costs include electricity for the dust collector fan and maintenance costs. Environmental impacts from the dust collector include disposal of waste generated by the dust collector (i.e., worn-out or broken bags).

This source is not subject to an emission limit for particulates under NSPS.

## 2.9 Pressure Oxidation Hot Cure [EU ID 85-87]

After autoclaving, the oxidized ore concentrate slurry enters the three POX hot cure tanks. The POX hot cure tanks have a steam vent that can emit particulates. The following section provides a BACT review for particulates.

### 2.9.1 Particulates

The only determination for ore hot curing in the RBLC is for the Project's POX hot cure tanks (good operating practices, 0.4 lb/hr). The RBLC was searched for all determinations in the last 10 years under the process name description containing the keywords "cure" or "curing." Results other than the Project's POX hot cure tanks included curing operations for painting, rubber tire processing, core production (for a metal casting facility), carbon fiber production, and glass fiber production. These determinations are not applicable to the Project's POX hot cure process.

Possible add-on control technologies for particulates include a dust collector, ESP, and wet scrubber. Because of the high moisture content in the hot cure exhaust, dust collectors are not technically feasible due to plugging.

Potential annual particulate emissions from the POX hot cure tanks based on 8,760 hours of operations are 1.8 ton/yr. Because of this low emission level, add-on particulate control technologies would not be cost-effective. Therefore, Donlin Gold proposes to select good operating practices as BACT for particulates (PM, $PM_{10}$, and $PM_{2.5}$). The resulting BACT emission rate is 0.4 lb/hr.

Capital costs, energy costs, and environmental impacts of good operating practices are minimal. This source is not subject to an emission limit for particulates under NSPS.

## 2.10 Electrowinning Cells [EU ID 91-94]

The Project will include electrowinning (EW) cells, where precious metals are precipitated out of precious-metal-bearing (pregnant) solution through electrolysis. The EW cells will primarily be a source of mercury emissions. However, test data from similar sources have shown that small amounts of particulates may be emitted. The following section provides a BACT review for particulates.

### 2.10.1 Particulates

The RBLC was searched for all determinations in the last 10 years with process names containing the keyword "electrowinning." The only result found was for the Project (good operating practices, 0.19 lb/hr).

Possible particulate control technologies for EW cells are a dust collector, ESP, and wet scrubber. Because the high moisture content in the EW cells' exhaust would lead to plugging, dust collectors are not technically feasible.

Potential annual particulate emissions from the EW cells based on 8,760 hours of operations are 0.8 ton/yr. Because of this low emission level, the above-mentioned add-on particulate controls would not be cost-effective. Therefore, Donlin Gold proposes to use best operating practices as BACT for particulates (PM, $PM_{10}$, and $PM_{2.5}$). The resulting BACT emissions are 0.19 lb/hr.

Capital costs, energy costs, and environmental impacts of good operating practices are minimal. These sources are not subject to an emission limit for particulates under NSPS.

## 2.11 Retort [EU ID 97]

The Project will include a mercury retort, where precious-metal-bearing sludge recovered in the EW process will be heated to recover mercury prior to melting in the induction melting furnace. The retort will primarily be a source of mercury emissions. However, test data from similar sources have shown that small amounts of particulates may be emitted. The following section provides a BACT review for particulates.

### 2.11.1 Particulates

The only determination for a mercury retort in the RBLC is for the Project's retort (good operating practices, 0.03 lb/hr). The RBLC was searched for all determinations in the last 10 years under the process name description containing the keyword "retort." The only determination found besides the Project's retort was for a wood dryer and retort furnace. This determination is not applicable to the Project's mercury retort.

Possible particulate control technologies for a retort are a dust collector, ESP, and wet scrubber. Potential annual particulate emissions from the retort based on 8,760 hours of operations are 0.1 ton/yr. Because of this low emission level, the above-mentioned add-on particulate controls would not be cost-effective. Therefore, Donlin Gold proposes to use best operating practices as BACT for particulates (PM, $PM_{10}$, and $PM_{2.5}$). The resulting BACT emissions are 0.03 lb/hr.

Capital costs, energy costs, and environmental impacts of good operating practices are minimal. This source is not subject to an emission limit for particulates under NSPS.

## 2.12 Laboratories [EU ID 103-104, 106, 108-109]

Laboratory facilities will be located within the process plant building. The facilities will include a sample receiving and preparation laboratory, an assay laboratory, and a metallurgical laboratory. The laboratory processes will emit small amounts of particulates. The following section provides a BACT review for particulates.

### 2.12.1 Particulates

The particulate emissions generated by the laboratory processes will be collected by fume hoods. Possible control technologies for fume hood exhaust, ranked in order of highest to lowest control effectiveness, are a dust collector, ESP, and wet scrubber (EPA 1995). Donlin Gold proposes to select the top control option, a dust collector, as BACT control technology to control particulate (PM, $PM_{10}$, and $PM_{2.5}$) emissions from each laboratory. The resulting BACT emissions are as follows:

- Sample receiving and preparation laboratory – 0.009 gr/scf
- Assay laboratory – 0.004 gr/scf
- Metallurgical laboratory – 0.009 gr/scf

The capital cost for each dust collector is expected to be similar to the furnace dust collector cost of approximately $100,000 per unit. Other costs include electricity for the dust collector fan and maintenance costs. Environmental impacts from the dust collector include disposal of waste generated by the dust collector (i.e., worn-out or broken bags).

This source is not subject to an emission limit for particulates under NSPS.

## 2.13 Reagent Handling for Water Treatment [EU ID 111]

The operations water treatment plant will include a water conditioning circuit. Transfers of water conditioning reagents will generate particulate emissions. The following section provides a BACT review for particulates.

### 2.13.1 Particulates

Possible particulate emission control technologies for reagent (such as lime) transfers were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 90.019, Lime/Limestone Handling/Kilns/Storage/Manufacturing. Determinations for crushers, silos, fuel tanks, and fuel-fired sources were excluded from the BACT review. The results of the RBLC search are summarized in Table 2-26.

**Table 2-26. Particulate Control Options for Reagent Transfers**

| Control Technology | Number of Determinations* | Emission Limit (gr/dscf) |
|---|---|---|
| Dust collector | 17** | 0.002 to 0.020 |
| Wet scrubber | 1*** | 0.020 |
| Enclosure | 1 | No data |
| Water sprays / High moisture | 2 | No data |
| No control specified | 7 | 0.014 |

* Separate determinations for different types of PM (PM, $PM_{10}$, $PM_{2.5}$, filterable, etc.) for the same emission source were counted as one determination.
** Includes two BACT determinations for dust collectors for the Project (reagent handling for water treatment, 0.02 gr/dscf; mill reagents handling, 0.02 gr/dscf) from its air permit issued in 2017.
*** This is the Project's BACT determination of wet scrubber (0.02 gr/dscf) for mill reagents slaking from its air permit issued in 2017.

An additional possible control option not found in the RBLC search is an ESP. The possible control technologies, in order of control effectiveness, are a dust collector, ESP, wet scrubber, enclosure, and water sprays (EPA 1995).

Donlin Gold proposes to select the top control option, a dust collector, as BACT control technology to control particulate emissions from reagent transfers. The resulting BACT particulate (PM, $PM_{10}$, and $PM_{2.5}$) emission rate is 0.02 gr/scf. At this BACT emission rate, potential annual emissions of particulates based on 8,760 hours of operations are only 1.1 ton/yr.

The estimated capital cost for the dust collector is approximately $20,000 (AMEC 2011). Other costs include electricity for the dust collector fan and maintenance costs. Environmental impacts from the dust collector include disposal of waste generated by the dust collector (i.e., worn-out or broken bags).

These sources are not subject to an emission limit for particulates under NSPS.

## 2.14 Mill Reagents Handling [EU ID 59, 61, 63, 65, 67, 69, 71, 73, 75]

The mill process requires various reagents. These reagents include lime, flocculant, caustic soda, copper sulfate, xanthate (PAX), and soda ash. The handling of these dry chemicals generates particulate emissions. The following section provides a BACT review for particulates from the following sources:

- Lime handling and slaking – hopper, silo, and slaker
- Flocculant handling and mixing

- Caustic soda handling and mixing
- Copper sulfate handling and mixing
- PAX handling and mixing
- Soda ash handling and mixing

### 2.14.1 Particulates

Section 2.13.1 identifies the possible emission control technologies for lime transfers. These same control technologies are applicable to the reagent handling reviewed in this section. The possible control technologies, in order of control effectiveness, are a dust collector, ESP, wet scrubber, enclosure, and water sprays (EPA 1995).

Donlin Gold proposes to select the top control option, dust collectors, as BACT control technology to control particulate emissions from the following sources: lime hopper and silo, flocculant handling and mixing, caustic soda handling and mixing, copper sulfate handling and mixing, PAX handling and mixing, and soda ash handling and mixing.

For the lime slaker, a dust collector is not considered technically feasible due to the presence of moisture from slaking and the potential of dust collector clogging. An ESP was also determined to be inappropriate for this application, and, at any rate, it would not be expected to provide better control than a wet scrubber. Therefore, Donlin Gold proposes to select a wet scrubber as BACT for the lime slaker.

The resulting BACT particulate (PM, $PM_{10}$, and $PM_{2.5}$) emission rate for each of the sources reviewed in this section is 0.02 gr/scf. At this BACT emission rate, potential annual emissions of particulates based on 8,760 hours of operation are less than 2.3 ton/yr per source.

The capital cost for the dust collectors and wet scrubber are as follows:

- Lime handling –
    - Hopper – Dust collector 15-FIL-535: $20,000 (AMEC 2011)
    - Silo – Dust collector 15-DCL-700: $31,737 (AMEC 2013)
    - Slaker – Wet scrubber 15-SBW-550: $190,341 (AMEC 2013)
- Flocculant handling and mixing – Dust collector 15-DCL-XFL: $43,412 (AMEC 2013)
- Caustic soda handling and mixing – Dust collector 15-DCL-100: $39,577 (AMEC 2013)

- Copper sulfate handling and mixing – Dust collector 15-DCL-105: $43,412 (AMEC 2013)
- PAX handling and mixing – Dust collector 15-DCL-110: $43,412 (AMEC 2013)
- Soda ash handling and mixing –
  - Handling – Dust collector 15-DCL-520: $36,357 (AMEC 2013)
  - Mixing tank – Dust collector 15-DCL-115: $43,412 (AMEC 2013)

Other costs for the dust collectors include electricity for the dust collector fan and maintenance costs. Environmental impacts from the dust collectors include disposal of waste generated by the dust collectors (i.e., worn-out or broken bags).

Other costs for the wet scrubber include electricity for the scrubber water pumps and maintenance costs. Environmental impacts from the scrubbers include managing the scrubber effluent water.

These sources are not subject to an emission limit for particulates under NSPS.

## 2.15 Fuel Tanks [EU ID 126-142, 150-152, 156]

The Project will include 21 fuel tanks that are significant under Title V. There will be:

- Fifteen 2,500,000-gallon ULSD tanks at the tank farm
- Two 33,000-gallon ULSD tanks at the power plant
- Two 25,000-gallon ULSD tanks at the fuel station
- One 25,000-gallon ULSD tank for the generators at the camp
- One 5,000-gallon aviation gasoline tank at the airport

These fuel tanks will have VOC emissions. The following section provides a BACT review for VOC emissions from these tanks. Fuel tanks with a capacity of 10,000 gallons or less, with lids or other closure, and that store liquid with a vapor pressure not greater than 80 millimeters (mm) of mercury at 21°C are insignificant under Title V and are discussed in Section 2.23.

### 2.15.1 VOC

Possible VOC emission control technologies for the fuel tanks were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under process codes 42.005 Petroleum Liquid Storage in Fixed Roof Tanks and 42.006 Petroleum Liquid Storage in Floating Roof Tanks. The results of the RBLC search are summarized in Table 2-27.

**Table 2-27. VOC Control Options for Fuel Tanks**

| Control Technology | Number of Determinations |
|---|---|
| Floating roof | 72 |
| Submerged fill | 38 |
| Capture and recover/control | 24 |
| Fixed roof | 4 |
| NSPS | 1 |
| No control specified | 16 |

Potential annual VOC emissions from all the fuel tanks combined are 1.7 ton/yr. Because of this low emission level, expensive add-on controls such as a floating roof or capture and recover/control system for VOC control would not be cost-effective. Therefore, Donlin Gold proposes to select submerged fill tanks as BACT for VOC emissions.

There are no significant capital, energy, or environmental impacts associated with the use of submerged fill tanks for VOC control.

## 2.16 Incinerators [EU ID 27-28]

The Project will include two incinerators:

- Camp waste incinerator
- Sewage sludge incinerator

The camp waste incinerator and sewage sludge incinerator will be used to dispose of the trash and human waste, respectively, generated by an estimated 600 mine employees living in the camp. The incinerators will emit CO, $NO_X$, particulates, $SO_2$, Pb, and GHG.[19] The following sections provide a BACT review for each of these pollutants except $SO_2$ and Pb.

### 2.16.1 CO

Possible CO emission control technologies for the incinerators were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under process codes 24.4 and 24.5, Waste Disposal, subcategories Municipal Waste Combustion and Wastewater Treatment Sludge Incineration. The results of the RBLC search are summarized in Table 2-28.

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[19] Incinerators emit trace amounts of organics, which are hazardous air pollutants regulated under NSPS per Section 129 of the Clean Air Act.

**Table 2-28. CO Control Options for Waste and Sewage Sludge Incinerators**

| Control Technology | Number of Determinations | Emission Limit (ppmvd @ 7% $O_2$) |
|---|---|---|
| Oxidation Catalyst | 1 | 75 |
| Good combustion practices | 2* | 13 to 52 |
| No control specified | 3 | 13 |

* These two BACT determinations of good combustion practices are for the Project's camp waste incinerator (13 ppmvd @ 7% $O_2$) and sewage sludge incinerator (52 ppmvd @ 7% $O_2$) from its air permit issued in 2017.

The emissions control system for the Project's incinerators has not been determined at this time. However, Donlin Gold will purchase incinerators that meet the control and emission standards required by NSPS CCCC and LLLL. Per these emission standards, potential annual CO emissions based on the maximum daily throughput and 365 operating days per year (day/yr) are 0.4 ton/yr for the camp waste incinerator and less than 0.01 ton/yr for the sewage sludge incinerator. Because of the low emission level, any additional CO control would not be cost-effective. Therefore, Donlin Gold proposes to select incinerators that meet the NSPS limits as BACT for CO emissions. The resulting BACT/NSPS emission rates are as follows:

- Camp waste incinerator – 17 ppmvd @ 7% $O_2$ [40 CFR 60 Subpart CCCC Table 5][20]
- Sewage sludge incinerator – 52 ppmvd @ 7% $O_2$ [40 CFR 60 Subpart LLLL Table 2]

Capital costs, energy costs, and environmental impacts will depend on the controls required to meet the NSPS emission limits.

## 2.16.2 $NO_X$

Possible $NO_X$ emission control technologies for the incinerators were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under process codes 24.4 and 24.5, Waste Disposal, subcategories Municipal Waste Combustion and Wastewater Treatment Sludge Incineration. The results of the RBLC search are summarized in Table 2-29.

[20] The previous Donlin BACT emission limit (13 ppmvd @ 7% $O_2$) was based on Table 8 of 40CFR 60 Subpart CCCC for small, remote incinerators. Because the Donlin incinerator may exceed the small, remote incinerator maximum combustion rate of 3 tons per day (ton/day), the emission limit is revised to the Table 5 limit for larger incinerators.

**Table 2-29. $NO_X$ Control Options for Waste and Sewage Sludge Incinerators**

| Control Technology | Number of Determinations | Emission Limit (ppmvd @ 7% $O_2$) |
|---|---|---|
| SCR | 1 | 45 |
| Selective Non-Catalytic Reduction (SNCR) | 2 | 110 |
| Good combustion practices | 2* | 170 to 210 |
| No control specified | 3 | 170 |

* These two BACT determinations of good combustion practices are for the Project's camp waste incinerator (170 ppmvd @ 7% $O_2$) and sewage sludge incinerator (210 ppmvd @ 7% $O_2$) from its air permit issued in 2017.

An additional possible control option not found in the RBLC search for $NO_X$ emissions from incinerators is a low-$NO_X$ burner with flue gas recirculation.

The emissions control system for the Project's incinerators has not been determined at this time. However, Donlin Gold proposes to purchase incinerators that meet the control and emission standards required by NSPS CCCC and LLLL. Per these emission standards, potential annual $NO_X$ emissions based on maximum daily throughput and 365 day/yr are 0.8 ton/yr for the camp waste incinerator and less than 0.06 ton/yr for the sewage sludge incinerator. Because of the low emission level, any additional $NO_X$ control would not be cost-effective. Therefore, Donlin Gold proposes to select incinerators that meet the NSPS limits as BACT for $NO_X$ emissions. The resulting BACT/NSPS emission rates are as follows:

- Camp waste incinerator – 23 ppmvd @ 7% $O_2$ [40 CFR 60 Subpart CCCC Table 5][21]
- Sewage sludge incinerator – 210 ppmvd @ 7% $O_2$ [40 CFR 60 Subpart LLLL Table 2]

Capital costs, energy costs, and environmental impacts will depend on the controls required to meet the NSPS emission limits.

## 2.16.3 Particulates

Possible particulate emission control technologies for the incinerators were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under process codes 24.4 and 24.5, Waste Disposal, subcategories Municipal Waste Combustion and Wastewater Treatment Sludge Incineration. The results of the RBLC search are summarized in Table 2-30.

**Table 2-30. Particulate Control Options for Waste and Sewage Sludge Incinerators**

[21] The previous Donlin BACT emission limit (170 ppmvd @ 7% $O_2$) was based on Table 8 of 40CFR 60 Subpart CCCC for small, remote incinerators. Because the Donlin incinerator may exceed the small, remote incinerator maximum combustion rate of 3 ton/day, the emission limit is revised to the Table 5 limit for larger incinerators.

| Control Technology | Number of Determinations | Emission Limit (mg/dscm @ 7% $O_2$) |
|---|---|---|
| Dust collector | 1 | 24 |
| Scrubber | 1 | No data |
| Good Combustion Practices | 2* | 60 to 270 |
| No control specified | 2 | 270 |

* These two BACT determinations of good combustion practices are for the Project's camp waste incinerator (270 mg/dscm @ 7% $O_2$) and sewage sludge incinerator (60 mg/dscm @ 7% $O_2$) from its air permit issued in 2017.

The emissions control system for the Project's incinerators has not been determined at this time. However, Donlin Gold proposes to purchase incinerators that meet the control and emission standards required by NSPS CCCC and LLLL. Per these emission standards, potential annual particulate emissions based on maximum daily throughput and 365 day/yr are 0.3 ton/yr for the camp waste incinerator and 0.009 ton/yr for the sewage sludge incinerator. Because of the low emission level, any additional particulate control would not be cost-effective. Therefore, Donlin Gold proposes to select incinerators that meet the NSPS limits as BACT for particulate emissions. The resulting BACT/NSPS emission rates are as follows:

- Camp waste incinerator – 18 mg/dscm @ 7% $O_2$ [40 CFR 60 Subpart CCCC Table 5][22]
- Sewage sludge incinerator – 60 mg/dscm @ 7% $O_2$ [40 CFR 60 Subpart LLLL Table 2]

Capital cost, energy cost, and environmental impact will depend on the controls required to meet the NSPS emission limits.

## 2.16.4 GHG

As discussed in Section 2.1.6, the possible add-on control option for GHG is CCS. CCS is an emerging technology that has had limited successful application on an industrial scale. There are currently no CCS systems commercially available in the United States. For BACT purposes, it is considered an innovative control option. "Innovative controls that have not been demonstrated on any source type similar to the proposed source need not be considered in the BACT analysis" (EPA 1990). Furthermore, CCS has not been demonstrated as available for the proposed remote Project location.

[22] The previous Donlin BACT emission limit (270 ppmvd @ 7% $O_2$) was based on Table 8 of 40CFR 60 Subpart CCCC for small, remote incinerators. Because the Donlin incinerator may exceed the small, remote incinerator maximum combustion rate of 3 ton/day, the emission limit is revised to the Table 5 limit for larger incinerators.

Donlin Gold proposes good combustion practices as BACT control for GHG emissions. The potential annual, combined GHG emissions from the camp waste and sewage sludge incinerators are 3,936 ton/yr.

## 2.17 Acidulation Tanks and Neutralization Tanks [EU ID 124-125]

The Project will include several tanks associated with the POX process that are sources of GHG emissions:

- Acidulation tanks
- Neutralization tanks

In the acidulation tanks, acidic solution will be added to the concentrate slurry to reduce its carbonate gangue component. In the neutralization tanks, lime slurry will be added to the concentrate slurry in the presence of oxygen to bring the pH to approximately 9 before it is pumped to the carbon-in-leach circuit. In both processes, $CO_2$ is produced and emitted.

The acidulation and neutralization tanks will have the potential to emit 273,175 tons of $CO_2$ per year, combined. As discussed in Section 2.1.6, the possible add-on control option for GHG is CCS. CCS is an emerging technology that has had limited successful application on an industrial scale. There are currently no CCS systems commercially available in the United States. For BACT purposes, it is considered an innovative control option. "Innovative controls that have not been demonstrated on any source type similar to the proposed source need not be considered in the BACT analysis" (EPA 1990). Furthermore, CCS has not been demonstrated as available for the proposed remote Project location.

Donlin Gold proposes good operating practices for GHG emissions from the acidulation and neutralization tanks. Capital costs, energy costs, and environmental impacts of using good combustion practices are minimal.

## 2.18 Fugitive Dust from Unpaved Roads [EU ID 158-160]

The Project will produce fugitive particulate emissions from travel on unpaved haul roads and access roads. Unpaved road emissions come from ore and waste hauling, road graders, maintenance vehicles, and other haul road travel.

Possible particulate emission control technologies for unpaved roads were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 99.150, Unpaved Roads. The results of the RBLC search are summarized in Table 2-31.

**Table 2-31. Particulate Control Options for Unpaved Roads**

| Control Technology | Number of Determinations* | Control Efficiency (%) |
|---|---|---|
| Chemical and water | 5** | 70 to 90 |
| Water | 2 | 85 to 90 |
| Speed reduction | 1 | No data |
| Paving | 2 | No data |
| No control specified | 1 | No data |

* Separate determinations for different types of PM (PM, $PM_{10}$, $PM_{2.5}$, filterable, etc.) for the same emission source were counted as one determination.
** Includes the Project's BACT determination of chemical dust suppressant and watering (90%) from its air permit issued in 2017.

Donlin Gold proposes the use of best practical methods (BPMs), as described in the Donlin Gold Fugitive Dust Control Plan (FDCP) provided in Appendix E, as BACT for unpaved roads. The BPMs include: chemical dust suppressants and water application. Donlin Gold cexpects to achieve 90 percent or greater control efficiency for particulate emissions from unpaved roads using these methods. These BPMs combined with achieving 90 percent control represent the top BACT control option. Total potential annual particulate emissions from haul road and access road travel at the Project are approximately 3,500 ton/yr.

Costs for using chemical dust suppressants and water are the capital and operating costs of the equipment (chemical and water application trucks), as well as the cost of the chemical dust suppressant, which is approximately $600 per thousand gallons. Energy and environmental costs from the use of chemical and water suppression include air pollutant emissions from operation of the application trucks and possible impacts to vegetation from chemical dust suppressant usage.

As shown in Table 2-31, chemical dust suppressants and water application can achieve 90 percent control of fugitive dust from unpaved roads. This level of control (90 percent) is the most common control efficiency found in the RBLC for unpaved roads. A list of all RBLC determinations (1970 to date) that specify a control efficiency of 90 percent or greater is provided in Table 2-32.

**Table 2-32. Particulate Control Options for Unpaved Roads at or above 90 Percent Efficiency**

| RBLC ID | Permit Issuance Date | Control Methos | Control Efficiency (%) |
|---|---|---|---|
| AK-0084 | 6/30/2017 | Chemical Suppressant and Water | 90 |
| AR-0094 | 11/5/2008 | Chemical Suppressant and Water | 90 |
| AR-0124 | 8/3/2015 | Water | 90 |
| CO-0043 | 9/25/2000 | Chemical Suppressant and Water | 85-90 |
| IN-0034 | 11/30/1993 | Chemical Suppressant | 90 |
| LA-0209 | 6/28/2006 | Water and Speed Reduction | 95.5 |
| LA-0239 | 5/24/2010 | Chemical Suppressant, Water, and Speed Reduction | 90 |
| MO-0048 | 8/20/1997 | Chemical Suppressant | 90 |
| NV-0045 | 12/11/2006 | Chemical Suppressant | 98 |
| NV-0045 | 12/11/2006 | Chemical Suppressant | 98 |
| NV-0047 | 2/26/2008 | Chemical Suppressant and Water | 90 |
| OH-0111 | 11/26/1986 | Not specified | 90 |
| OH-0126 | 4/8/1987 | Surface Treatment and Speed Reduction | 90 |
| OH-0131 | 5/28/1987 | Surface Treatment and Speed Reduction | 90 |
| TX-0032 | 11/5/1981 | Water and compaction | 90 |
| UT-0021 | 6/2/1980 | Chemical Suppressant and Water | 90 |
| VA-0074 | 4/23/1987 | Water | 90 |

The EPA source documents for control efficiency referenced in AP-42, Section 13.2.2, Unpaved Roads, as well as additional applicable studies, were reviewed by Air Sciences. This review (described in Air Sciences' memorandum (Air Sciences 2015b)) indicated that the studies showed that chemical suppressants alone could achieve 90 percent, or more, control efficiency. The Air Sciences memorandum also provides examples of other agencies that have adopted a 90-percent-control-efficiency level with chemical dust suppressants application on unpaved roads as part of their air quality program.

The Air Sciences memorandum was reviewed by Greg Muleski of SACI, LLC. SACI provides consulting services on the characterization and control of air pollution sources, and Mr. Muleski had previously been a co-author of several EPA studies that are supporting documents for AP-

42. The conclusion of the review was that chemical unpaved road dust suppressants can reasonably achieve over 90 percent average control efficiency (SACI 2015).

Based on the BACT determinations, and the Air Sciences and SACI reviews, a 90 percent control level for unpaved road dust is considered technologically feasible. Therefore, Donlin Gold has proposed control measures for achieving 90 percent dust control as BACT.

## 2.19 Fugitive Dust from Material Loading and Unloading [EU ID 115-120]

Material loading and unloading activities generate fugitive particulate emissions from the handling of materials (e.g., loading of haul trucks via a shovel, truck dumping, etc.). Possible particulate emission control technologies for material loading and unloading were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 99.190, Other Fugitive Dust Sources. The results were filtered to include only material transfer emission sources. The results of the RBLC search are summarized in Table 2-33.

**Table 2-33. Particulate Control Options for Material Loading and Unloading**

| Control Technology | Number of Determinations* | Control Efficiency (%) |
|---|---|---|
| Baghouse | 6 | 99 |
| Water spray | 4** | 90 to 99 |
| Enclosure | 1 | No data |
| No control specified | 4 | No data |

* Separate determinations for different types of PM (PM, $PM_{10}$, $PM_{2.5}$, filterable, etc.) for the same emission source were counted as one determination.
** Includes the Project's BACT determination of water sprays (90%) from its air permit issued in 2017.

The material loading and unloading sources at the Project are mobile sources; therefore, add-on controls are not feasible. Donlin Gold proposes the use of BPMs, as described in its FDCP, as BACT for material loading and unloading emissions. The BPMs include natural precipitation and material moisture, avoiding activities during adverse winds, and watering work areas. Total potential particulate emissions from material loading and unloading are approximately 530 ton/yr. Capital costs, energy costs, and environmental impacts of using BPMs are minimal.

## 2.20 Fugitive Dust from Wind Erosion [EU ID 161]

Wind erosion can generate dust emissions from exposed and active mining areas such as the tailings impoundment beach, waste rock dump, run-of-mine ore and overburden stockpiles, and the haul and access roads.

The RBLC was searched for all determinations in the last 10 years under the process code 99.190, Other Fugitive Dust Sources. The search results were filtered to include only wind erosion emission sources. The results of the RBLC search are presented in Table 2-34.

**Table 2-34. Particulate Control Options for Wind Erosion**

| Control Technology | Number of Determinations* | Control Efficiency (%) |
|---|---|---|
| Water spray | 1** | 90 |
| Enclosure | 1 | No data |

* Separate determinations for different types of PM (PM, $PM_{10}$, $PM_{2.5}$, filterable, etc.) for the same emission source were counted as one determination.
** Includes the Project's BACT determination of water sprays (90%) from its air permit issued in 2017.

Due to the large, exposed areas that are potentially subject to wind erosion, add-on controls are not feasible for wind erosion sources at the Project. Donlin Gold therefore proposes to use BPMs, as described in the FDCP, as BACT for wind erosion from exposed areas. The BPMs for wind erosion include natural precipitation and material moisture, phased surface disturbance, dozer maintenance of waste facility surfaces, and chemical application. In addition, the coarse ore stockpile wind erosion emissions will be controlled by a cover over the stockpile. Haul road wind erosion emissions will be controlled by water and chemical application as discussed in Section 2.18.

The total potential particulate emissions from wind erosion at the Project are approximately 32 ton/yr.

Capital costs, energy costs, and environmental impacts of the BPMs listed above are minimal except for water and chemical dust suppression costs, which are discussed in Section 2.18, and the capital cost of an enclosure for the coarse ore stockpile.

## 2.21 Fugitive Dust from Drilling and Blasting [EU ID 113-114]

The Project will produce particulate emissions from drilling and blasting operations. Blasting breaks the overburden, waste rock, and ore into sizes that can be hauled and/or crushed. Holes are drilled into rock to allow placement of explosive materials for blasting operations.

The RBLC was searched for all determinations in the last 10 years under the process code 99.190, Other Fugitive Dust Sources. The search results were filtered to include only drilling and blasting emission sources. The results of the RBLC search returned two determinations. One result was for drilling at an oil and gas facility which did not specify a control. The other result was for drilling and blasting operations at the Project with a control of best practical methods.

Donlin Gold proposes to use BPMs, as described in the FDCP, as BACT for particulate emissions from drilling and blasting. The BPMs for drilling and blasting include natural precipitation and material moisture, avoiding activities during adverse winds, and using blast-hole-stemming and wet or shrouded drilling when practical.

Total potential particulate emissions from drilling and blasting are approximately 272 ton/yr. Capital costs, energy costs, and environmental impacts of using BPMs are minimal.

## 2.22 Fugitive Combustion Emissions from Blasting [EU ID 114]

The Project will produce fugitive combustion emissions from blasting operations. Blasting generates CO, $NO_X$, and GHG from explosives combustion.

The RBLC was searched for all determinations in the last 10 years under the process code 99.190, Other Fugitive Dust Sources. The search results were filtered to include only blasting emission sources. The only result was for blasting operations at the Project, and the specified control was good combustion practices.

Donlin Gold proposes to select good combustion practices as BACT for fugitive combustion emissions from blasting for all pollutants. Total potential particulate emissions from blasting are approximately 1,921 ton/yr for CO, 52 ton/yr for $NO_X$, and 11,740 ton/yr for GHG. Capital costs, energy costs, and environmental impacts of using good combustion practices are minimal.

## 2.23 Title V Insignificant Emission Units [EU ID 21-23, 25-26, 143-149, 153-155, 157]

The Project will include ancillary equipment that will not require a Title V operating permit under 18 AAC 50.326 because it is categorized as "insignificant." This equipment and a description of the "insignificant" categorization are provided in Table 2-35. Note that the fire pump engines associated with the fire pump tanks discussed in this section are discussed in Section 2.5.

**Table 2-35. Title V Insignificant Emission Units**

| Emission Unit | Units | Title V Insignificant Category |
|---|---|---|
| Portable building heaters (0.86 MMBtu/hr, each) | 20 | A combustion emission unit with a rated capacity less than 1.7 MMBtu per hour (MMBtu/hr) using kerosene, No. 1 fuel oil, or No. 2 fuel oil; emission units under this paragraph do not include internal combustion engines. [18 AAC 50.326(g)(7)] |
| Auxiliary $SO_2$ burner (2 MMBtu/hr) | 1 | An emission unit with an actual emission rate, per pollutant, of less than the insignificant emission rates. [18 AAC 50.326(e)] |
| Building heaters (0.175 MMBtu/hr, each) | 138 | A combustion emission unit with a rated capacity less than 4 MMBtu/hr exclusively using NG, butane, propane, or liquefied petroleum gas; emission units under this paragraph do not include internal combustion engines. [18 AAC 50.326(g)(5)] |
| Air handlers (2.5 MMBtu/hr, each) | 7 | |
| $SO_2$ burner (2 MMBtu/hr) | 1 | |
| ANFO mixing plant tank (10,000 gallons, diesel) | 1 | Operation, loading, and unloading of volatile liquid storage with 10,000-gallon capacity or less, with lids or other closure and storing liquid with a vapor pressure not greater than 80 mm of mercury at 21ºC. [18 AAC 50.326(g)(3)] |
| Mine site mill fire pump tank (270 gallons, diesel) | 1 | |
| Tank farm fire pump tank (270 gallons, diesel) | 1 | |
| Camp fire pump tank (270 gallons, diesel) | 1 | |
| Jet fuel tanks (9,900 gallons each, jet fuel) | 2 | |
| Airport generator tank (9,900 gallons, diesel) | 1 | |
| POX boilers tank (5,000 gallons, diesel) | 1 | |
| Oxygen plant boiler tank (5,000 gallons, diesel) | 1 | |
| Carbon elution heater tank (5,000 gallons, diesel) | 1 | |
| Auxiliary $SO_2$ burner tank (500 gallons, diesel) | 1 | |

## 2.23.1 Combustion Emissions from Ancillary Fuel Burning Equipment

As shown in Table 2-35, the ancillary fuel burning equipment at the Project includes NG-fired building heaters and air handler heaters. In addition, there is an NG-fired $SO_2$ burner and a ULSD-fired auxiliary $SO_2$ burner, which produce $SO_2$ for the cyanide destruction process. The heat input rates for the ancillary fuel burning equipment range from 0.175 to 2.5 MMBtu/hr per unit. These sources are categorized as "insignificant" per 18 AAC 50.326(e) or (g) because of their small size and/or low level of emissions.

The potential emissions of each source, based on 8,760 hours of operation, are provided in Table 2-36.

**Table 2-36. Ancillary Fuel Burning Equipment per Unit Emissions (ton/yr, per unit)**

| Source | CO | $NO_X$ | PM* | VOC | $CO_2$ |
|---|---|---|---|---|---|
| Portable building heaters, each | 0.15 | 0.58 | 0.095 | 0.01 | 614 |
| Building heaters, each | 0.03 | 0.07 | 0.006 | 0.004 | 90 |
| Air handler heaters (2.5 MMBtu/hr), each | 0.90 | 1.07 | 0.08 | 0.06 | 1,281 |
| $SO_2$ burner (2 MMBtu/hr) | 0.72 | 0.86 | 0.07 | 0.05 | 1,025 |
| Auxiliary $SO_2$ burner (2 MMBtu/hr) | 0.34 | 1.35 | 0.22 | 0.02 | 1,428 |

* PM – Total particulates

The possible control options for fuel burning equipment are discussed in Section 2.4, Boilers and Heaters. However, because of the low emission levels shown in Table 2-36, no control options, other than good combustion practices and use of clean fuels, would be cost-effective. Therefore, Donlin Gold proposes to select good operating practices and clean fuels as BACT for CO, $NO_X$, particulate, VOC, and GHG emissions.

Capital costs, energy costs, and environmental impacts of using good operating practices and clean fuels are minimal. These sources are not subject to emission limits under NSPS.

## 2.23.2 VOC from Tanks

Possible VOC emission control technologies for the fuel tanks are discussed in Section 2.15, Fuel Tanks.

Potential annual VOC emissions from all the insignificant fuel tanks described in this section are less than 0.2 ton/yr combined. Because of this low emission level, expensive add-on controls such as a floating roof or capture and recover/control system for VOC control would not be cost-effective. Therefore, Donlin Gold proposes to select submerged fill tanks as BACT for VOC emissions.

There are no significant capital, energy, or environmental impacts associated with the use of submerged fill tanks for VOC control.

These tanks are not subject to an emission limit for VOC under NSPS.

# 3.0 REFERENCES

ADEC. 2015. "Fugitive Emissions and BACT." Email from Patrick Dunn (ADEC) to Mike Rieser (Donlin Gold), March 18.

Air Sciences. 2015b. "Unpaved Road Dust Control Efficiency from Chemical Suppressants." Prepared for Robert (Nick) Enos (Donlin Gold), February 27.

AMEC. 2011. "Mechanical Equipment List." Client: Donlin Creek LLC, Project: Donlin Creek Feasibility Study Update 2, Project No. 166549, Doc. No. 166549-99-EL-001, Rev. C.

—. 2013. "AMEC Cost Estimate." Costs assembled in 2011. Excel spreadsheet prepared by AMEC; forwarded by M. Rieser (Donlin) to K. Lewis (Air Sciences Inc.) on December 18.

CGS. 2011. "Your Email RFQ #H330800-PM009 - Vent Gas Scrubber RFP." Letter from CGA to Hatch Ltd., May 17.

EPA. 1990. "New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting, DRAFT." October.

—. 1995. "AP-42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources." Office of Air Quality Planning and Standards. Appendix B.2, Table B.2-3, January.

—. 2002. "EPA Air Pollution Control Cost Manual, Sixth Edition." EPA/452/B-02-001, January.

—. 2021. "Technology Transfer Network, Clean Air Technology Center - RACT/BACT/LAER Clearinghouse." Accessed October 2021. http://www.epa.gov/ttn/catc/rblc/htm/rbxplain.html.

Hatch Ltd. 2011. "Customer RFQ No. H330800-PM016, IONEX Quote No. 2011-046, Rev. No. 0, Date: 5/24/11."

MECA. 2015. "Emission Control Technology for Stationary Internal Combustion Engines." Manufacturers of Emission Controls Association (MECA), May. Accessed October 12, 2021. http://www.meca.org/resources/MECA_stationary_IC_engine_report_0515_final.pdf.

NDEP. 2020a. "Class I Air Quality Operating Permit No. AP1041-0739.04." Issued to Nevada Gold Mines LLC - Goldstrike Mines, March 26.

—. 2020b. "Class I Air Quality Permit No. AP1041-0723.04." Issued to Newmont Mining Corporation - Twin Creeks Mine, June 29.

Nystén, Sofia. 2011. "Water Injection." November 7.

SACI. 2015. "Control of Unpaved Road Dust Using Chemical Suppressants." Prepared for Robert (Nick) Enos (Donlin Gold), May 14.

Seitz, J. S. 1995. "Calculating Potential to Emit (PTE) for Emergency Generators." Office of Air Quality Planning and Standards, September 6.

Wärtsilä. 2011. "RE: Eklutna air emissions tabulation." Email from C. Whitney (Wärtsilä) to R. Ridley, November 2.

—. 2013a. "Emission reduction - gas engines." Accessed October 28, 2013. http://www.Wärtsilä.com/en/power-plants/technology/emission-reduction/gas-engines.

—. 2013b. "Emission reduction - liquid fuel engines." Accessed October 28, 2013. http://www.Wärtsilä.com/en/power-plants/technology/emission-reduction/liquid-fuel-engines.

—. 2013c. "RE: Ballpark Costs Numbers for SCR and OC controls for 18V50DF Engines." Email from D. Finn (Wärtsilä) to M. Rieser (Donlin Gold), October 16.

# Attachment C1 – BACT Summary

Table C1-1 provides a summary of the BACT steps for each source described in this report.

**Table C1-1. BACT Summary**

| Source/Pollutant | Step 1<br>Possible Control Technologies | Step 2<br>Infeasible Technologies | Step 3<br>Ranking Control Technologies | Step 4<br>Most Effective Control Technology | Step 5<br>Selection of BACT |
|---|---|---|---|---|---|
| **Main Power Plant –** 12 Wärtsilä Model 18V50DF dual-fuel engines | | | | | |
| CO | Oxidation catalyst, NSCR, Good combustion practices | NSCR | 1. Oxidation catalyst<br>2. Good combustion practices | Oxidation catalyst | Oxidation catalyst<br>0.09 g/hp-hr (gas)<br>0.13 g/hp-hr (oil) |
| $NO_X$ | SCR, NSCR, Low $NO_X$ combustion, Lean-burn combustion technology, Good combustion practices, Water injection, Other add-on controls | Water injection, NSCR | 1. SCR<br>2. Other add-on control devices<br>3. Low $NO_X$ combustion/Lean-burn combustion technology<br>4. Good combustion practices | SCR | SCR<br>0.06 g/hp-hr (gas)<br>0.40 g/hp-hr (oil) |
| Particulates | Filter, Wet scrubber, ESP, Clean fuels/Good combustion practices | Filter, Wet scrubber, ESP | 1. Clean fuels/Good combustion practices | Clean fuels/Good combustion practices | Clean fuels / Good combustion practices<br>0.10 g/hp-hr (gas)<br>0.11 g/hp-hr (oil-filterable)<br>0.22 g/hp-hr (oil-filterable and condensable |
| VOC | Oxidation catalyst, NSCR, Good combustion practices | NSCR | 1. Oxidation catalyst<br>2. Good combustion practices | Oxidation catalyst | Oxidation catalyst<br>0.07 g/hp-hr (gas)<br>0.16 g/hp-hr (oil) |

| Source/Pollutant | Step 1<br>Possible Control Technologies | Step 2<br>Infeasible Technologies | Step 3<br>Ranking Control Technologies | Step 4<br>Most Effective Control Technology | Step 5<br>Selection of BACT |
|---|---|---|---|---|---|
| GHG/$CO_2$ | CCS, Energy-efficient combined cycle operation, Good combustion practices | CCS | 1. Energy-efficient combined cycle operation<br>2. Good combustion practices | Energy-efficient combined cycle operation | Energy-efficient combined cycle operation<br>305 g/hp-hr (gas)<br>440 g/hp-hr (oil) |
| **Ore Crushing –** gyratory crusher, surge pocket, apron feeder, coarse ore reclaim apron feeders 1 to 4, pebble crushers | | | | | |
| Particulates | Dust collector, Wet scrubber, ESP, Enclosure, Water sprays or dust suppressant | None | 1. Dust collector<br>2. ESP<br>3. Wet scrubber<br>4. Enclosure<br>5. Water sprays or dust suppressant | Dust collector | Dust collector<br>0.01 $gr/ft^3$ |
| **Ore Crushing –** GC dump pocket and rock breaker, GC discharge conveyor, stockpile feed conveyor, SAG mill feed conveyor, pebble discharge conveyor | | | | | |
| Particulates | Dust collector, Wet scrubber, ESP, Enclosure, Water sprays or dust suppressant | Dust collector, Wet scrubber, ESP | 1. Enclosure<br>2. Water sprays or dust suppressant | Enclosure | Enclosure<br>0.00048 lb/ton |
| **Autoclaves –** two units | | | | | |
| CO | Thermal oxidation, Oxidation catalyst, Good operating practices | Thermal oxidation, Oxidation catalyst | 1. Good operating practices | Good operating practices | Good operating practices<br>88.0 lb/hr per unit |
| Particulates | Dust collector, Wet scrubber, ESP | Dust collector | 1. Wet scrubber<br>2. ESP | Wet scrubber | Wet scrubber<br>0.22 lb/hr per unit |
| VOC | Thermal oxidation, Oxidation catalyst, Carbon adsorption | Thermal oxidation, Oxidation catalyst | 1. Carbon adsorption | Carbon adsorption | Carbon adsorption<br>0.04 lb/hr per unit |
| GHG | CCS, Good operating practices | CCS | 1. Good operating practices | Good operating practices | Good operating practices |

| Source/Pollutant | Step 1<br>Possible Control Technologies | Step 2<br>Infeasible Technologies | Step 3<br>Ranking Control Technologies | Step 4<br>Most Effective Control Technology | Step 5<br>Selection of BACT |
|---|---|---|---|---|---|
| **Boilers and Heaters –** POX boilers, oxygen plant boiler, carbon elution heater, air handler heaters, power plant auxiliary heaters | | | | | |
| CO | Oxidation catalyst, Good combustion practices | None | 1. Oxidation catalyst<br>2. Good combustion practices | Good combustion practices (Oxidation catalyst is not cost-effective) | Good combustion practices<br>0.082 lb/MMBtu (NG)<br>0.038 lb/MMBtu (ULSD) |
| $NO_X$ (POX and oxygen plant boilers, carbon elution heater, air handler heaters) | SCR, Low-$NO_X$ burner, Good combustion practices | Low-$NO_X$ burner | 1. SCR<br>2. Good combustion practices | Good combustion practices (SCR is not cost-effective) | Good combustion practices<br>0.098 lb/MMBtu (NG)<br>0.154 lb/MMBtu (ULSD) |
| $NO_X$ (power plant auxiliary boilers) | SCR, Low-$NO_X$ burner, Good combustion practices | None | 1. SCR<br>2. Low-$NO_X$ burner<br>3. Good combustion practices | Low-$NO_X$ burner (SCR is not cost-effective) | Low-$NO_X$ burner<br>0.049 lb/MMBtu (NG)<br>0.154 lb/MMBtu (ULSD) |
| Particulates | Dust collector, Wet scrubber, ESP, Clean fuels/Good combustion practices | Dust collector, Wet scrubber, ESP | 1. Clean fuels/Good combustion practices | Clean fuels/Good combustion practices | Clean fuels / Good combustion practices<br>0.0075 lb/MMBtu (NG)<br>0.025 lb/MMBtu (ULSD) |
| VOC | Oxidation catalyst, thermal oxidizer, Good combustion practices | None | 1. Oxidation catalyst<br>2. Thermal oxidizer<br>3. Good combustion practices | Good combustion practices (Oxidation catalyst and thermal oxidizer are not cost-effective) | Good combustion practices<br>0.0054 lb/MMBtu (NG)<br>0.0015 lb/MMBtu (ULSD) |
| GHG | CCS, Good combustion practices | CCS | 1. Good combustion practices | Good combustion practices | Good combustion practices |
| **Black Start and Emergency Diesel Engines –** black start generators (two units, 600 kW each), camp emergency generators (four units, 1,500 kW each), mine site tank farm fire pump (252 hp), mine site mill fire pump (252 hp), camp site fire pump (252 hp) | | | | | |
| CO | Oxidation catalyst, Good combustion practices, NSPS IIII | None | 1. Oxidation catalyst<br>2. Good combustion practices<br>3. NSPS IIII | Good combustion practices (Oxidation catalyst is not cost-effective) | Good combustion practices / NSPS IIII<br>3.27 g/hp-hr |

| Source/Pollutant | Step 1<br>Possible Control Technologies | Step 2<br>Infeasible Technologies | Step 3<br>Ranking Control Technologies | Step 4<br>Most Effective Control Technology | Step 5<br>Selection of BACT |
|---|---|---|---|---|---|
| $NO_X$ + VOC | SCR, Oxidation catalyst, Good combustion practices, NSPS IIII | None | 1. SCR<br>2. Oxidation catalyst<br>3. Good combustion practices<br>4. NSPS IIII | Good combustion practices (SCR and oxidation catalyst are not cost-effective) | Good combustion practices / NSPS IIII<br>6.0 g/hp-hr (Black start and Emergency)<br>3.7 g/hp-hr (Camp fire pump) |
| Particulates | Particulate filter, Good combustion practices, NSPS IIII | None | 1. Particulate filter<br>2. Clean fuels / Good combustion practices<br>3. NSPS IIII | Clean fuels/Good combustion practices (particulate filters are not cost effective) | Clean fuels / Good combustion practices / NSPS IIII<br>0.19 g/hp-hr |
| GHG | CCS, Good combustion practices | CCS | 1. Good combustion practices | Good combustion practices | Good combustion practices |
| **Small Diesel Engines –** airport diesel generators (two units, 200 kW each) | | | | | |
| CO | Oxidation catalyst, Good combustion practices, NSPS IIII | None | 1. Oxidation catalyst<br>2. Good combustion practices<br>3. NSPS IIII | Good combustion practices (Oxidation catalyst is not cost-effective) | Good combustion practices / NSPS IIII<br>3.27 g/hp-hr |
| $NO_X$ | SCR, Good combustion practices, NSPS IIII | None | 1. SCR<br>2. Good combustion practices<br>3. NSPS IIII | Good combustion practices (SCR is not cost-effective) | Good combustion practices / NSPS IIII<br>0.37 g/hp-hr |
| Particulates | Good combustion practices, NSPS IIII | None | 1. Clean fuels / Good combustion practices<br>2. NSPS IIII | Clean fuels/Good combustion practices | Clean fuels/Good combustion practices / NSPS IIII<br>0.02 g/hp-hr |
| VOC | Oxidation catalyst, Good combustion practices, NSPS IIII | None | 1. Oxidation catalyst<br>2. Good combustion practices<br>3. NSPS IIII | Good combustion practices (Oxidation catalyst is not cost-effective) | Good combustion practices / NSPS IIII<br>0.18 g/hp-hr |
| GHG | CCS, Good combustion practices | CCS | 1. Good combustion practices | Good combustion practices | Good combustion practices |

| Source/Pollutant | Step 1<br>Possible Control Technologies | Step 2<br>Infeasible Technologies | Step 3<br>Ranking Control Technologies | Step 4<br>Most Effective Control Technology | Step 5<br>Selection of BACT |
|---|---|---|---|---|---|
| **Carbon Regeneration Kiln** | | | | | |
| CO | Thermal oxidation, Oxidation catalyst, Good operating practices | None | 1. Thermal oxidation and Oxidation catalyst<br>2. Good operating practices | Good operating practices (Thermal oxidation and Oxidation catalyst are not cost-effective) | Good operating practices<br>0.88 lb/hr |
| $NO_X$ | SCR, Good operating practices | None | 1. SCR<br>2. Good operating practices | Good operating practices (SCR is not cost-effective) | Good operating practices<br>0.02 lb/hr |
| Particulates | Dust collector, Wet scrubber, ESP, Wet off-gas cooler | None | 1. Dust collector, Wet scrubber, ESP<br>2. Wet off-gas cooler | Wet off-gas cooler (Dust collector, Wet scrubber, ESP are not cost-effective) | Wet off-gas cooler<br>0.44 lb/hr |
| VOC | Thermal oxidation, Oxidation catalyst, Good operating practices | None | 1. Thermal oxidation and Oxidation catalyst<br>2. Good operating practices | Good operating practices (Thermal oxidation, Oxidation catalyst are not cost-effective) | Good operating practices<br>0.44 lb/hr |
| **Induction Melting Furnace** | | | | | |
| Particulates | Dust collector, Wet scrubber, ESP, Enclosure | None | 1. Dust collector<br>2. ESP<br>3. Wet scrubber<br>4. Enclosure | Dust collector | Dust collector<br>0.005 gr/scf |
| **Pressure Oxidation Hot Cure** – POX hot cure tanks (3 units) | | | | | |
| Particulates | Dust collector, Wet scrubber, ESP, Good operating practices | Dust collector | 1. Wet scrubber, ESP<br>2. Good operating practices | Good operating practices (Wet scrubber, ESP are not cost-effective) | Good operating practices<br>0.40 lb/hr |
| **Electrowinning Cells** | | | | | |

| Source/Pollutant | Step 1<br>Possible Control Technologies | Step 2<br>Infeasible Technologies | Step 3<br>Ranking Control Technologies | Step 4<br>Most Effective Control Technology | Step 5<br>Selection of BACT |
|---|---|---|---|---|---|
| Particulates | Dust collector, Wet scrubber, ESP, Good operating practices | Dust collector | 1. Wet scrubber, ESP<br>2. Good operating practices | Good operating practices (Wet scrubber, ESP are not cost-effective) | Good operating practices<br>0.19 lb/hr |
| **Retort** | | | | | |
| Particulates | Dust collector, Wet scrubber, ESP, Good operating practices | None | 1. Dust collector, Wet scrubber, ESP<br>2. Good operating practices | Good operating practices (Dust collector, Wet scrubber, ESP are not cost-effective) | Good operating practices<br>0.03 lb/hr |
| **Laboratories** – sample receiving and preparation laboratory, assay laboratory, and metallurgical laboratory | | | | | |
| Particulates | Dust collector, ESP, Wet scrubber | None | 1. Dust collector<br>2. ESP<br>3. Wet scrubber | Dust collector | Dust collector<br>0.009 gr/scf (Sampling)<br>0.004 gr/scf (Assay)<br>0.009 gr/scf (Metallurgical) |
| **Reagent Handling for Water Treatment –** transfers | | | | | |
| Particulates | Dust collector, Enclosure, Wet scrubber, ESP, Water sprays | None | 1. Dust collector<br>2. ESP<br>3. Wet scrubber<br>4. Enclosure<br>5. Water sprays | Dust collector | Dust collector<br>0.02 gr/scf |
| **Mill Reagents Handling –** lime handling **–** hopper and silo, flocculant handling and mixing, caustic soda handling and mixing, copper sulfate handling and mixing, PAX handling and mixing, soda ash handling and mixing | | | | | |
| Particulates | Dust collector, Wet scrubber, ESP, Water sprays | None | 1. Dust collector<br>2. ESP<br>3. Wet scrubber<br>4. Water sprays | Dust collector | Dust collector<br>0.02 gr/scf |
| **Mill Reagents Handling –** lime handling – lime slaker | | | | | |

| Source/Pollutant | Step 1 Possible Control Technologies | Step 2 Infeasible Technologies | Step 3 Ranking Control Technologies | Step 4 Most Effective Control Technology | Step 5 Selection of BACT |
|---|---|---|---|---|---|
| Particulates | Dust collector, Wet scrubber, ESP, Water sprays | Dust collector | 1. Wet scrubber or ESP<br>2. Water sprays | Wet scrubber | Wet scrubber 0.02 gr/scf |
| **Fuel Tanks –** tank farm tanks 1 to 15, fuel station tanks 1 and 2, power plant tanks A and B, camp generator tank, aviation gasoline tank | | | | | |
| VOC | Floating roof, Submerged fill, Fixed roof, Capture and recover/control, NSPS, Good operating practices | None | 1. Floating roof<br>2. Submerged fill<br>3. Fixed roof<br>4. Capture and recover/control<br>5. NSPS<br>6. Good operating practices | Submerged fill (Floating roof not cost-effective) | Submerged fill |
| **Incinerators –** camp waste and sewage sludge incinerators | | | | | |
| CO | Thermal oxidation, Oxidation catalyst, Good combustion practices | None | 1. Thermal oxidation and Oxidation catalyst<br>2. Good combustion practices | Controls necessary to meet NSPS | NSPS CCCC and LLLL 17 ppmvd @ 7% $O_2$ (Camp waste incinerator) 52 ppmvd @ 7% $O_2$ (Sewage Sludge incinerator) |
| $NO_X$ | SCR, SNCR, Low-$NO_X$ burners and Lean burn with Flue gas recirculation, Good combustion practices | None | 1. SCR<br>2. SNCR, Low-$NO_X$ burners and Lean burn with Flue gas recirculation<br>3. Good combustion practices | Controls necessary to meet NSPS | NSPS CCCC and LLLL 23 ppmvd @ 7% $O_2$ (Camp waste incinerator) 210 ppmvd @ 7% $O_2$ (Sewage Sludge incinerator) |

| Source/Pollutant | Step 1<br>Possible Control Technologies | Step 2<br>Infeasible Technologies | Step 3<br>Ranking Control Technologies | Step 4<br>Most Effective Control Technology | Step 5<br>Selection of BACT |
|---|---|---|---|---|---|
| Particulates | Dust collector, Wet scrubber, ESP, Good combustion practices | None | 1. Dust collector, Wet scrubber, ESP<br>2. Good combustion practices | Controls necessary to meet NSPS | NSPS CCCC and LLLL<br>18 mg/dscm @ 7% $O_2$ (Camp waste incinerator)<br>60 mg/dscm @ 7% $O_2$ (Sewage Sludge incinerator) |
| GHG | CCS, Good combustion practices | CCS | 1. Good combustion practices | Good combustion practices | Good combustion practices |
| **Acidulation Tanks and Neutralization Tanks** | | | | | |
| GHG | CCS, Good operating practices | CCS | 1. Good operating practices | Good operating practices | Good operating practices |
| **Fugitive Dust from Unpaved Roads** | | | | | |
| Particulates | Chemical and water, Water, Chemical, Speed reduction, Paving, Crushed stone | Paving | 1. Chemical and water<br>2. Chemical<br>3. Water<br>4. Speed reduction<br>5. Crushed stone | Chemical and water | BPMs: Chemical and water application |
| **Fugitive Dust from Material Loading and Unloading** | | | | | |
| Particulates | Enclosure, Baghouse, Water spray, Moisture content, Best practical methods | Enclosure, Baghouse, Water spray, Moisture content | 1. BPMs | BPMs | BPMs |
| **Fugitive Dust from Wind Erosion** | | | | | |
| Particulates | Water spray, Chemical, Enclosure, Moisture content, Wind block, Best practical methods | Water spray, Chemical, Enclosure, Moisture content, Wind block | 1. BPMs | BPMs | BPMs |
| **Fugitive Dust from Drilling and Blasting** | | | | | |

| Source/Pollutant | Step 1 Possible Control Technologies | Step 2 Infeasible Technologies | Step 3 Ranking Control Technologies | Step 4 Most Effective Control Technology | Step 5 Selection of BACT |
|---|---|---|---|---|---|
| Particulates | Best practical methods | None | 1. BPMs | BPMs | BPMs |
| **Fugitive Combustion Emissions from Blasting** | | | | | |
| CO, $NO_X$, VOC, GHG | Good combustion practices | None | 1. Good combustion practices | Good combustion practices | Good combustion practices |
| **Title V Insignificant Emission Units –** portable building heaters, building heaters, air handlers, $SO_2$ burner, Auxiliary $SO_2$ burner | | | | | |
| CO | Oxidation catalyst, Good combustion practices | None | 1. Oxidation catalyst<br>2. Good combustion practices | Good combustion practices (Oxidation catalyst is not cost-effective) | Good combustion practices:<br>0.038 lb/MMBtu (Portable Building Heaters, Auxiliary $SO_2$ burner)<br>0.039 lb/MMBtu (Building Heaters)<br>0.082 lb/MMBtu (Air Handler Heaters, $SO_2$ Burner) |
| $NO_X$ | SCR, Low-$NO_X$ burners and Lean burn combustion technology, Good combustion practices | None | 1. SCR<br>2. Low $NO_X$-burners and Lean burn combustion technology<br>3. Good combustion practices | Good combustion practices (Add-on controls are not cost-effective) | Good combustion practices:<br>0.154 lb/MMBtu (Portable Building Heaters, Auxiliary $SO_2$ burner)<br>0.092 lb/MMBtu (Building Heaters)<br>0.098 lb/MMBtu (Air Handler Heaters, $SO_2$ Burners) |

| Source/Pollutant | Step 1<br>Possible Control Technologies | Step 2<br>Infeasible Technologies | Step 3<br>Ranking Control Technologies | Step 4<br>Most Effective Control Technology | Step 5<br>Selection of BACT |
|---|---|---|---|---|---|
| Particulates | Dust collector, Wet scrubber, ESP, Clean fuels/Good combustion practices | Dust collector, Wet scrubber, ESP | 1. Clean fuels/Good combustion practices | Clean fuels/Good combustion practices | Clean fuels/Good combustion practices:<br>0.025 lb/MMBtu (Portable Building Heaters, Auxiliary $SO_2$ burner)<br>0.0075 lb/MMBtu (Building Heaters)<br>0.0075 lb/MMBtu (Air Handler Heaters, $SO_2$ Burners) |
| VOC | Oxidation catalyst, Good combustion practices | None | 1. Oxidation catalyst<br>2. Good combustion practices | Good combustion practices (Oxidation catalyst is not cost-effective) | Good combustion practices:<br>0.0026 lb/MMBtu (Portable Building Heaters, Auxiliary $SO_2$ burner)<br>0.0075 lb/MMBtu (Building Heaters)<br>0.0054 lb/MMBtu (Air Handler Heaters, $SO_2$ Burners) |
| GHG | CCS, Good combustion practices | CCS | 1. Good combustion practices | Good combustion practices | Good combustion practices |

**Title V Insignificant Emission Units –** ANFO mixing plant tank, mine site mill fire pump tank, tank farm fire pump tank, camp fire pump tank, jet fuel tanks, airport generator tank, POX boilers tank, oxygen plant boiler tank, carbon elution heater tank, auxiliary $SO_2$ burner tank

| Source/Pollutant | Step 1<br>Possible Control Technologies | Step 2<br>Infeasible Technologies | Step 3<br>Ranking Control Technologies | Step 4<br>Most Effective Control Technology | Step 5<br>Selection of BACT |
|---|---|---|---|---|---|
| VOC | Floating roof, Submerged fill, Fixed roof, Capture and recovery control, NSPS, Leak detection and repair, Good operating practices | None | 1. Floating roof<br>2. Submerged fill<br>3. Fixed roof<br>4. Capture and recovery control<br>5. NSPS<br>6. Leak detection and repair<br>7. Good operating practices | Submerged fill (Floating roof not cost-effective) | Submerged fill |

SCR – Selective Catalytic Reduction
ESP – Electrostatic Precipitator
CCS – Carbon Capture and Sequestration
NSPS – New Source Performance Standards per 40 CFR 60
NSPS Controls – Emission controls required to meet the NSPS emission limits
SNCR – Selective Non-Catalytic Reduction

# Attachment C2 – RBLC Search Downloads

# Table of Contents

**RBLC Search Downloads**

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - CO (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AR-0163 | 06/09/2019  ACT | Lime Injector Burners | 17.13 | Natural Gas | 0 | | Carbon Monoxide | Combustion of Natural gas and Good Combustion Practices | 0.0824 | LB/MMBTU | |
| *FL-0368 | 02/14/2019  ACT | Emergency Engines | 17.13 | Natural gas | 0 | | Carbon Monoxide | good combustion practices | 4 | G-HP-HR | 4.00 |
| KY-0110 | 07/23/2020  ACT | EP 10-05 - Austenitizing Furnace Rolls Emergency Generator | 17.13 | Natural Gas | 636 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 4 | G/HP-HR | 4.00 |
| KY-0110 | 07/23/2020  ACT | EP 10-06 - Tempering Furnace Rolls Emergency Generator | 17.13 | Natural Gas | 636 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 4 | G/HP-HR | 4.00 |
| *MI-0440 | 05/22/2019  ACT | FGENGINES | 17.13 | natural gas | 16500 | HP | Carbon Monoxide | Oxidation catalyst | 0.3 | G/HP-H | 0.30 |
| AK-0084 | 06/30/2017  ACT | Twelve (12) Large ULSD/Natural Gas-Fired Internal Combustion Engines | 17.11 | Diesel and Natural Gas | 143.5 | MMBtu/hr | Carbon Monoxide | Oxidation Catalyst and Maintain Good Combustion Practices | 0.18 | G/KW-HR (ULSD) | 0.09 |
| *LA-0346 | 01/04/2018  ACT | emergency generators (4 units) | 17.11 | natural gas | 13410 | hp (each) | Carbon Monoxide | Comply with standards of 40 CFR 60 Subpart JJJJ | 4 | G/BHP-HR | 4.00 |
| *MI-0441 | 12/21/2018  ACT | EUEMGNG1--A 1500 HP natural gas fueled emergency engine | 17.13 | Natural gas | 1500 | HP | Carbon Monoxide | Burn natural gas and be NSPS compliant | 4 | G/HP-H | 4.00 |
| *MI-0441 | 12/21/2018  ACT | EUEMGNG2 | 17.13 | NATURAL GAS | 6000 | HP | Carbon Monoxide | Burn natural gas and be NSPS compliant. | 4 | G/HP-H | 4.00 |
| CA-1240 | 03/17/2017  ACT | Internal Combustion Engine | 17.13 | Natural gas | 881 | bhp | Carbon Monoxide | Oxidation catalyst | 54 | PPMVD | 0.38 |
| CA-1241 | 08/19/2016  ACT | ICE Landfill or digested gas fired | 17.14 | Digester gas | 1573 | bhp | Carbon Monoxide | SCR/Oxidation catalyst | 36 | PPMV | 0.26 |
| IN-0246 | 10/22/2015  ACT | LANDFILL GAS-FIRED ENGINE GENERATOR SETS | 17.14 | LANDFILL GAS | 2233 | BHP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 3.3 | G/BHP-HR | 3.30 |
| *KS-0030 | 03/31/2016  ACT | Spark ignition RICE emergency AC generators | 17.13 | Natural gas | 450 | kW | Carbon Monoxide | | 4 | G/HP-HR | 4.00 |
| *KS-0030 | 03/31/2016  ACT | Spark ignition RICE electricity generating units (EGUs) | 17.13 | Natural Gas | 10 | MW | Carbon Monoxide | | 3.86 | LB/H | 0.13 |
| ME-0041 | 03/30/2016  ACT | Engine #1 | 17.14 | landfill gas | 16.5 | MMBTU/H | Carbon Monoxide | | 3.5 | G/BHP*H | 3.50 |
| ME-0041 | 03/30/2016  ACT | Engine #2 | 17.14 | landfill gas | 16.5 | MMBTU/H | Carbon Monoxide | | 3.5 | G/BHPH | 3.50 |
| ME-0041 | 03/30/2016  ACT | Engine #3 | 17.14 | landfill gas | 16.5 | MMBTU/H | Carbon Monoxide | | 3.5 | G/BHPH | 3.50 |
| MI-0420 | 06/03/2016  ACT | EUN_EM_GEN | 17.13 | Natural gas | 225 | H/YR | Carbon Monoxide | Good combustion practices and clean burn fuel (pipeline quality natural gas). | 9.6 | LB/H | 4.00 |
| MI-0424 | 12/05/2016  ACT | EUNGENGINE (Emergency engine--natural gas) | 17.13 | Natural gas | 500 | H/YR | Carbon Monoxide | Oxidation catalyst and good combustion practices. | 0.8 | G/HP-H | 0.80 |
| MI-0426 | 03/24/2017  ACT | EUN_EM_GEN (Natural gas emergency engine). | 17.13 | Natural gas | 205 | H/YR | Carbon Monoxide | Good combustion practices and clean burn fuel (pipeline quality natural gas). | 11 | LB/H | 4.00 |
| TX-0755 | 05/21/2015  ACT | Internal Combustion Compressor Engines | 17.13 | Residue gas equivalent to natural gas | 206149 | MMBtu/yr | Carbon Monoxide | Ultra Lean-burn engines firing residue gas (with low carbon density) which is equivalent to natural gas, and use of oxidation catalysts | 0.083 | G/HP HR | 0.08 |
| VT-0040 | 03/04/2016  ACT | Stationary Internal Combustion Engine | 17.14 | Landfill gas | 2535 | scfm | Carbon Monoxide | To keep the engine's CO emissions as low as reasonably possible, the build up of siliceous deposits in the engine combustion chambers must be periodically serviced/cleaned. It is anticipated to require annual cleaning, as well as a more extensive on-site in-frame cleaning every 3 years, as well as a more extensive off-site overhaul every 6 years. | 3.5 | G/B-HP-H | 3.50 |
| AL-0301 | 07/22/2014  ACT | PROPANE FIRED EMERGENCY GENERATOR | 17.13 | PROPANE | 400 | KW | Carbon Monoxide | | 7.5 | LB/1000 GAL | |

## BACT Determinations for Large Internal Combustion Engines (> 500 HP) - CO (Gas-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0333 | 07/05/2012  ACT | 1.6 MW Caterpillar Model G3520C lean-burn internal combustion engine | 17.14 | biogas | 0 | | Carbon Monoxide | Engine design and good combustion practices. | 24.7 | LB/H | 5.22 |
| FL-0339 | 09/15/2014  ACT | 12 LFG-fired RICE/generator sets, 1.6 MW each | 17.14 | Landfill gas | 14.96 | MMBTU/hr, LHV | Carbon Monoxide | Engine combustion characteristics | 3.5 | G/BHP-H | 3.50 |
| FL-0345 | 12/18/2013  ACT | Four landfill gas-to-energy engines | 17.14 | Landfill gas | 554 | scfm | Carbon Monoxide | Reflects degradation of engines after use. Based on proper combustion in engines. | 3.5 | G/BHP-H | 3.50 |
| IL-0113 | 12/23/2013  ACT | Engines | 17.14 | Treated landfill gas | 2.6 | MW | Carbon Monoxide | | 2.5 | G/HP-H | 2.50 |
| IN-0157 | 03/05/2012  ACT | CATERPILLAR 3520 LANDFILL GAS-FUELED ENGINE/GENERATORS | 17.14 | LANDFILL GAS | 1.6 | MW | Carbon Monoxide | GOOD CUMBUSTION PRACTICES | 3.3 | G/HP-H | 3.30 |
| KS-0035 | 01/24/2014  ACT | spark ignition four stroke lean burn reciprocating internal combustion engine (RICE) electric generating units (EGUs) | 17.13 | Natural gas | 12526 | BHP | Carbon Monoxide | selective catalytic reduction (SCR) system and an oxidation catalyst | 2.67 | LBS PER HOUR | 0.10 |
| LA-0257 | 12/06/2011  ACT | Generator Engines (2) | 17.13 | Natural Gas | 2012 | hp | Carbon Monoxide | Comply with 40 CFR 60 Subpart JJJJ | 19.51 | LB/H | 4.40 |
| LA-0311 | 07/15/2013  ACT | No. 5 Urea Plant Emergency Generator B (33-13, EQT 182) | 17.13 | Natural Gas | 2500 | HP | Carbon Monoxide | Good combustion practices; proper equipment design consistent with 40 CFR 60 Subpart JJJJ | 27.56 | LB/HR | 5.00 |
| MI-0396 | 05/08/2012  ACT | (1) Caterpillar 3516 Generator Engine ("Engine 7") | 17.14 | Landfill gas | 800 | KW | Carbon Monoxide | The engine is a ‘‘low emissions‘‘ engine tuned for low NOx which is a trade-off for higher CO emissions. The CO emission limit is the manufacturer's specification for CO when tuned for low NOx. | 3.1 | G/B-HP-H | 3.10 |
| MI-0396 | 05/08/2012  ACT | (1) Caterpillar 3512 Generator Engine ("Engine 8") | 17.14 | Landfill gas | 615 | KW | Carbon Monoxide | This is a low emissions engine tuned for low NOx which is a trade off for higher CO emissions. The CO emission limit is the manufacturer's specification for CO when tuned for low NOx. | 3.03 | G/B-HP-H | 3.03 |
| MI-0396 | 05/08/2012  ACT | (2) Landfill Gas Generator Engine ("Engines 9&10") | 17.14 | Landfill gas | 1600 | KW | Carbon Monoxide | This is a ‘‘low emissions‘‘ engine tuned for low NOx which is a trade off for higher CO emissions. The CO emission limit is the manufacturer's specification for CO when tuned for low NOx. | 3.3 | G/B-HP-H | 3.30 |
| MI-0411 | 12/11/2013  ACT | FGENGINES7R-10 (4 CAT engines using landfill gas) | 17.14 | Landfill gas | 1600 | KW | Carbon Monoxide | | 3.3 | G/B-HP-H | 3.30 |
| MI-0412 | 12/04/2013  ACT | Emergency Engine--natural gas (EUNGENGINE) | 17.13 | natural gas | 1000 | kW | Carbon Monoxide | Oxidation catalyst and good combustion practices. | 0.8 | G/HP-H | 0.80 |
| MI-0413 | 05/12/2014  ACT | FG-ENG2007>500 â€“ Two natural gas fired SI engines greater than 500 hp | 17.13 | natural gas | 0 | | Carbon Monoxide | | 0 | | |
| OK-0148 | 09/12/2012  ACT | Large Internal Combustion Engines (>500 hp) | 17.13 | Natural Gas | 1775 | Horsepower | Carbon Monoxide | Oxidation Catalyst | 0.55 | GM/HP-HR | 0.55 |
| OK-0148 | 09/12/2012  ACT | Large Internal Combustion Engines (>500 hp) | 17.13 | Natural Gas | 2370 | Horsepower | Carbon Monoxide | Oxidation Catalyst | 0.55 | GM/HP-HR | 0.55 |
| OK-0153 | 03/01/2013  ACT | COMPRESSOR ENGINE 1,775-HP CAT G3606LE | 17.13 | NATURAL GAS | 1775 | HP | Carbon Monoxide | EACH ENGINE EQUIPPED W/OXIDATION CATALYST. | 0.36 | GM/HP-HR | 0.36 |
| OK-0153 | 03/01/2013  ACT | EMERGENCY GENERATORS 2,889-HP CAT G3520C IM | 17.13 | NATURAL GAS | 2889 | HP | Carbon Monoxide | OXIDATION CATALYST | 0.43 | GM/HP-HR | 0.43 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - CO (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *OR-0052 | 06/21/2013  ACT | Caterpillar 3520C internal combustion engines which drive electric generators | 17.14 | landfill gas | 2328 | MMdscf/year | Carbon Monoxide | | 3.6 | G/HP-HR | 3.60 |
| *OR-0052 | 06/21/2013  ACT | Caterpillar 3516 internal combustion engines which drive electric generators | 17.14 | landfill gas | 1400 | MMdscf/year | Carbon Monoxide | | 2.5 | G/BHP-HR | 2.50 |
| PA-0297 | 05/23/2013  ACT | 3.11 MW GENERATORS (WAUKESHA) #1 and #2 | 17.13 | Natural Gas | 0 | | Carbon Monoxide | CO Catalyst | 0.08 | G/BHP-HR | 0.08 |
| PA-0301 | 03/31/2014  ACT | Three Four Stroke Lean Burn Engine - Caterpillar G3608 TA, 2370 BHP | 17.13 | Natural Gas | 0 | | Carbon Monoxide | Oxidation Catalyst | 47 | PPMVD | 0.33 |
| PA-0301 | 03/31/2014  ACT | One four stroke lean burn engine, Caterpillar Model G3612 TA, 3550 bhp | 17.13 | Natural Gas | 0 | | Carbon Monoxide | Oxidation catalyst | 47 | PPMVD | 0.33 |
| PA-0302 | 04/16/2014  ACT | Spark Ignited 4 stroke Rich Burn Engine (7 units) | 17.13 | Natural Gas | 0 | | Carbon Monoxide | NSCR | 0.3 | G/BHP-HR | 0.30 |
| TX-0642 | 12/20/2013  ACT | Emergency Engine | 17.13 | natural gas | 1328 | hp | Carbon Monoxide | | 1.3 | G/HP-H | 1.30 |
| TX-0680 | 06/14/2013  ACT | Refrigeration compressor engine | 17.13 | natural gas | 1183 | hp | Carbon Monoxide | oxidation catalyst | 0.252 | G/HP-HR | 0.25 |
| TX-0680 | 06/14/2013  ACT | Recompression compressor engine | 17.13 | natural gas | 1380 | hp | Carbon Monoxide | oxidation catalyst | 0.252 | G/HP-HR | 0.25 |
| TX-0692 | 12/20/2013  ACT | (12) reciprocating internal combustion engines | 17.13 | natural gas | 18 | MW | Carbon Monoxide | oxidation catalyst | 0.3 | G/HP-HR | 0.30 |
| VT-0038 | 07/12/2012  ACT | Landfill gas to energy engines | 17.14 | landfill gas | 1600 | kW (each engine) | Carbon Monoxide | Engine design and periodic cleaning/rebuilding of engine to manage the build-up of siloxane in the engine. | 3.5 | G/B-HP-H | 3.50 |
| VT-0038 | 07/12/2012  ACT | Landfill gas to energy engines - after annual maintenance | 17.14 | landfill gas | 1600 | kw (each) | Carbon Monoxide | Engine design and annual maintenance for removal of siloxane build up in the engine. | 3.1 | G/B-HP-H | 3.10 |
| VT-0038 | 07/12/2012  ACT | Landfill gas to energy engines - new and 6-yr rebuild | 17.14 | landfill gas | 1600 | kw (each) | Carbon Monoxide | engine design for new and/or rebuilt engine. | 2.75 | G/B-HP-H | 2.75 |
| CA-1186 | 08/26/2011  ACT | Internal Combustion Engine | 17.14 | Landfill Gas | 1966 | BHP | Carbon Monoxide | Lean-burn engine with air fuel ratio controller | 308 | PPMVD@15% O2 | 2.19 |
| CA-1192 | 06/21/2011  ACT | EMERGENCY IC ENGINE | 17.13 | NATURAL GAS | 550 | KW | Carbon Monoxide | EXHAUST VENTED TO A OXIDATION CATALYST SYSTEM, OPERATIONAL LIMIT OF 50 HRS/YR | 1 | G/HP-H | 1.00 |
| FL-0326 | 08/25/2011  ACT | Landfill Gas-to-Energy | 17.14 | Landfill gas | 4000 | scfm | Carbon Monoxide | Lean-burn engine with air-to-fuel controller | 3.5 | G/B-HP-H | 3.50 |
| MI-0397 | 06/29/2011  ACT | Landfill gas fired generator engines-2 | 17.14 | Landfill gas | 260880 | MMBTU/yr | Carbon Monoxide | Good combustion practices with an air/fuel ratio controller | 3.3 | G/B-HP-H | 3.30 |
| MI-0398 | 06/17/2011  ACT | Landfill gas fired generator engine | 17.14 | Landfill gas | 264.38 | MMSCF/YR | Carbon Monoxide | Good combustion practices with an air/fuel ratio controller. | 3.3 | G/B-HP-H | 3.30 |
| NJ-0078 | 05/03/2011  ACT | INTERNAL COMBUSTION ENGINES | 17.14 | LANDFILL GAS | 848820 | MMBTU/YR | Carbon Monoxide | OXIDATION CATALYST | 1.95 | LB/H | |
| OH-0347 | 07/05/2011  ACT | 2 caterpillar engines 2233 HP | 17.14 | Landfill gas | 2233 | HP | Carbon Monoxide | Lean burn technology | 27.06 | LB/H | 5.00 |
| OH-0348 | 09/14/2011  ACT | Reciprocationg Internal Combustion Engines (10) | 17.14 | Landfill Gas | 2233 | HP | Carbon Monoxide | Lean burn technology and meeting the requirements of Part 60 Subpart JJJJ | 13.53 | LB/H | 2.75 |
| *PA-0279 | 12/13/2010  ACT | RIC ENGINES (2) | 17.14 | Treated Landfil Gas | 66876 | CF/H | Carbon Monoxide | | 3 | G/B-HP-H | 3.00 |
| PA-0287 | 09/27/2011  ACT | CATERPILLAR G3516B COMPRESSOR ENGINES (2) | 17.13 | Natural Gas | 0 | | Carbon Monoxide | Oxidation Catalyst - Miratech | 0.12 | G/B-HP-H | 0.12 |
| PA-0287 | 09/27/2011  ACT | WAUKESHA P9390GSI COMPRESSOR ENGINES (4) (1980 BHP) | 17.13 | Natural Gas | 0 | | Carbon Monoxide | 3-way catalyst, Johnson Matthey | 0.26 | G/B-HP-H | 0.26 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *AK-0085 | 08/13/2020  ACT | One (1) Black Start Generator Engine | 17.11 | ULSD | 186.6 | gph | Carbon Monoxide | Oxidation Catalyst, Good Combustion Practices, and 500 hour limit per year. | 3.3 | G/HP-HR | 3.30 |
| AR-0161 | 09/23/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Carbon Monoxide | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 3.5 | G/KW-H | 2.61 |
| AR-0163 | 06/09/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Carbon Monoxide | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 3.5 | G/KW-HR | 2.61 |
| IL-0130 | 12/31/2018  ACT | Emergency Engine | 17.11 | Ultra-Low Sulfur Diesel | 1500 | kW | Carbon Monoxide | | 3.5 | G/KW-HR | 2.61 |
| IN-0317 | 06/11/2019  ACT | Emergency generator EU-6006 | 17.11 | Diesel | 2800 | HP | Carbon Monoxide | Tier II diesel engine | 3.5 | G/KWH | 2.61 |
| IN-0317 | 06/11/2019  ACT | Emergency fire pump EU-6008 | 17.11 | Diesel | 750 | HP | Carbon Monoxide | Engine that complies with Table 4 to Subpart IIII of Part 60 | 3.5 | G/KWH | 2.61 |
| KY-0110 | 07/23/2020  ACT | EP 10-02 - North Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | 2.61 |
| KY-0110 | 07/23/2020  ACT | EP 10-03 - South Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | 2.61 |
| KY-0110 | 07/23/2020  ACT | EP 10-04 - Emergency Fire Water Pump | 17.11 | Diesel | 920 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | 2.61 |
| KY-0110 | 07/23/2020  ACT | EP 10-07 - Air Separation Plant Emergency Generator | 17.11 | Diesel | 700 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | 2.61 |
| KY-0110 | 07/23/2020  ACT | EP 10-01 - Caster Emergency Generator | 17.11 | Diesel | 2922 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | 2.61 |
| KY-0115 | 04/19/2021  ACT | New Pumphouse (XB13) Emergency Generator #1 (EP 08-05) | 17.11 | Diesel | 2922 | HP | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | 2.60 |
| KY-0115 | 04/19/2021  ACT | Tunnel Furnace Emergency Generator (EP 08-06) | 17.11 | Diesel | 2937 | HP | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | 2.60 |
| KY-0115 | 04/19/2021  ACT | Caster B Emergency Generator (EP 08-07) | 17.11 | Diesel | 2937 | HP | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | 2.60 |
| KY-0115 | 04/19/2021  ACT | Air Separation Unit Emergency Generator (EP 08-08) | 17.11 | Diesel | 700 | HP | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | 2.60 |
| *LA-0364 | 01/06/2020  ACT | Emergency Generator Diesel Engines | 17.11 | Diesel Fuel | 550 | hp | Carbon Monoxide | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| *LA-0364 | 01/06/2020  ACT | Emergency Fire Water Pumps | 17.11 | Diesel Fuel | 550 | hp | Carbon Monoxide | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| *MI-0442 | 08/21/2019  ACT | FGEMENGINE | 17.11 | Diesel | 1100 | KW | Carbon Monoxide | | 0.15 | G/HP-H | 0.15 |
| *MI-0445 | 11/26/2019  ACT | EUEMENGINE (diesel fuel emergency engine) | 17.11 | diesel fuel | 22.68 | MMBTU/H | Carbon Monoxide | Good Combustion Practices and meeting NSPS Subpart IIII requirements | 3.5 | G/KW-H | 2.61 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0872 | 10/31/2019  ACT | Emergency Generators | 17.11 | ultra low sulfur diesel | 0 | | Carbon Monoxide | Limiting duration and frequency of generator use to 100 hr/yr. Good combustion practices will be used to reduce VOC including maintaining proper air-to-fuel ratio. | 0.6 | G/KW HR | 0.45 |
| TX-0876 | 02/06/2020  ACT | Emergency generator | 17.11 | DIESEL | 0 | | Carbon Monoxide | Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101, limited to 100 hours per year of non-emergency operation | 0 | | |
| TX-0882 | 01/17/2020  ACT | EMERGENCY ENGINES | 17.12 | DIESEL | 0 | | Carbon Monoxide | GOOD COMBUSTION PRACTICES, CLEAN FUEL, 100 HR/YR, ULTRA LOW SULFUR FUEL | 0.0057 | LB/MMBTU | |
| TX-0888 | 04/23/2020  ACT | EMERGENCY GENERATORS & FIRE WATER PUMP ENGINES | 17.11 | Ultra-low Sulfur Diesel | 0 | | Carbon Monoxide | well-designed and properly maintained engines and each limited to 100 hours per year of non-emergency use. | 0 | | |
| *TX-0904 | 09/09/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Carbon Monoxide | 100 HOURS OPERATIONS, Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101 | 0 | | |
| *TX-0905 | 09/16/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Carbon Monoxide | limited to 100 hours per year of non-emergency operation | 0 | | |
| *TX-0915 | 03/17/2021  ACT | DIESEL GENERATOR | 17.11 | DIESEL | 0 | | Carbon Monoxide | LIMITED 500 HR/YR OPERATION | 2.61 | G/HPHR | 2.61 |
| VA-0332 | 06/24/2019  ACT | Emergency Diesel Generator - 300 kW | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Carbon Monoxide | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 2.6 | G/HP-H | 2.60 |
| AK-0084 | 06/30/2017  ACT | Black Start and Emergency Internal Cumbustion Engines | 17.11 | Diesel | 1500 | kWe | Carbon Monoxide | Good Combustion Practices | 4.38 | G/KW-HR | 3.27 |
| AK-0084 | 06/30/2017  ACT | Twelve (12) Large ULSD/Natural Gas-Fired Internal Combustion Engines | 17.11 | Diesel and Natural Gas | 143.5 | MMBtu/hr | Carbon Monoxide | Oxidation Catalyst and Maintain Good Combustion Practices | 0.18 | G/KW-HR (ULSD) | 0.13 |
| *AL-0318 | 12/18/2017  ACT | 250 Hp Emergency CI, Diesel-fired RICE | 17.11 | Diesel | 0 | | Carbon Monoxide | | 0 | | |
| *FL-0363 | 12/04/2017  ACT | Two 3300 kW emergency generators | 17.11 | ULSD | 0 | | Carbon Monoxide | Certified engine | 3.5 | GRAMS PER KWH | 2.61 |
| *FL-0367 | 07/27/2018  ACT | 1,500 kW Emergency Diesel Generator | 17.11 | ULSD | 14.82 | MMBtu/hour | Carbon Monoxide | Operate and maintain the engine according to the manufacturer's written instructions | 3.5 | G/KW-HOUR | 2.61 |
| IL-0129 | 07/30/2018  ACT | Emergency Engines | 17.11 | Ultra-low sulfur diesel | 0 | | Carbon Monoxide | | 0 | | |
| *LA-0312 | 06/30/2017  ACT | DFP1-13 - Diesel Fire Pump Engine (EQT0013) | 17.11 | Diesel | 650 | horsepower | Carbon Monoxide | Compliance with NSPS Subpart IIII | 0.9 | LB/HR | 0.63 |
| *LA-0312 | 06/30/2017  ACT | DEG1-13 - Diesel Fired Emergency Generator Engine (EQT0012) | 17.11 | Diesel | 1474 | horsepower | Carbon Monoxide | Compliance with NSPS Subpart IIII | 0.51 | LB/HR | 0.16 |
| LA-0331 | 09/21/2018  ACT | Firewater Pumps | 17.11 | Diesel Fuel | 634 | kW | Carbon Monoxide | Good Combustion and Operating Practices. | 3.7 | G/HP-H | 3.70 |
| LA-0331 | 09/21/2018  ACT | Large Emergency Engines (>50kW) | 17.11 | Diesel Fuel | 5364 | HP | Carbon Monoxide | Good Combustion and Operating Practices. | 3.5 | G/KW-H | 2.61 |
| *MA-0043 | 06/21/2017  ACT | Cold Start Engine | 17.11 | ULSD | 19.04 | MMBTU/HR | Carbon Monoxide | | 2.2 | LB/HR | 0.37 |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE1 in FGRICE (Emergency diesel generator engine) | 17.11 | Diesel | 500 | H/YR | Carbon Monoxide | Good design and combustion practices. | 3.5 | G/KW-H | 2.61 |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE2 in FGRICE (Emergency Diesel Generator Engine) | 17.11 | Diesel | 500 | H/YR | Carbon Monoxide | Good design and combustion practices. | 3.5 | G/KW-H | 2.61 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0425 | 05/09/2017  ACT | EUFIREPUMP in FGRICE (Diesel fire pump engine) | 17.11 | Diesel | 500 | H/YR | Carbon Monoxide | Good design and combustion practices. | 3.5 | G/KW-H | 2.61 |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (North Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Carbon Monoxide | Good combustion practices and meeting NSPS Subpart IIII requirements. | 3.5 | G/KW-H | 2.61 |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (South Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Carbon Monoxide | Good combustion practices and meeting NSPS IIII requirements. | 3.5 | G/KW-H | 2.61 |
| MI-0435 | 07/16/2018  ACT | EUEMENGINE: Emergency engine | 17.11 | Diesel | 2 | MW | Carbon Monoxide | State of the art combustion design. | 3.5 | G/KW-H | 2.61 |
| *MI-0441 | 12/21/2018  ACT | EUEMGD1--A 1500 HP diesel fueled emergency engine | 17.11 | Diesel | 1500 | HP | Carbon Monoxide | Good combustion practices and will be NSPS compliant. | 3.5 | G/KW-H | 2.61 |
| *MI-0441 | 12/21/2018  ACT | EUEMGD2--A 6000 HP diesel fuel fired emergency engine | 17.11 | Diesel | 6000 | HP | Carbon Monoxide | Good combustion practices and will be NSPS compliant. | 3.5 | G/KW-H | 2.61 |
| OH-0370 | 09/07/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Carbon Monoxide | State-of-the-art combustion design | 8.8 | LB/H | 2.61 |
| OH-0372 | 09/27/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Carbon Monoxide | State-of-the-art combustion design | 8.8 | LB/H | 2.60 |
| OH-0374 | 10/23/2017  ACT | Emergency Generators (2 identical, P004 and P005) | 17.11 | Diesel fuel | 2206 | HP | Carbon Monoxide | Certified to the meet the emissions standards in 40 CFR 89.112 and 89.113 pursuant to 40 CFR 60.4205(b) and 60.4202(a)(2). Good combustion practices per the manufacturerâ€™s operating manual. | 12.69 | LB/H | 2.60 |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Generator Engine (P001) | 17.11 | Diesel fuel | 2206 | HP | Carbon Monoxide | Good combustion design | 12.64 | LB/H | 2.60 |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Fire Pump Engine (P002) | 17.11 | Diesel fuel | 700 | HP | Carbon Monoxide | Good combustion design | 4.01 | LB/H | 2.60 |
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fired generator (P007) | 17.11 | Diesel fuel | 2682 | HP | Carbon Monoxide | Comply with NSPS 40 CFR 60 Subpart IIII | 15.4 | LB/H | 2.60 |
| OH-0378 | 12/21/2018  ACT | Emergency Diesel-fired Generator Engine (P007) | 17.11 | Diesel fuel | 3353 | HP | Carbon Monoxide | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 19.25 | LB/H | 2.60 |
| OH-0378 | 12/21/2018  ACT | 1,000 kW Emergency Generators (P008 - P010) | 17.11 | Diesel fuel | 1341 | HP | Carbon Monoxide | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 7.7 | LB/H | 2.60 |
| *PA-0313 | 07/27/2017  ACT | Emergency Generator | 17.11 | Diesel | 2500 | bhp | Carbon Monoxide | | 3.5 | G | |
| VA-0328 | 04/26/2018  ACT | Emergency Diesel GEN | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Carbon Monoxide | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 2.6 | G/HP H | 2.60 |
| *WI-0284 | 04/24/2018  ACT | Diesel-Fired Emergency Generators | 17.11 | Diesel Fuel | 0 | | Carbon Monoxide | Good Combustion Practices | 0.6 | G/KWH | 0.45 |
| *WI-0286 | 04/24/2018  ACT | P42 -Diesel Fired Emergency Generator | 17.11 | Diesel Fuel | 0 | | Carbon Monoxide | Good Combustion Practices | 0.6 | G/KWH | 0.45 |
| FL-0356 | 03/09/2016  ACT | Three 3300-kW ULSD emergency generators | 17.11 | ULSD | 0 | | Carbon Monoxide | Use of clean engine | 3.5 | G / KW-HR | 2.61 |
| IN-0263 | 03/23/2017  ACT | EMERGENCY GENERATORS (EU014A AND EU-014B) | 17.11 | DISTILLATE OIL | 3600 | HP EACH | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.61 | G/HP-H EACH | 2.61 |

BACT Determinations for Large Internal Combustion Engines (> 500 HP) - CO (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| KY-0109 | 10/24/2016  ACT | Emergency Generators #1, #2, & #3 (EU72, EU73, & EU74) | 17.11 | Diesel | 53.6 | gal/hr | Carbon Monoxide | The permittee shall prepare and maintain for EU72, EU73, and EU74, within 90 days of startup, a good combustion and operation practices plan (GCOP) that defines, measures and verifies the use of operational and design practices determined as BACT for minimizing CO, VOC, PM, PM10, and PM2.5 emissions. Any revisions requested by the Division shall be made and the plan shall be maintained on site. The permittee shall operate according to the provisions of this plan at all times, including periods of startup, shutdown, and malfunction. The plan shall be incorporated into the plant standard operating procedures (SOP) and shall be made available for the Divisionâ€™s inspection. The plan shall include, but not be limited to: i. A list of combustion optimization practices and a means of verifying the practices have occurred. ii. A list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred. iii. A list of the design choices determined to be BACT and verification that designs were implemented in the final construction. | 2.6 | G/HP-HR (EU72 &EU73) | 2.60 |
| LA-0305 | 06/30/2016  ACT | Diesel Engines (Emergency) | 17.11 | Diesel | 4023 | hp | Carbon Monoxide | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0307 | 03/21/2016  ACT | Diesel Engines | 17.11 | Diesel | 0 | | Carbon Monoxide | good combustion practices, Use ultra low sulfur diesel, and comply with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0309 | 06/04/2015  ACT | Emergency Generator Engines | 17.11 | Diesel | 2922 | hp (each) | Carbon Monoxide | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Generator 1 | 17.11 | Diesel | 2584 | HP | Carbon Monoxide | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel). | 14.81 | LB/H | 2.60 |
| LA-0316 | 02/17/2017  ACT | emergency generator engines (6 units) | 17.11 | diesel | 3353 | hp | Carbon Monoxide | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0317 | 12/22/2016  ACT | Emergency Generator Engines (4 units) | 17.11 | Diesel | 0 | | Carbon Monoxide | complying with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0 | | |
| LA-0317 | 12/22/2016  ACT | Firewater pump Engines (4 units) | 17.11 | diesel | 896 | hp (each) | Carbon Monoxide | complying with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0 | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 3 Engine | 17.11 | Diesel Fuel | 600 | hp | Carbon Monoxide | Proper operation and limits on hours operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 4 Engine | 17.11 | Diesel Fuel | 600 | hp | Carbon Monoxide | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| MI-0421 | 08/26/2016  ACT | Emergency Diesel Generator Engine (EUEMRGRICE in FGRICE) | 17.11 | Diesel | 500 | H/YR | Carbon Monoxide | Good design and combustion practices. | 3.5 | G/KW-H | 2.61 |
| MI-0421 | 08/26/2016  ACT | Dieself fire pump engine (EUFIREPUMP in FGRICE) | 17.11 | Diesel | 500 | H/YR | Carbon Monoxide | Good design and combustion practices. | 3.5 | G/KW-H | 2.61 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0423 | 01/04/2017  ACT | EUEMENGINE (Diesel fuel emergency engine) | 17.11 | Diesel Fuel | 22.68 | MMBTU/H | Carbon Monoxide | Good combustion practices and meeting NSPS Subpart IIII requirements. | 3.5 | G/KW-H | 2.61 |
| NJ-0084 | 03/10/2016  ACT | Diesel Fired Emergency Generator | 17.11 | ULSD | 44 | H/YR | Carbon Monoxide | use of ultra low sulfur diesel oil a clean burning fuel | 3.5 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Black start generator | 17.11 | ultra low sulfur diesel | 3000 | KW | Carbon Monoxide | Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations. | 2.6 | G/BHP-H | 2.60 |
| OH-0366 | 08/25/2015  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2346 | HP | Carbon Monoxide | State-of-the-art combustion design | 13.5 | LB/H | 2.61 |
| OH-0367 | 09/23/2016  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2947 | HP | Carbon Monoxide | State-of-the-art combustion design | 16.96 | LB/H | 2.61 |
| OH-0368 | 04/19/2017  ACT | Emergency Generator (P009) | 17.11 | Diesel fuel | 5000 | HP | Carbon Monoxide | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 28.8 | LB/H | 2.60 |
| PA-0309 | 12/23/2015  ACT | 2000 kW Emergency Generator | 17.11 | Ultra-low sulfur Diesel | 0 | | Carbon Monoxide | | 0.6 | GM/HP-HR | 0.60 |
| PA-0310 | 09/02/2016  ACT | Emergency Generator Engines | 17.11 | ULSD | 0 | | Carbon Monoxide | | 2.61 | G/BHP-HR | 2.61 |
| PA-0311 | 09/01/2015  ACT | Fire Pump Engine | 17.11 | diesel | 0 | | Carbon Monoxide | | 1 | G/HP-HR | 1.00 |
| TX-0728 | 04/01/2015  ACT | Emergency Diesel Generator | 17.11 | Diesel | 1500 | hp | Carbon Monoxide | Minimized hours of operations Tier II engine | 0.0126 | G/HP HR | 2.33 |
| TX-0799 | 06/08/2016  ACT | Fire pump engines | 17.11 | diesel | 0 | | Carbon Monoxide | Equipment specifications and good combustion practices. Operation limited to 100 hours per year. | 0.0055 | LB/HP-HR | 2.49 |
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED EMERGENCY GENERATOR 3000 kW (1) | 17.11 | DIESEL FUEL | 0 | | Carbon Monoxide | Good Combustion Practices/Maintenance | 3.5 | G/KW | |
| AK-0076 | 08/20/2012  ACT | Combustion of Diesel by ICEs | 17.11 | ULSD | 1750 | kW | Carbon Monoxide | | 3.5 | G/KW-H | 2.61 |
| AK-0082 | 01/23/2015  ACT | Emergency Camp Generators | 17.11 | Ultra Low Sulfur Diesel | 2695 | hp | Carbon Monoxide | | 2.6 | GRAMS/HP-H | 2.60 |
| AK-0082 | 01/23/2015  ACT | Fine Water Pumps | 17.11 | Ultra Low Sulfur Diesel | 610 | hp | Carbon Monoxide | | 2.6 | GRAMS/HP-H | 2.60 |
| AK-0082 | 01/23/2015  ACT | Bulk Tank Generator Engines | 17.11 | Ultra Low Sulfur Diesel | 891 | hp | Carbon Monoxide | | 2.6 | GRAMS/HP-H | 2.60 |
| AL-0301 | 07/22/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | DIESEL | 800 | HP | Carbon Monoxide | | 0.0055 | LB/HP-H | 2.49 |
| FL-0338 | 05/30/2012  ACT | Main Propulsion Engines - Development Driller 1 | 17.11 | Diesel | 0 | | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler. | 1.98 | G/KW-H | 1.48 |
| FL-0338 | 05/30/2012  ACT | Main Propulsion Engines - C.R. Luigs | 17.11 | Diesel | 5875 | hp | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers measurement system, positive crankcase ventilation, turbocharger and aftercooler, and high pressure fuel injection with aftercooler. | 2.42 | G/KW-H | 1.80 |

## BACT Determinations for Large Internal Combustion Engines (> 500 HP) - CO (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0338 | 05/30/2012  ACT | Fast Rescue Craft Diesel Engine - C.R. Luigs | 17.11 | diesel | 142 | hp | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines and use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - Development Driller 1 | 17.11 | Diesel | 2229 | hp | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 0.37 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - C.R. Luigs | 17.11 | diesel | 2064 | hp | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 0.34 | T/12MO ROLLING TOTAL | |
| FL-0346 | 04/22/2014  ACT | Four 3100 kW black start emergency generators | 17.11 | ULSD | 2.32 | MMBtu/hr (HHV) per engine | Carbon Monoxide | Good combustion practice | 3.5 | GRAMS PER KW-HR | 2.61 |
| FL-0347 | 09/16/2014  ACT | Main Propulsion Generator Diesel Engines | 17.11 | Diesel | 9910 | hp | Carbon Monoxide | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0.8 | G/KW-H | 0.60 |
| FL-0347 | 09/16/2014  ACT | Emergency Diesel Engine | 17.11 | Diesel | 3300 | hp | Carbon Monoxide | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| IA-0105 | 10/26/2012  ACT | Emergency Generator | 17.11 | diesel fuel | 142 | GAL/H | Carbon Monoxide | good combustion practices | 3.5 | G/KW-H | 2.61 |
| IA-0106 | 07/12/2013  ACT | Emergency Generators | 17.11 | diesel fuel | 180 | GAL/H | Carbon Monoxide | good combustion practices | 3.5 | G/KW-H | 2.61 |
| IL-0114 | 09/05/2014  ACT | Emergency Generator | 17.11 | distillate fuel oil | 3755 | HP | Carbon Monoxide | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 3.5 | G/KW-H | 2.61 |
| IN-0158 | 12/03/2012  ACT | TWO (2) EMERGENCY DIESEL GENERATORS | 17.11 | DIESEL | 1006 | HP EACH | Carbon Monoxide | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 2.6 | G/HP-H | 2.60 |
| IN-0158 | 12/03/2012  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 2012 | HP | Carbon Monoxide | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 2.6 | G/HP-H | 2.60 |
| IN-0166 | 06/27/2012  ACT | TWO (2) EMERGENCY GENERATORS | 17.11 | DIESEL | 1341 | HORSEPOWER, EACH | Carbon Monoxide | GOOD COMBUSTION PRACTICES AND LIMITED HOURS OF NON-EMERGENCY OPERATION | 0 | | |
| IN-0166 | 06/27/2012  ACT | THREE (3) FIREWATER PUMP ENGINES | 17.11 | DIESEL | 575 | HORSEPOWER, EACH | Carbon Monoxide | GOOD COMBUSTION PRACTICES AND LIMITED HOURS OF NON-EMERGENCY OPERATION | 0 | | |
| IN-0173 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.61 | G/BHP-H | 2.61 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR | 17.11 | NO. 2 FUEL OIL | 4690 | B-HP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.61 | G/B-HP-H | 2.61 |
| IN-0180 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.61 | G/B-HP-H | 2.61 |
| *KS-0036 | 03/18/2013  ACT | Caterpillar C18DITA Diesel Engine Generator | 17.11 | No. 2 Distillate Fuel Oil | 900 | BHP | Carbon Monoxide | utilize efficient combustion/design technology | 1.8 | LB/HR | 0.91 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0296 | 05/23/2014  ACT | Emergency Diesel Generators (EQTs 622, 671, 773, 850, 994, 995, 996, 1033, 1077, 1105, & 1202) | 17.11 | Diesel | 2682 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII; operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage. | 15.43 | LB/HR | 2.61 |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 1 | 17.11 | Diesel | 5364 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 30.86 | LB/H | 2.63 |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 2 | 17.11 | Diesel | 5364 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 30.86 | LB/H | 2.63 |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 1 | 17.11 | Diesel | 751 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 4.32 | LB/H | 2.63 |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 2 | 17.11 | Diesel | 751 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 4.32 | LB/H | 2.63 |
| MA-0039 | 01/30/2014  ACT | Emergency Engine/Generator | 17.11 | ULSD | 7.4 | MMBTU/H | Carbon Monoxide | | 2.6 | GM/BHP-H | 2.60 |
| MD-0042 | 04/08/2014  ACT | EMERGENCY GENERATOR 1 | 17.11 | ULTRA LOW SULFU DIESEL | 2250 | KW | Carbon Monoxide | USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES AND HOURS OF OPERATION LIMITED TO 100 HOURS PER YEAR | 2.6 | G/HP-H | 2.60 |
| MD-0044 | 06/09/2014  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 1550 | HP | Carbon Monoxide | GOOD COMBUSTION PRACTICES AND DESIGNED TO MEET EMISSION LIMIT | 2.6 | G/HP-H | 2.60 |
| MI-0406 | 11/01/2013  ACT | FG-EMGEN7-8; Two (2) 1,000kW diesel-fueled emergency reciprocating internal combustion engines | 17.11 | Diesel | 1000 | kW | Carbon Monoxide | Good combustion practices. | 2.6 | G/B-HP-H | 2.60 |
| NJ-0079 | 07/25/2012  ACT | Emergency Generator | 17.11 | Ultra Low Sulfur distillate Diesel | 100 | H/YR | Carbon Monoxide | Use of ULSD oil | 1.99 | LB/H | |
| NJ-0080 | 11/01/2012  ACT | Emergency Generator | 17.11 | ULSD | 200 | H/YR | Carbon Monoxide | | 11.56 | LB/H | |
| NY-0104 | 08/01/2013  ACT | Emergency generator | 17.11 | ultra low sulfur diesel | 0 | | Carbon Monoxide | Good combustion practice. | 0.45 | G/BHP-H | 0.45 |
| OH-0352 | 06/18/2013  ACT | Emergency generator | 17.11 | diesel | 2250 | KW | Carbon Monoxide | Purchased certified to the standards in NSPS Subpart IIII | 17.35 | LB/H | 2.61 |
| OH-0355 | 05/07/2013  ACT | Test Cell 1 for Aircraft Engines and Turbines | 17.11 | JET FUEL | 0 | | Carbon Monoxide | | 5.1 | LB/MMBTU | 16.19 |
| OH-0355 | 05/07/2013  ACT | Test Cell 2 for Aircraft Engines and Turbines | 17.11 | JET FUEL | 0 | | Carbon Monoxide | | 7.3 | LB/MMBTU | 23.18 |
| OH-0360 | 11/05/2013  ACT | Emergency generator (P003) | 17.11 | diesel | 1112 | KW | Carbon Monoxide | Purchased certified to the standards in NSPS Subpart IIII | 8.57 | LB/H | 2.61 |
| OH-0363 | 11/05/2014  ACT | Emergency generator (P002) | 17.11 | Diesel fuel | 1100 | KW | Carbon Monoxide | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 8.49 | LB/H | 2.61 |
| OK-0154 | 07/02/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR ENGINE | 17.11 | DIESEL | 1341 | HP | Carbon Monoxide | COMBUSTION CONTROL. | 0.001 | LB/HR | |
| PA-0278 | 10/10/2012  ACT | Emergency Generator | 17.11 | Diesel | 0 | | Carbon Monoxide | | 0.13 | G/B-HP-H | 0.13 |
| PA-0286 | 01/31/2013  ACT | EMERGENCY GENERATOR-ENGINE | 17.13 | Diesel | 0 | | Carbon Monoxide | | 0.13 | GM/B-HP-H | 0.13 |
| PA-0291 | 04/23/2013  ACT | EMERGENCY GENERATOR | 17.11 | Ultra Low sulfur Distillate | 7.8 | MMBTU/H | Carbon Monoxide | | 5.79 | LB/H | |
| *PA-0292 | 06/01/2012  ACT | DIESEL GENERATOR (2.25 MW EACH) - 5 UNITS | 17.11 | #2 Oil | 0 | | Carbon Monoxide | CO Oxidation Catalyst | 3.5 | GRAMS/KW-H | 2.61 |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Generator | 17.11 | ULSD Fuel oil # 2 | 0 | | Carbon Monoxide | | 2.6 | G/BHP-H | 2.60 |
| SC-0113 | 02/08/2012  ACT | EMERGENCY GENERATORS 1 THRU 8 | 17.11 | DIESEL | 757 | HP | Carbon Monoxide | ENGINES MUST BE CERTIFIED TO COMPLY WITH NSPS, SUBPART IIII. | 3.5 | GR/KW-H | 2.61 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VA-0321 | 03/12/2013  ACT | Emergency diesel generator- 2200 kW | 17.11 | ultra low sulfur diesel | 500 | hrs/yr | Carbon Monoxide | good combustion practices | 3.5 | G/KW-HR | 2.61 |
| WV-0025 | 11/21/2014  ACT | Emergency Generator | 17.11 | Diesel | 2015.7 | HP | Carbon Monoxide | | 0 | | 2.60 |
| WY-0070 | 08/28/2012  ACT | Diesel Emergency Generator (EP15) | 17.11 | Ultra Low Sulfur Diesel | 839 | hp | Carbon Monoxide | EPA Tier 2 rated | 0 | | |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.11 | DIESEL | 2683 | HP | Carbon Monoxide | | 3.5 | G/KW-H | 2.61 |
| FL-0328 | 10/27/2011  ACT | Main Propulsion Engines | 17.11 | Diesel | 0 | | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers (DEWT) measurement system. | 3.3 | G/KW-H | 2.46 |
| FL-0328 | 10/27/2011  ACT | Crane Engines (units 1 and 2) | 17.11 | Diesel | 0 | | Carbon Monoxide | Use of certified EPA Tier 1 engines and good combustion practices based on the current manufacturerâ€™s specifications for this engine. | 11.8 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Crane Engines (units 3 and 4) | 17.11 | Diesel | 0 | | Carbon Monoxide | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 4 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Emergency Engine | 17.11 | Diesel | 0 | | Carbon Monoxide | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.09 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Emergency Fire Pump Engine | 17.11 | Diesel | 0 | | Carbon Monoxide | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.005 | TONS PER YEAR | |
| FL-0332 | 09/23/2011  ACT | 600 HP Emergency Equipment | 17.11 | Ultra-Low Sulfur Oil | 0 | | Carbon Monoxide | See Pollutant Notes. | 2.6 | G/HP-H | 2.60 |
| LA-0251 | 04/26/2011  ACT | Large Generator Engines (17 units) | 17.11 | Diesel | 0 | | Carbon Monoxide | no additional control | 0.03 | LB/H | 3.50 |
| LA-0254 | 08/16/2011  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 1250 | HP | Carbon Monoxide | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 2.6 | G/HP-H | 2.60 |
| MI-0402 | 11/17/2011  ACT | Diesel fuel-fired combustion engine (RICE) | 17.11 | Diesel | 732 | HP | Carbon Monoxide | Good combustion practices | 0.31 | G/HP-H | 0.31 |
| *SD-0005 | 06/29/2010  ACT | Emergency Generator | 17.11 | Distillate Oil | 2000 | Kilowatts | Carbon Monoxide | | | | |
| *SD-0005 | 06/29/2010  ACT | Fire Water Pump | 17.11 | Distillate Oil | 577 | horsepower | Carbon Monoxide | | | | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AR-0163 | 06/09/2019  ACT | Lime Injector Burners | 17.13 | Natural Gas | 0 | | Nitrogen Oxides (NOx) | Low NOx burners<br>Combustion of clean fuel<br>Good Combustion Practices | 0.095 | LB/MMBTU | 0.30 |
| AR-0163 | 06/09/2019  ACT | Lime Injector Burners | 17.13 | Natural Gas | 0 | | Nitrous Oxide (N2O) | Good operating practices | 0.0002 | LB/MMBTU | |
| *FL-0368 | 02/14/2019  ACT | Emergency Engines | 17.13 | Natural gas | 0 | | Nitrogen Oxides (NOx) | Good combustion practices | 2 | G/HP-HR | 2.00 |
| KY-0110 | 07/23/2020  ACT | EP 10-05 - Austenitizing Furnace Rolls Emergency Generator | 17.13 | Natural Gas | 636 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2 | G/HP-HR | 2.00 |
| KY-0110 | 07/23/2020  ACT | EP 10-06 - Tempering Furnace Rolls Emergency Generator | 17.13 | Natural Gas | 636 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2 | G/HP-HR | 2.00 |
| *MI-0440 | 05/22/2019  ACT | FGENGINES | 17.13 | natural gas | 16500 | HP | Nitrogen Oxides (NOx) | Selective catalytic reduction | 0.5 | G/HP-H | 0.50 |
| AK-0084 | 06/30/2017  ACT | Twelve (12) Large ULSD/Natural Gas-Fired Internal Combustion Engines | 17.11 | Diesel and Natural Gas | 143.5 | MMBtu/hr | Nitrogen Oxides (NOx) | Selective Catalytic Reduction (SCR) and Good Combustion Practices | 0.53 | G/KW-HR (ULSD) | 0.06 |
| *LA-0346 | 01/04/2018  ACT | emergency generators (4 units) | 17.11 | natural gas | 13410 | hp (each) | Nitrogen Oxides (NOx) | Comply with standards of 40 CFR 60 Subpart JJJJ | 2 | G/BHP-HR | 2.00 |
| *MI-0441 | 12/21/2018  ACT | EUEMGNG1--A 1500 HP natural gas fueled emergency engine | 17.13 | Natural gas | 1500 | HP | Nitrogen Oxides (NOx) | Burn natural gas and be NSPS compliant. | 2 | G/HP-H | 2.00 |
| *MI-0441 | 12/21/2018  ACT | EUEMGNG2 | 17.13 | NATURAL GAS | 6000 | HP | Nitrogen Oxides (NOx) | Burn natural gas and be NSPS compliant | 2 | G/HP-H | 2.00 |
| CA-1240 | 03/17/2017  ACT | Internal Combustion Engine | 17.13 | Natural gas | 881 | bhp | Nitrogen Oxides (NOx) | SCR catalyst-Urea injection | 5 | PPMVD | 0.06 |
| CA-1241 | 08/19/2016  ACT | ICE Landfill or digested gas fired | 17.14 | Digester gas | 1573 | bhp | Nitrogen Oxides (NOx) | SCR/Oxidation catalyst | 9 | PPMV | 0.11 |
| IN-0246 | 10/22/2015  ACT | LANDFILL GAS-FIRED ENGINE GENERATOR SETS | 17.14 | LANDFILL GAS | 2233 | BHP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 0.6 | G/BHP-HR | 0.60 |
| *KS-0030 | 03/31/2016  ACT | Spark ignition RICE emergency AC generators | 17.13 | Natural gas | 450 | kW | Nitrogen Oxides (NOx) | | 2 | G/HP-HR | 2.00 |
| *KS-0030 | 03/31/2016  ACT | Spark ignition RICE electricity generating units (EGUs) | 17.13 | Natural Gas | 10 | MW | Nitrogen Oxides (NOx) | | 2.13 | LB/H | 0.07 |
| LA-0292 | 01/22/2016  ACT | Waukesha 16V-275GL Compressor Engines Nos. 1-12 | 17.13 | Natural Gas | 5000 | HP | Nitrogen Oxides (NOx) | Lean-burn combustion, use of natural gas as fuel, good equipment design, and proper combustion techniques | 4.96 | LB/HR | 0.45 |
| LA-0295 | 07/12/2016  ACT | Reciprocating Internal Combustion Engines 1 and 2 (1-08, EQT 321 & 2-08, EQT 322) | 17.15 | NATURAL GAS AND VENT GAS | 11265 | HP | Nitrogen Oxides (NOx) | Good combustion practices, including good equipment design, use of gaseous fuels for good mixing, and proper combustion techniques (see notes below) | 14.67 | LB/H | 0.59 |
| ME-0041 | 03/30/2016  ACT | Engine #1 | 17.14 | landfill gas | 16.5 | MMBTU/H | Nitrogen Oxides (NOx) | Air/Fuel Ratio Controllers | 0.6 | G/BHP*H | 0.60 |
| ME-0041 | 03/30/2016  ACT | Engine #2 | 17.14 | landfill gas | 16.5 | MMBTU/H | Nitrogen Oxides (NOx) | Air/Fuel Ratio Controllers | 0.6 | G/BHPH | 0.60 |
| ME-0041 | 03/30/2016  ACT | Engine #3 | 17.14 | landfill gas | 16.5 | MMBTU/H | Nitrogen Oxides (NOx) | Air/Fuel Ratio Controller | 0.6 | G/BHPH | 0.60 |
| MI-0420 | 06/03/2016  ACT | EUN_EM_GEN | 17.13 | Natural gas | 225 | H/YR | Nitrogen Oxides (NOx) | Low NOx design (turbo charger and after cooler) and good combustion practices. | 4.8 | LB/H | 2.00 |
| MI-0424 | 12/05/2016  ACT | EUNGENGINE (Emergency engine--natural gas) | 17.13 | Natural gas | 500 | H/YR | Nitrogen Oxides (NOx) | Good combustion practices. | 2 | G/HP-H | 2.00 |
| MI-0426 | 03/24/2017  ACT | EUN_EM_GEN (Natural gas emergency engine). | 17.13 | Natural gas | 205 | H/YR | Nitrogen Oxides (NOx) | Low NOx design (turbo charger and after cooler) and good combustion practices. | 4 | LB/H | 2.00 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0755 | 05/21/2015  ACT | Internal Combustion Compressor Engines | 17.13 | Residue gas equivalent to natural gas | 206149 | MMBtu/yr | Nitrogen Oxides (NOx) | Ultra Lean-burn engines firing natural gas | 0.5 | G/HP HR | 0.50 |
| AL-0301 | 07/22/2014  ACT | PROPANE FIRED EMERGENCY GENERATOR | 17.13 | PROPANE | 400 | KW | Nitrogen Oxides (NOx) | | 13 | LB/1000 GAL | |
| CA-1227 | 09/25/2013  ACT | ICE LANDFILL GAS FIRED ENGINE | 17.14 | LANDFILL GAS | 2233 | BHP | Nitrogen Oxides (NOx) | engine design | 0.5 | G/BHP-HR | 0.50 |
| FL-0333 | 07/05/2012  ACT | 1.6 MW Caterpillar Model G3520C lean-burn internal combustion engine | 17.14 | biogas | 0 | | Nitrogen Oxides (NOx) | Engine design and good combustion practices. | 9.9 | LB/H | |
| FL-0339 | 09/15/2014  ACT | 12 LFG-fired RICE/generator sets, 1.6 MW each | 17.14 | Landfill gas | 14.96 | MMBTU/hr, LHV | Nitrogen Oxides (NOx) | Engine combustion characteristics | 0.6 | G/BHP-H | 0.60 |
| FL-0345 | 12/18/2013  ACT | Four landfill gas-to-energy engines | 17.14 | Landfill gas | 554 | scfm | Nitrogen Oxides (NOx) | Efficient combustion design and air-fuel controllers | 0.6 | G/BHP-H | 0.60 |
| IL-0113 | 12/23/2013  ACT | Engines | 17.14 | Treated landfill gas | 2.6 | MW | Nitrogen Oxides (NOx) | | 0.6 | G/HP-H | 0.60 |
| IN-0167 | 04/16/2013  ACT | EMERGENCY GENERATOR | 17.13 | NATURAL GAS | 620 | HP | Nitrogen Oxides (NOx) | USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES | 0.5 | G/HP-H | 0.50 |
| KS-0035 | 01/24/2014  ACT | spark ignition four stroke lean burn reciprocating internal combustion engine (RICE) electric generating units (EGUs) | 17.13 | Natural gas | 12526 | BHP | Nitrogen Oxides (NOx) | Selective Catalytic Reduction (SCR) system and oxidation catalyst | 1.45 | LBS PER HOUR | 0.05 |
| LA-0257 | 12/06/2011  ACT | Generator Engines (2) | 17.13 | Natural Gas | 2012 | hp | Nitrogen Oxides (NOx) | Comply with 40 CFR 60 Subpart JJJJ | 9.76 | LB/H | 2.00 |
| LA-0287 | 07/21/2014  ACT | Emergency Generator Reciprocating Engine (G30, EQT 15) | 17.13 | Natural Gas | 1175 | HP | Nitrogen Oxides (NOx) | Good combustion practices; use of natural gas as fuel; limit non-emergency use to <= 100 hours per year; adherence to the permittee's operating and maintenance practices | 5.18 | LB/HR | 2.00 |
| LA-0311 | 07/15/2013  ACT | No. 5 Urea Plant Emergency Generator B (33-13, EQT 182) | 17.13 | Natural Gas | 2500 | HP | Nitrous Oxide (N2O) | Proper combustion controls (electronic air-to-fuel ratio controller, timing control, pre-chamber ignition, and turbochargers); selecting a fuel efficient engine; using natural gas as fuel. | 0.001 | TPY | |
| MI-0396 | 05/08/2012  ACT | (1) Caterpillar 3516 Generator Engine ("Engine 7") | 17.14 | Landfill gas | 800 | KW | Nitrogen Oxides (NOx) | Must use an electronic Air Fuel Ratio Controller (AFRC). This is a ‘‘low emissions‘‘ engine tuned for low NOx which is a trade-off with higher CO emissions. The emission limit is the manufacturer's specification for NOx when tuned for low NOx. | 2 | G/B-HP-H | 2.00 |
| MI-0396 | 05/08/2012  ACT | (1) Caterpillar 3512 Generator Engine ("Engine 8") | 17.14 | Landfill gas | 615 | KW | Nitrogen Oxides (NOx) | Electronic Air Fuel Ratio Controller (AFRC). This is a ‘‘low emissions‘‘ engine tuned for low NOx which is a trade-off with higher CO emissions. The NOx emission limit is the manufacturer's specification for when the engine is tuned for low NOx. | 2 | G/B-HP-H | 2.00 |
| MI-0396 | 05/08/2012  ACT | (2) Landfill Gas Generator Engine ("Engines 9&10") | 17.14 | Landfill gas | 1600 | KW | Nitrogen Oxides (NOx) | Electronic Air Fuel Ratio Controller. This engine is a ‘‘low emissions‘‘ engine tuned for low NOx which is a tradeoff for higher CO emissions. The NOx emission limit is the manufacturer's specification when tuned for low NOx. | 0.6 | G/B-HP-H | 0.60 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0401 | 12/21/2011  ACT | Emergency generator | 17.13 | Natural gas | 1200 | kW output | Nitrogen Oxides (NOx) | | 0.5 | G/HP-H | 0.50 |
| MI-0412 | 12/04/2013  ACT | Emergency Engine--natural gas (EUNGENGINE) | 17.13 | natural gas | 1000 | kW | Nitrogen Oxides (NOx) | Good combustion practices | 2 | G/HP-H | 2.00 |
| OK-0148 | 09/12/2012  ACT | Large Internal Combustion Engines (>500 hp) | 17.13 | Natural Gas | 1775 | Horsepower | Nitrogen Oxides (NOx) | Ultra Lean Burn | 0.5 | GM/HP-HR | 0.50 |
| OK-0148 | 09/12/2012  ACT | Large Internal Combustion Engines (>500 hp) | 17.13 | Natural Gas | 2370 | Horsepower | Nitrogen Oxides (NOx) | Ultra Lean Burn | 0.5 | GM/HP-HR | 0.50 |
| OK-0153 | 03/01/2013  ACT | COMPRESSOR ENGINE 1,775-HP CAT G3606LE | 17.13 | NATURAL GAS | 1775 | HP | Nitrogen Oxides (NOx) | | 0.5 | GM/HP-HR | 0.50 |
| OK-0153 | 03/01/2013  ACT | EMERGENCY GENERATORS 2,889-HP CAT G3520C IM | 17.13 | NATURAL GAS | 2889 | HP | Nitrogen Oxides (NOx) | LEAN-BURN COMBUSTION. | 0.5 | GM/HP-HR | 0.50 |
| *OR-0052 | 06/21/2013  ACT | Caterpillar 3520C internal combustion engines which drive electric generators | 17.14 | landfill gas | 2328 | MMdscf/year | Nitrogen Oxides (NOx) | | 0.6 | G/HP-HR | 0.60 |
| *OR-0052 | 06/21/2013  ACT | Caterpillar 3516 internal combustion engines which drive electric generators | 17.14 | landfill gas | 1400 | MMdscf/year | Nitrogen Oxides (NOx) | | 1.45 | G/BHP-HR | 1.45 |
| *OR-0052 | 06/21/2013  ACT | Caterpillar 3516 internal combustion engines which drive electric generators | 17.14 | landfill gas | 1400 | MMdscf/year | Nitrogen Oxides (NOx) | | 1.45 | G/BHP-HR | 1.45 |
| *OR-0052 | 06/21/2013  ACT | Caterpillar 3516 internal combustion engines which drive electric generators | 17.14 | landfill gas | 1400 | MMdscf/year | Nitrogen Oxides (NOx) | | 1.45 | G/BHP-HR | 1.45 |
| PA-0297 | 05/23/2013  ACT | 3.11 MW GENERATORS (WAUKESHA) #1 and #2 | 17.13 | Natural Gas | 0 | | Nitrogen Oxides (NOx) | | 0.5 | G/BHP-HR | 0.50 |
| PA-0301 | 03/31/2014  ACT | Three Four Stroke Lean Burn Engine - Caterpillar G3608 TA, 2370 BHP | 17.13 | Natural Gas | 0 | | Nitrogen Oxides (NOx) | | 0.5 | G/BHP-HR | 0.50 |
| PA-0301 | 03/31/2014  ACT | One four stroke lean burn engine, Caterpillar Model G3612 TA, 3550 bhp | 17.13 | Natural Gas | 0 | | Nitrogen Oxides (NOx) | | 0.5 | G/BHP-HR | 0.50 |
| PA-0302 | 04/16/2014  ACT | Spark Ignited 4 stroke Rich Burn Engine (7 units) | 17.13 | Natural Gas | 0 | | Nitrogen Oxides (NOx) | NSCR | 0.2 | G/BHP-HR | 0.20 |
| *PA-0303 | 02/02/2012  ACT | Emergency Generator Set, Rich Burn, 850 BHP | 17.13 | NG | 0 | | Nitrogen Oxides (NOx) | Miratech model IQ-24-10-EC1 NSCR system | 0.5 | G/BHP-HR | 0.50 |
| TX-0642 | 12/20/2013  ACT | Emergency Engine | 17.13 | natural gas | 1328 | hp | Nitrogen Oxides (NOx) | | 2 | G/HP-H | 2.00 |
| TX-0680 | 06/14/2013  ACT | Refrigeration compressor engine | 17.13 | natural gas | 1183 | hp | Nitrogen Oxides (NOx) | ultra-lean burn technology | 0.5 | G/HP-HR | 0.50 |
| TX-0680 | 06/14/2013  ACT | Recompression compressor engine | 17.13 | natural gas | 1380 | hp | Nitrogen Oxides (NOx) | ultra-lean burn technology | 0.5 | G/HP-HR | 0.50 |
| TX-0692 | 12/20/2013  ACT | (12) reciprocating internal combustion engines | 17.13 | natural gas | 18 | MW | Nitrogen Oxides (NOx) | Selective Catalytic Reduction (SCR) | 0.084 | G/HP-HR | 0.08 |
| CA-1186 | 08/26/2011  ACT | Internal Combustion Engine | 17.14 | Landfill Gas | 1966 | BHP | Nitrogen Oxides (NOx) | Lean-burn engine with air fuel ratio controller | 38 | PPMVD@15% O2 | 0.44 |
| CA-1192 | 06/21/2011  ACT | EMERGENCY IC ENGINE | 17.13 | NATURAL GAS | 550 | KW | Nitrogen Oxides (NOx) | SCR, OPERATIONAL LIMIT OF 50 HRS/YR | 0.21 | G/HP-H | 0.21 |
| CA-1222 | 09/22/2011  ACT | ICE: Spark Igition | 17.13 | natural gas | 2889 | bhp | Nitrogen Oxides (NOx) | SCR with process control NOx monitor | 7 | PPMVD@15% O2 | 0.08 |
| IN-0135 | 11/10/2011  ACT | 4-STROKE LEAN BURN COAL BED METHANE (CBM)-FIRED RECIPROCATING INTERNAL COMUBSTION ENGINES (RICE) | 17.15 | COAL BED METHANE | 4601 | BRAKE HORSEPOWER | Nitrous Oxide (N2O) | GOOD COMBUSTION PRACTICES AND PROPER MAINTENANCE | 0.23 | LB/MW-H | 0.08 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0397 | 06/29/2011  ACT | Landfill gas fired generator engines-2 | 17.14 | Landfill gas | 260880 | MMBTU/yr | Nitrogen Oxides (NOx) | Good combustion practices with an air/fuel ratio controller. | 0.6 | G/B-HP-H | 0.60 |
| MI-0398 | 06/17/2011  ACT | Landfill gas fired generator engine | 17.14 | Landfill gas | 264.38 | MMSCF/YR | Nitrogen Oxides (NOx) | Good combustion practices with an air/fuel ratio controller. | 1 | G/B-HP-H | 1.00 |
| NJ-0078 | 05/03/2011  ACT | INTERNAL COMBUSTION ENGINES | 17.14 | LANDFILL GAS | 848820 | MMBTU/YR | Nitrogen Oxides (NOx) | THESE ARE ULTRA LEAN BURN ENGINES | 0.5 | GRAMS/B-HP-H | 0.50 |
| OH-0347 | 07/05/2011  ACT | 2 caterpillar engines 2233 HP | 17.14 | Landfill gas | 2233 | HP | Nitrogen Oxides (NOx) | Lean burn technology | 5.9 | LB/H | 1.20 |
| OH-0348 | 09/14/2011  ACT | Reciprocationg Internal Combustion Engines (10) | 17.14 | Landfill Gas | 2233 | HP | Nitrogen Oxides (NOx) | Lean burn technology and meeting the requirements of Part 60 Subpart JJJJ | 2.46 | LB/H | 0.50 |
| *PA-0279 | 12/13/2010  ACT | RIC ENGINES (2) | 17.14 | Treated Landfil Gas | 66876 | CF/H | Nitrogen Oxides (NOx) | Each engine shall be constructed with low NOx technology in the form of lean burn combustion with automatic air/fuel ratio control. | 0.5 | G/B-HP-H | 0.50 |
| PA-0287 | 09/27/2011  ACT | CATERPILLAR G3516B COMPRESSOR ENGINES (2) | 17.13 | Natural Gas | 0 | | Nitrogen Oxides (NOx) | | 0.5 | G/B-HP-H | 0.50 |
| PA-0287 | 09/27/2011  ACT | WAUKESHA P9390GSI COMPRESSOR ENGINES (4) (1980 BHP) | 17.13 | Natural Gas | 0 | | Nitrogen Oxides (NOx) | 3-way catalyst, Johnson Matthey | 0.2 | G/B-HP-H | 0.20 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *AK-0085 | 08/13/2020  ACT | One (1) Black Start Generator Engine | 17.11 | ULSD | 186.6 | gph | Nitrogen Oxides (NOx) | Good combustion practices, limit operation to 500 hours per year. | 3.3 | G/HP-HR | 3.30 |
| AR-0161 | 09/23/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 0.4 | G/KW-H | 0.30 |
| AR-0163 | 06/09/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 4.86 | G/KW-HR | 3.62 |
| AR-0163 | 06/09/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Nitrous Oxide (N2O) | Good Combustion Practices | 0.0013 | LB/MMBTU | |
| IL-0130 | 12/31/2018  ACT | Emergency Engine | 17.11 | Ultra-Low Sulfur Diesel | 1500 | kW | Nitrogen Oxides (NOx) | | 6.4 | G/KW-HR | 4.77 |
| IN-0317 | 06/11/2019  ACT | Emergency generator EU-6006 | 17.11 | Diesel | 2800 | HP | Nitrogen Oxides (NOx) | Tier II diesel engine | 6.4 | G/KWH | 4.77 |
| IN-0317 | 06/11/2019  ACT | Emergency fire pump EU-6008 | 17.11 | Diesel | 750 | HP | Nitrogen Oxides (NOx) | Engine that complies with Table 4 to Subpart IIII of Part 60 | 4 | G/KWH | 2.98 |
| KY-0110 | 07/23/2020  ACT | EP 10-02 - North Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 4.77 | G/HP-HR | 4.77 |
| KY-0110 | 07/23/2020  ACT | EP 10-03 - South Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 4.77 | G/HP-HR | 4.77 |
| KY-0110 | 07/23/2020  ACT | EP 10-04 - Emergency Fire Water Pump | 17.11 | Diesel | 920 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 4.77 | G/HP-HR | 4.77 |
| KY-0110 | 07/23/2020  ACT | EP 10-07 - Air Separation Plant Emergency Generator | 17.11 | Diesel | 700 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 4.77 | G/HP-HR | 4.77 |
| KY-0110 | 07/23/2020  ACT | EP 10-01 - Caster Emergency Generator | 17.11 | Diesel | 2922 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 4.77 | G/HP-HR | 4.77 |
| KY-0115 | 04/19/2021  ACT | New Pumphouse (XB13) Emergency Generator #1 (EP 08-05) | 17.11 | Diesel | 2922 | HP | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | 4.80 |
| KY-0115 | 04/19/2021  ACT | Tunnel Furnace Emergency Generator (EP 08-06) | 17.11 | Diesel | 2937 | HP | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | 4.80 |
| KY-0115 | 04/19/2021  ACT | Caster B Emergency Generator (EP 08-07) | 17.11 | Diesel | 2937 | HP | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | 4.80 |
| KY-0115 | 04/19/2021  ACT | Air Separation Unit Emergency Generator (EP 08-08) | 17.11 | Diesel | 700 | HP | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | 4.80 |
| *LA-0364 | 01/06/2020  ACT | Emergency Generator Diesel Engines | 17.11 | Diesel Fuel | 550 | hp | Nitrogen Oxides (NOx) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| *LA-0364 | 01/06/2020  ACT | Emergency Fire Water Pumps | 17.11 | Diesel Fuel | 550 | hp | Nitrogen Oxides (NOx) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| *MI-0442 | 08/21/2019  ACT | FGEMENGINE | 17.11 | Diesel | 1100 | KW | Nitrogen Oxides (NOx) | | 5.3 | G/HP-H | 5.30 |
| *MI-0445 | 11/26/2019  ACT | EUEMENGINE (diesel fuel emergency engine) | 17.11 | diesel fuel | 22.68 | MMBTU/H | Nitrogen Oxides (NOx) | Good Combustion Practices and meeting NSPS Subpart IIII requirements | 6.4 | G/KW-H | 4.77 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0379 | 02/06/2019  ACT | Emergency Generators (P005 and P006) | 17.11 | Diesel fuel | 3131 | HP | Nitrogen Oxides (NOx) | Tier IV engine<br>Tier IV NSPS standards certified by engine manufacturer. | 3.45 | LB/H | 0.50 |
| TX-0876 | 02/06/2020  ACT | Emergency generator | 17.11 | DIESEL | 0 | | Nitrogen Oxides (NOx) | Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101, limited to 100 hours per year of non-emergency operation | 0 | | |
| TX-0879 | 02/19/2020  ACT | Emergency Firewater Engine | 17.11 | Ultra-low sulfur diesel | 0 | | Nitrogen Oxides (NOx) | Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs/yr of non-emergency operation. Have a non-resettable runtime meter. | 0 | | |
| TX-0882 | 01/17/2020  ACT | EMERGENCY ENGINES | 17.12 | DIESEL | 0 | | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES, CLEAN FUEL, 100 HR/YR, ULTRA LOW SULFUR FUEL | 0.0092 | LB/MMBTU | |
| TX-0888 | 04/23/2020  ACT | EMERGENCY GENERATORS & FIRE WATER PUMP ENGINES | 17.11 | Ultra-low Sulfur Diesel | 0 | | Nitrogen Oxides (NOx) | well-designed and properly maintained engines and each limited to 100 hours per year of non-emergency use. | 0 | | |
| *TX-0904 | 09/09/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Nitrogen Oxides (NOx) | 100 HOURS OPERATIONS, Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101 | 0 | | |
| *TX-0905 | 09/16/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Nitrogen Oxides (NOx) | limited to 100 hours per year of non-emergency operation | 0 | | |
| VA-0332 | 06/24/2019  ACT | Emergency Diesel Generator - 300 kW | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 4.8 | G/HP-H | 4.80 |
| AK-0084 | 06/30/2017  ACT | Black Start and Emergency Internal Cumbustion Engines | 17.11 | Diesel | 1500 | kWe | Nitrogen Oxides (NOx) | Good Combustion Practices | 8 | G/KW-HR | 5.97 |
| AK-0084 | 06/30/2017  ACT | Twelve (12) Large ULSD/Natural Gas-Fired Internal Combustion Engines | 17.11 | Diesel and Natural Gas | 143.5 | MMBtu/hr | Nitrogen Oxides (NOx) | Selective Catalytic Reduction (SCR) and Good Combustion Practices | 0.53 | G/KW-HR (ULSD) | 0.40 |
| *AL-0318 | 12/18/2017  ACT | 250 Hp Emergency CI, Diesel-fired RICE | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 0 | | |
| *FL-0367 | 07/27/2018  ACT | 1,500 kW Emergency Diesel Generator | 17.11 | ULSD | 14.82 | MMBtu/hour | Nitrogen Oxides (NOx) | Operate and maintain the engine according to the manufacturer's written instructions | 6.4 | G/KW-HOUR | 4.77 |
| IL-0129 | 07/30/2018  ACT | Emergency Engines | 17.11 | Ultra-low sulfur diesel | 0 | | Nitrogen Oxides (NOx) | | 0 | | |
| *LA-0312 | 06/30/2017  ACT | DFP1-13 - Diesel Fire Pump Engine (EQT0013) | 17.11 | Diesel | 650 | horsepower | Nitrogen Oxides (NOx) | Compliance with NSPS Subpart IIII | 6.6 | LB/HR | 4.61 |
| *LA-0312 | 06/30/2017  ACT | DEG1-13 - Diesel Fired Emergency Generator Engine (EQT0012) | 17.11 | Diesel | 1474 | horsepower | Nitrogen Oxides (NOx) | Compliance with NSPS Subpart IIII | 19.23 | LB/HR | 5.92 |
| LA-0331 | 09/21/2018  ACT | Firewater Pumps | 17.11 | Diesel Fuel | 634 | kW | Nitrogen Oxides (NOx) | Good Combustion and Operating Practices. | 3.1 | G/HP-H | 3.10 |
| LA-0331 | 09/21/2018  ACT | Large Emergency Engines (>50kW) | 17.11 | Diesel Fuel | 5364 | HP | Nitrogen Oxides (NOx) | Good Combustion and Operating Practices | 5.6 | G/KW-H | 4.18 |
| *MA-0043 | 06/21/2017  ACT | Cold Start Engine | 17.11 | ULSD | 19.04 | MMBTU/HR | Nitrogen Oxides (NOx) | | 35.09 | LB/HR | |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE1 in FGRICE (Emergency diesel generator engine) | 17.11 | Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | Certified engines, limited operating hours. | 21.2 | LB/H | |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE2 in FGRICE (Emergency Diesel Generator Engine) | 17.11 | Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | Certified engines, limited operating hours | 4.4 | LB/H | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0425 | 05/09/2017  ACT | EUFIREPUMP in FGRICE (Diesel fire pump engine) | 17.11 | Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | Certified engines. Limited operating hours. | 3.53 | LB/H | |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (North Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Nitrogen Oxides (NOx) | Good combustion practices and meeting NSPS Subpart IIII requirements. | 6.4 | G/KW-H | 4.77 |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (South Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Nitrogen Oxides (NOx) | Good combustion practices and meeting NSPS IIII requirements. | 6.4 | G/KW-H | 4.77 |
| MI-0434 | 03/22/2018  ACT | EUENGINE01 through EUENGINE08 | 17.11 | Diesel | 3633 | BHP | Nitrogen Oxides (NOx) | Good combustion practices. | 6.4 | G/KW-H | 4.77 |
| MI-0435 | 07/16/2018  ACT | EUEMENGINE: Emergency engine | 17.11 | Diesel | 2 | MW | Nitrogen Oxides (NOx) | State of the art combustion design. | 6.4 | G/KW-H | 4.77 |
| *MI-0441 | 12/21/2018  ACT | EUEMGD1--A 1500 HP diesel fueled emergency engine | 17.11 | Diesel | 1500 | HP | Nitrogen Oxides (NOx) | Good combustion practices and will be NSPS compliant. | 6.4 | G/KW-H | 4.77 |
| *MI-0441 | 12/21/2018  ACT | EUEMGD2--A 6000 HP diesel fuel fired emergency engine | 17.11 | Diesel | 6000 | HP | Nitrogen Oxides (NOx) | Good combustion practices and will be NSPS compliant. | 6.4 | G/KW-H | 4.77 |
| OH-0370 | 09/07/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 16.07 | LB/H | 4.77 |
| OH-0372 | 09/27/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 16.1 | LB/H | 4.78 |
| OH-0374 | 10/23/2017  ACT | Emergency Generators (2 identical, P004 and P005) | 17.11 | Diesel fuel | 2206 | HP | Nitrogen Oxides (NOx) | Certified to the meet the emissions standards in 40 CFR 89.112 and 89.113 pursuant to 40 CFR 60.4205(b) and 60.4202(a)(2). Good combustion practices per the manufacturerâ€™s operating manual. | 23.21 | LB/H | 4.77 |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Generator Engine (P001) | 17.11 | Diesel fuel | 2206 | HP | Nitrogen Oxides (NOx) | Good combustion design | 24.71 | LB/H | 5.08 |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Fire Pump Engine (P002) | 17.11 | Diesel fuel | 700 | HP | Nitrogen Oxides (NOx) | Good combustion design | 4.97 | LB/H | 3.22 |
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fired generator (P007) | 17.11 | Diesel fuel | 2682 | HP | Nitrogen Oxides (NOx) | Comply with NSPS 40 CFR 60 Subpart IIII | 28.2 | LB/H | 4.77 |
| OH-0377 | 04/19/2018  ACT | Emergency Diesel Generator (P003) | 17.11 | Diesel fuel | 1860 | HP | Nitrogen Oxides (NOx) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 19.68 | LB/H | 4.80 |
| OH-0378 | 12/21/2018  ACT | Emergency Diesel-fired Generator Engine (P007) | 17.11 | Diesel fuel | 3353 | HP | Nitrogen Oxides (NOx) | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 37.41 | LB/H | 5.06 |
| OH-0378 | 12/21/2018  ACT | 1,000 kW Emergency Generators (P008 - P010) | 17.11 | Diesel fuel | 1341 | HP | Nitrogen Oxides (NOx) | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 14.96 | LB/H | 5.06 |
| VA-0328 | 04/26/2018  ACT | Emergency Diesel GEN | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 4.8 | G/HP H | 4.80 |
| *WI-0284 | 04/24/2018  ACT | Diesel-Fired Emergency Generators | 17.11 | Diesel Fuel | 0 | | Nitrogen Oxides (NOx) | The Use of Ultra-Low Sulfur Fuel and Good Combustion Practices | 5.36 | G/KWH | 4.00 |
| *WI-0286 | 04/24/2018  ACT | P42 -Diesel Fired Emergency Generator | 17.11 | Diesel Fuel | 0 | | Nitrogen Oxides (NOx) | Good Combustion Practices, The Use of an Engine Turbocharger and Aftercooler. | 5.36 | G/KWH | 4.00 |
| WV-0027 | 09/15/2017  ACT | Emergency Generator - ESDG14 | 17.11 | ULSD | 900 | bhp | Nitrogen Oxides (NOx) | Engine Design | 4.77 | G/HP-HR | 4.77 |
| IN-0263 | 03/23/2017  ACT | EMERGENCY GENERATORS (EU014A AND EU-014B) | 17.11 | DISTILLATE OIL | 3600 | HP EACH | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 4.42 | G/HP-H EACH | 4.42 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0292 | 01/22/2016  ACT | Emergency Generators No. 1 & No. 2 | 17.11 | Diesel | 1341 | HP | Nitrogen Oxides (NOx) | Good equipment design, proper combustion techniques, use of low sulfur fuel, and compliance with 40 CFR 60 Subpart IIII | 14.16 | LB/HR | 4.79 |
| LA-0305 | 06/30/2016  ACT | Diesel Engines (Emergency) | 17.11 | Diesel | 4023 | hp | Nitrogen Oxides (NOx) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0307 | 03/21/2016  ACT | Diesel Engines | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | good combustion practices, Use ultra low sulfur diesel, and comply with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0309 | 06/04/2015  ACT | Emergency Generator Engines | 17.11 | Diesel | 2922 | hp (each) | Nitrogen Oxides (NOx) | Complying with 40 CFR 60 Subpart IIII | 6.4 | G/KW-HR | 4.77 |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Generator 1 | 17.11 | Diesel | 2584 | HP | Nitrogen Oxides (NOx) | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel). | 27.34 | LB/H | 4.80 |
| LA-0316 | 02/17/2017  ACT | emergency generator engines (6 units) | 17.11 | diesel | 3353 | hp | Nitrogen Oxides (NOx) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0317 | 12/22/2016  ACT | Emergency Generator Engines (4 units) | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | complying with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0 | | |
| LA-0317 | 12/22/2016  ACT | Firewater pump Engines (4 units) | 17.11 | diesel | 896 | hp (each) | Nitrogen Oxides (NOx) | complying with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0 | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 3 Engine | 17.11 | Diesel Fuel | 600 | hp | Nitrogen Oxides (NOx) | Proper operation and limits on hours operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 4 Engine | 17.11 | Diesel Fuel | 600 | hp | Nitrogen Oxides (NOx) | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| MI-0421 | 08/26/2016  ACT | Emergency Diesel Generator Engine (EUEMRGRICE in FGRICE) | 17.11 | Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | Certified engines, limited operating hours. | 22.6 | LB/H | |
| MI-0421 | 08/26/2016  ACT | Dieself fire pump engine (EUFIREPUMP in FGRICE) | 17.11 | Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | Certified engines, limited operating hours. | 3.53 | LB/H | |
| MI-0423 | 01/04/2017  ACT | EUEMENGINE (Diesel fuel emergency engine) | 17.11 | Diesel Fuel | 22.68 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices and meeting NSPS IIII requirements. | 6.4 | G/KW-H | 4.77 |
| NJ-0084 | 03/10/2016  ACT | Diesel Fired Emergency Generator | 17.11 | ULSD | 44 | H/YR | Nitrogen Oxides (NOx) | use of ultra low sulfur diesel a clean burning fuel. | 42.3 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Black start generator | 17.11 | ultra low sulfur diesel | 3000 | KW | Nitrogen Oxides (NOx) | Generator equipped with selective catalytic reduction.<br>Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations. | 2.11 | G/BHP-H | 2.11 |
| OH-0366 | 08/25/2015  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2346 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 21.6 | LB/H | 4.18 |
| OH-0367 | 09/23/2016  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2947 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 27.18 | LB/H | 4.18 |
| OH-0368 | 04/19/2017  ACT | Emergency Generator (P009) | 17.11 | Diesel fuel | 5000 | HP | Nitrogen Oxides (NOx) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 5.5 | LB/H | 0.50 |
| PA-0309 | 12/23/2015  ACT | 2000 kW Emergency Generator | 17.11 | Ultra-low sulfur Diesel | 0 | | Nitrogen Oxides (NOx) | | 5.45 | GM/HP-HR | 5.45 |
| PA-0310 | 09/02/2016  ACT | Emergency Generator Engines | 17.11 | ULSD | 0 | | Nitrogen Oxides (NOx) | | 4.8 | G/BHP-HR | 4.80 |
| PA-0311 | 09/01/2015  ACT | Fire Pump Engine | 17.11 | diesel | 0 | | Nitrogen Oxides (NOx) | | 3 | G/HP-HR | 3.00 |
| TX-0728 | 04/01/2015  ACT | Emergency Diesel Generator | 17.11 | Diesel | 1500 | hp | Nitrogen Oxides (NOx) | Minimized hours of operations Tier II engine | 0.0218 | G/HP HR | 4.07 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED EMERGENCY GENERATOR 3000 kW (1) | 17.11 | DIESEL FUEL | 0 | | Nitrogen Oxides (NOx) | Good Combustion Practices/Maintenance | 6.4 | G/KW | 4.77 |
| AK-0076 | 08/20/2012  ACT | Combustion of Diesel by ICEs | 17.11 | ULSD | 1750 | kW | Nitrogen Oxides (NOx) | | 6.4 | G/KW-H | 4.77 |
| AK-0082 | 01/23/2015  ACT | Emergency Camp Generators | 17.11 | Ultra Low Sulfur Diesel | 2695 | hp | Nitrogen Oxides (NOx) | | 4.8 | GRAMS/HP-H | 4.80 |
| AK-0082 | 01/23/2015  ACT | Fine Water Pumps | 17.11 | Ultra Low Sulfur Diesel | 610 | hp | Nitrogen Oxides (NOx) | | 3 | GRAMS/HP-H | 3.00 |
| AK-0082 | 01/23/2015  ACT | Bulk Tank Generator Engines | 17.11 | Ultra Low Sulfur Diesel | 891 | hp | Nitrogen Oxides (NOx) | | 4.8 | GRAMS/HP-H | 4.80 |
| AL-0301 | 07/22/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | DIESEL | 800 | HP | Nitrogen Oxides (NOx) | | 0.015 | LB/HP-H | 6.80 |
| AR-0140 | 09/18/2013  ACT | EMERGENCY GENERATORS | 17.11 | DIESEL | 1500 | KW | Nitrous Oxide (N2O) | GOOD COMBUSTION PRACTICES | 0.0013 | LB/MMBTU | |
| CA-1219 | 07/09/2012  ACT | IC engine | 17.11 | diesel | 2722 | bhp | Nitrogen Oxides (NOx) | Tier 2 certified engine and 50 hr/yr for M&T | 4 | G/B-HP-H | 4.00 |
| DC-0009 | 03/15/2012  ACT | Diesel Emergency Generator | 17.11 | Ultra-low Sulfur Diesel | 2682 | hp | Nitrogen Oxides (NOx) | | 31.87 | LB/HR | 5.39 |
| FL-0338 | 05/30/2012  ACT | Main Propulsion Engines - Development Driller 1 | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler. | 12.1 | G/KW-H | 9.02 |
| FL-0338 | 05/30/2012  ACT | Main Propulsion Engines - C.R. Luigs | 17.11 | Diesel | 5875 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler. | 18.1 | G/KW-H | 13.50 |
| FL-0338 | 05/30/2012  ACT | Fast Rescue Craft Diesel Engine - C.R. Luigs | 17.11 | diesel | 142 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines and use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - Development Driller 1 | 17.11 | Diesel | 2229 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 1.6 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - C.R. Luigs | 17.11 | diesel | 2064 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 1.49 | T/12MO ROLLING TOTAL | |
| FL-0347 | 09/16/2014  ACT | Main Propulsion Generator Diesel Engines | 17.11 | Diesel | 9910 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 12.7 | G/KW-H | 9.47 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0347 | 09/16/2014  ACT | Emergency Diesel Engine | 17.11 | Diesel | 3300 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0348 | 05/15/2012  ACT | Drill Floor and Crew Quarters Electrical Generators | 17.11 | Diesel | 6789 | hp | Nitrogen Oxides (NOx) | Use of engine with turbo charger with after cooler, an enhanced work practice power management, NOx emissions maintenance system, and good combustion and maintenance practices based on the current manufacturerâ€™s specifications for each engine. | 26 | G/KW-H | 19.39 |
| FL-0348 | 05/15/2012  ACT | Emergency Electrical Generator | 17.11 | Diesel | 1100 | hp | Nitrogen Oxides (NOx) | Use of good combustion and maintenance practices based on the current manufacturerâ€™s specifications for this engine. | 0.22 | TONS | |
| FL-0350 | 12/31/2014  ACT | Main Propulsion Generator Engines | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturerâ€™s specifications issued for these engines at the time that the engines are operating under this permit | 0 | | |
| IA-0105 | 10/26/2012  ACT | Emergency Generator | 17.11 | diesel fuel | 142 | GAL/H | Nitrogen Oxides (NOx) | good combustion practices | 6 | G/KW-H | 4.47 |
| IL-0114 | 09/05/2014  ACT | Emergency Generator | 17.11 | distillate fuel oil | 3755 | HP | Nitrogen Oxides (NOx) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 0.67 | G/KW-H | 0.50 |
| IN-0158 | 12/03/2012  ACT | TWO (2) EMERGENCY DIESEL GENERATORS | 17.11 | DIESEL | 1006 | HP EACH | Nitrogen Oxides (NOx) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 4.8 | G/HP-H | 4.80 |
| IN-0158 | 12/03/2012  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 2012 | HP | Nitrogen Oxides (NOx) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 4.8 | G/HP-H | 4.80 |
| IN-0166 | 06/27/2012  ACT | TWO (2) EMERGENCY GENERATORS | 17.11 | DIESEL | 1341 | HORSEPOWER, EACH | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES AND LIMITED HOURS OF NON-EMERGENCY OPERATION | 0 | | |
| IN-0166 | 06/27/2012  ACT | THREE (3) FIREWATER PUMP ENGINES | 17.11 | DIESEL | 575 | HORSEPOWER, EACH | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES AND LIMITED HOURS OF NON-EMERGENCY OPERATION | 0 | | |
| IN-0173 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 4.46 | G/BHP-H | 4.46 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR | 17.11 | NO. 2 FUEL OIL | 4690 | B-HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 4.46 | G/B-HP-H | 4.46 |
| IN-0180 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 4.46 | G/B-HP-H | 4.46 |
| IN-0185 | 04/24/2014  ACT | DIESEL FIRE PUMP | 17.11 | DIESEL | 300 | HP | Nitrogen Oxides (NOx) | | 3 | G/HP-H | 3.00 |
| *KS-0036 | 03/18/2013  ACT | Caterpillar C18DITA Diesel Engine Generator | 17.11 | No. 2 Distillate Fuel Oil | 900 | BHP | Nitrogen Oxides (NOx) | utilize efficient combustion/design technology | 14 | LB/HR | 7.06 |
| LA-0296 | 05/23/2014  ACT | Emergency Diesel Generators (EQTs 622, 671, 773, 850, 994, 995, 996, 1033, 1077, 1105, & 1202) | 17.11 | Diesel | 2682 | HP | Nitrogen Oxides (NOx) | Compliance with 40 CFR 60 Subpart IIII; operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage. | 27.37 | LB/HR | 4.63 |
| LA-0308 | 09/26/2013  ACT | 2000 KW Diesel Fired Emergency Generator Engine | 17.11 | Diesel | 20.4 | MMBTU/hr | Nitrous Oxide (N2O) | Good combustion practices | 0 | | |
| LA-0308 | 09/26/2013  ACT | 2000 KW Diesel Fired Emergency Generator Engine | 17.11 | Diesel | 20.4 | MMBTU/hr | Nitrogen Oxides (NOx) | Good combustion and maintenance practices, and compliance with NSPS 40 CFR 60 Subpart IIII | 33.07 | LB/H | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 1 | 17.11 | Diesel | 5364 | HP | Nitrogen Oxides (NOx) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 52.58 | LB/H | 4.45 |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 2 | 17.11 | Diesel | 5364 | HP | Nitrogen Oxides (NOx) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 52.58 | LB/H | 4.45 |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 1 | 17.11 | Diesel | 751 | HP | Nitrogen Oxides (NOx) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 4.6 | LB/H | 2.78 |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 2 | 17.11 | Diesel | 751 | HP | Nitrogen Oxides (NOx) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 4.6 | LB/H | 2.78 |
| MA-0039 | 01/30/2014  ACT | Emergency Engine/Generator | 17.11 | ULSD | 7.4 | MMBTU/H | Nitrogen Oxides (NOx) | | 4.8 | GM/BHP-H | 4.80 |
| MD-0042 | 04/08/2014  ACT | EMERGENCY GENERATOR 1 | 17.11 | ULTRA LOW SULFU DIESEL | 2250 | KW | Nitrogen Oxides (NOx) | LIMITED OPERATING HOURS, USE OF ULTRA- LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 4.8 | G/HP-H | 4.80 |
| MD-0043 | 07/01/2014  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 1300 | HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND EXCLUSIVE USE OF ULSD | 4.8 | G/HP-H | 4.80 |
| MD-0044 | 06/09/2014  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 1550 | HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION LIMIT | 4.8 | G/HP-H | 4.80 |
| MI-0394 | 02/29/2012  ACT | Four (4) Emergency Generators | 17.11 | Diesel | 2280 | KW | Nitrogen Oxides (NOx) | No add-on controls, but ignition timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. | 6.93 | G/KW-H | 5.17 |
| MI-0394 | 02/29/2012  ACT | Nine (9) DRUPS Emergency Generators | 17.11 | Diesel | 3010 | KW | Nitrogen Oxides (NOx) | No add-on controls, but ignition timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. | 5.98 | G/KW-H | 4.46 |
| MI-0395 | 07/13/2012  ACT | Nine (9) DRUPS Emergency Generators | 17.11 | Diesel | 3010 | KW | Nitrogen Oxides (NOx) | No add-on controls, but ignition timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. | 5.98 | G/KW-H | 4.46 |
| MI-0395 | 07/13/2012  ACT | Four (4) Emergency Generators | 17.11 | Diesel | 2500 | KW | Nitrogen Oxides (NOx) | No add-on control, but ignition timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. | 7.13 | G/KW-H | 5.32 |
| MI-0406 | 11/01/2013  ACT | FG-EMGEN7-8; Two (2) 1,000kW diesel-fueled emergency reciprocating internal combustion engines | 17.11 | Diesel | 1000 | kW | Nitrogen Oxides (NOx) | Good combustion practices | 4.8 | G/B-HP-H | 4.80 |
| MI-0418 | 01/14/2015  ACT | FG-BACKUPGENS (Nine (9) DRUPS Emergency Engines) | 17.11 | Diesel | 3490 | KW | Nitrogen Oxides (NOx) | No add-on controls, but injection timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. | 8 | G/KW-H | 5.97 |
| MI-0418 | 01/14/2015  ACT | Four (4) emergency engines in FG-BACKUPGENS | 17.11 | Diesel | 2710 | KW | Nitrogen Oxides (NOx) | No add-on controls, but injection timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. | 7.13 | G/KW-H | 5.32 |
| NJ-0079 | 07/25/2012  ACT | Emergency Generator | 17.11 | Ultra Low Sulfur distillate Diesel | 100 | H/YR | Nitrogen Oxides (NOx) | Use of ULSD diesel oil | 21.16 | LB/H | |
| NJ-0080 | 11/01/2012  ACT | Emergency Generator | 17.11 | ULSD | 200 | H/YR | Nitrogen Oxides (NOx) | use of ultra low sulfur diesel (ULSD) a clean fuel | 18.53 | LB/H | |
| OH-0352 | 06/18/2013  ACT | Emergency generator | 17.11 | diesel | 2250 | KW | Nitrogen Oxides (NOx) | Purchased certified to the standards in NSPS Subpart IIII | 27.8 | LB/H | 4.18 |
| OH-0355 | 05/07/2013  ACT | Test Cell 1 for Aircraft Engines and Turbines | 17.11 | JET FUEL | 0 | | Nitrogen Oxides (NOx) | | 1.7 | LB/MMBTU | |
| OH-0355 | 05/07/2013  ACT | Test Cell 2 for Aircraft Engines and Turbines | 17.11 | JET FUEL | 0 | | Nitrogen Oxides (NOx) | | 4.4 | LB/MMBTU | |
| OH-0360 | 11/05/2013  ACT | Emergency generator (P003) | 17.11 | diesel | 1112 | KW | Nitrogen Oxides (NOx) | Purchased certified to the standards in NSPS Subpart IIII | 13.74 | LB/H | 4.18 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0363 | 11/05/2014  ACT | Emergency generator (P002) | 17.11 | Diesel fuel | 1100 | KW | Nitrogen Oxides (NOx) | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 29.01 | LB/H | 8.92 |
| OK-0145 | 06/25/2012  ACT | Emerg Diesel Gen, Fire Pump, Rail Steam Gen, Air Makeup Units | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 0 | | |
| OK-0154 | 07/02/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR ENGINE | 17.11 | DIESEL | 1341 | HP | Nitrogen Oxides (NOx) | COMBUSTION CONTROL | 0.011 | LB/HP-HR | 4.99 |
| PA-0278 | 10/10/2012  ACT | Emergency Generator | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 4.93 | G/B-HP-H | 4.93 |
| *PA-0282 | 06/01/2012  ACT | 650-KW BACKUP DIESEL GENERATOR | 17.11 | Diesel / #2 Oil | 45.8 | GAL/H | Nitrogen Oxides (NOx) | | 6.9 | G/HP-H | 6.90 |
| PA-0286 | 01/31/2013  ACT | EMERGENCY GENERATOR-ENGINE | 17.13 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 4.93 | GM/B-HP-H | 4.93 |
| PA-0291 | 04/23/2013  ACT | EMERGENCY GENERATOR | 17.11 | Ultra Low sulfur Distillate | 7.8 | MMBTU/H | Nitrogen Oxides (NOx) | | 9.89 | LB/H | |
| *PA-0292 | 06/01/2012  ACT | DIESEL GENERATOR (2.25 MW EACH) - 5 UNITS | 17.11 | #2 Oil | 0 | | Nitrogen Oxides (NOx) | SCR | 0.67 | GRAMS/KW-H | 0.50 |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Generator | 17.11 | ULSD Fuel oil # 2 | 0 | | Nitrogen Oxides (NOx) | | 2.85 | G/B-HP-H | 2.85 |
| SC-0113 | 02/08/2012  ACT | EMERGENCY GENERATORS 1 THRU 8 | 17.11 | DIESEL | 757 | HP | Nitrogen Oxides (NOx) | ENGINES MUST BE CERTIFIED TO COMPLY WITH NSPS, SUBPART IIII. | 4 | GR/KW-H | 2.98 |
| TX-0671 | 12/01/2014  ACT | Engines | 17.11 | ultra low sulfur diesel fuel | 0 | | Nitrogen Oxides (NOx) | Each emergency generator's emission factor is based on EPA's Tier 2 standards at 40CFR89.112 for NOx | 5.43 | G/KW-H | 4.05 |
| WV-0025 | 11/21/2014  ACT | Emergency Generator | 17.11 | Diesel | 2015.7 | HP | Nitrogen Oxides (NOx) | | 0 | | |
| WY-0070 | 08/28/2012  ACT | Diesel Emergency Generator (EP15) | 17.11 | Ultra Low Sulfur Diesel | 839 | hp | Nitrogen Oxides (NOx) | EPA Tier 2 rated | 0 | | |
| AK-0072 | 07/14/2011  ACT | EU 15 Caterpillar C-280-16 | 17.11 | ULSD | 4400 | KW | Nitrogen Oxides (NOx) | Engine has turbo charger and after cooler installed as part of the design | 9.8 | G/KW-H | 7.31 |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.11 | DIESEL | 2683 | HP | Nitrogen Oxides (NOx) | | 6.4 | G/KW-H | 4.77 |
| CA-1220 | 10/03/2011  ACT | ICE:Emergency-Compression Ignition | 17.11 | diesel | 1881 | BHP | Nitrogen Oxides (NOx) | Tier 2 certified and 50 hr/y M&T limit | 3.9 | G/B-HP-H | 3.90 |
| CA-1221 | 12/05/2011  ACT | ICE:Emergency-Compression Ignition | 17.11 | diesel | 3634 | bhp | Nitrogen Oxides (NOx) | Tier 2 certified and 50 hr/yr for M&T limit | 3.5 | G/B-HP-H | 3.50 |
| FL-0327 | 06/13/2011  ACT | Main Propulsion Engines | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion and maintenance practices, Power Management System, and NOx Concentration Maintenance System as described in the OCS permit application. | 12.7 | G/KW-H | 9.47 |
| FL-0327 | 06/13/2011  ACT | Emergency Engine | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Limited use of 24 hours/week and recordkeeping of operation. | 9.4 | TONS PER PROJECT | |
| FL-0328 | 10/27/2011  ACT | Main Propulsion Engines | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers (DEWT) measurement system. | 12.7 | G/KW-H | 9.47 |
| FL-0328 | 10/27/2011  ACT | Crane Engines (units 1 and 2) | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of certified EPA Tier 1 engines and good combustion practices based on the current manufacturerâ€™s specifications for this engine. | 9.5 | TONS PER YEAR | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - $NO_X$ (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0328 | 10/27/2011  ACT | Crane Engines (units 3 and 4) | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 9.7 | T/YR | |
| FL-0328 | 10/27/2011  ACT | Emergency Engine | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.4 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Emergency Fire Pump Engine | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.02 | TONS PER YEAR | |
| FL-0332 | 09/23/2011  ACT | 600 HP Emergency Equipment | 17.11 | Ultra-Low Sulfur Oil | 0 | | Nitrogen Oxides (NOx) | See Pollutant Notes. | 3 | G/HP-H | 3.00 |
| LA-0251 | 04/26/2011  ACT | Large Generator Engines (17 units) | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 6.32 | LB/H | 4.77 |
| LA-0254 | 08/16/2011  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 1250 | HP | Nitrous Oxide (N2O) | PROPER OPERATION AND GOOD COMBUSTION PRACTICES | 0.0014 | LB/MMBTU | |
| MI-0402 | 11/17/2011  ACT | Diesel fuel-fired combustion engine (RICE) | 17.11 | Diesel | 732 | HP | Nitrogen Oxides (NOx) | Good combustion practices | 4.85 | G/HP-H | 4.85 |
| *SD-0005 | 06/29/2010  ACT | Emergency Generator | 17.11 | Distillate Oil | 2000 | Kilowatts | Nitrogen Oxides (NOx) | | | | |
| *SD-0005 | 06/29/2010  ACT | Fire Water Pump | 17.11 | Distillate Oil | 577 | horsepower | Nitrogen Oxides (NOx) | | | | |

## BACT Determinations for Large Internal Combustion Engines (> 500 HP) - PM (Gas-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AR-0163 | 06/09/2019  ACT | Lime Injector Burners | 17.13 | Natural Gas | 0 | | Particulate matter, filterable (FPM) | Combustion of Natural gas and Good Combustion Practices | 0.0075 | LB/MMBTU | 0.02 |
| *FL-0368 | 02/14/2019  ACT | Emergency Engines | 17.13 | Natural gas | 0 | | Particulate matter, filterable (FPM) | Good combustion practices | 0.048 | G/HP-HR | 0.05 |
| KY-0110 | 07/23/2020  ACT | EP 10-05 - Austenitizing Furnace Rolls Emergency Generator | 17.13 | Natural Gas | 636 | HP | Particulate matter, filterable (FPM) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| *MI-0440 | 05/22/2019  ACT | FGENGINES | 17.13 | natural gas | 16500 | HP | Particulate matter, filterable (FPM) | Natural gas and good combustion practices. | 2 | LB/H | 0.05 |
| AK-0084 | 06/30/2017  ACT | Twelve (12) Large ULSD/Natural Gas-Fired Internal Combustion Engines | 17.11 | Diesel and Natural Gas | 143.5 | MMBtu/hr | Particulate matter, total (TPM) | Clean Fuel and Good Combustion Practices | 0.29 | G/KW-HR (ULSD) | 0.10 |
| *LA-0346 | 01/04/2018  ACT | emergency generators (4 units) | 17.11 | natural gas | 13410 | hp (each) | Particulate matter, total < 10 Âµ (TPM10) | | 0 | | |
| *MI-0441 | 12/21/2018  ACT | EUEMGNG1--A 1500 HP natural gas fueled emergency engine | 17.13 | Natural gas | 1500 | HP | Particulate matter, total < 10 Âµ (TPM10) | Burn pipeline quality natural gas | 0.13 | LB/H | 0.04 |
| *MI-0441 | 12/21/2018  ACT | EUEMGNG2 | 17.13 | NATURAL GAS | 6000 | HP | Particulate matter, total < 10 Âµ (TPM10) | Burn pipeline quality natural gas. | 0.5 | LB/H | 0.04 |
| IN-0246 | 10/22/2015  ACT | LANDFILL GAS-FIRED ENGINE GENERATOR SETS | 17.14 | LANDFILL GAS | 2233 | BHP | Particulate matter, total < 2.5 Âµ (TPM2.5) | GOOD COMBUSTION PRACTICES | 23.3 | LB/MMCF, CH4 DRY | |
| *KS-0030 | 03/31/2016  ACT | Spark ignition RICE emergency AC generators | 17.13 | Natural gas | 450 | kW | Particulate matter, total (TPM) | | 0.0001 | G/HP-HR | 0.00 |
| *KS-0030 | 03/31/2016  ACT | Spark ignition RICE electricity generating units (EGUs) | 17.13 | Natural Gas | 10 | MW | Particulate matter, total < 10 Âµ (TPM10) | | 1.31 | LB/H | 0.04 |
| LA-0292 | 01/22/2016  ACT | Waukesha 16V-275GL Compressor Engines Nos. 1-12 | 17.13 | Natural Gas | 5000 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Use of natural gas as fuel, good equipment design, and proper combustion techniques | 0.003 | LB/HR | 0.00 |
| ME-0041 | 03/30/2016  ACT | Engine #1 | 17.14 | landfill gas | 16.5 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Coalescing Filters | 1.2 | LB/H | 0.23 |
| ME-0041 | 03/30/2016  ACT | Engine #2 | 17.14 | landfill gas | 16.5 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Coalescing Filters | 1.2 | LB/H | 0.23 |
| ME-0041 | 03/30/2016  ACT | Engine #3 | 17.14 | landfill gas | 16.5 | MMBTU/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | Coalescing Filters | 1.2 | LB/H | 0.23 |
| MI-0420 | 06/03/2016  ACT | EUN_EM_GEN | 17.13 | Natural gas | 225 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices and low sulfur fuel (pipeline quality natural gas). | 0.01 | LB/MMBTU | 0.03 |
| MI-0424 | 12/05/2016  ACT | EUNGENGINE (Emergency engine--natural gas) | 17.13 | Natural gas | 500 | H/YR | Particulate matter, filterable (FPM) | Good combustion practices. | 0.0001 | LB/MMBTU | 0.00 |
| MI-0426 | 03/24/2017  ACT | EUN_EM_GEN (Natural gas emergency engine). | 17.13 | Natural gas | 205 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices and low sulfur fuel (pipeline quality natural gas). | 0.01 | LB/MMBTU | 0.03 |
| AL-0301 | 07/22/2014  ACT | PROPANE FIRED EMERGENCY GENERATOR | 17.13 | PROPANE | 400 | KW | Particulate matter, filterable (FPM) | | 0.7 | LB/1000 GAL | |
| FL-0345 | 12/18/2013  ACT | Four landfill gas-to-energy engines | 17.14 | Landfill gas | 554 | scfm | Particulate matter, total < 2.5 Âµ (TPM2.5) | Required treatment of LFG before burning. Maintain the air-to-fuel ratio to ensure efficient combustion. | 0 | | 0.24 |
| IL-0113 | 12/23/2013  ACT | Engines | 17.14 | Treated landfill gas | 2.6 | MW | Particulate matter, total (TPM) | | 0.1 | G/HP-H | 0.10 |
| IN-0167 | 04/16/2013  ACT | EMERGENCY GENERATOR | 17.13 | NATURAL GAS | 620 | HP | Particulate matter, filterable (FPM) | RESTRICTED TO USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES | 500 | H/YR | 0.20 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - PM (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IN-0185 | 04/24/2014  ACT | EMERGENCY GENERATORS | 17.13 | NATURAL GAS | 620 | HP | Particulate matter, filterable (FPM) | | 0.2 | G/KW-H | 0.15 |
| KS-0035 | 01/24/2014  ACT | spark ignition four stroke lean burn reciprocating internal combustion engine (RICE) electric generating units (EGUs) | 17.13 | Natural gas | 12526 | BHP | Particulate matter, total (TPM) | selective catalytic reduction (SCR) system and an oxidation catalyst | 1.44 | LBS PER HOUR | 0.05 |
| LA-0256 | 12/06/2011  ACT | EMERGENCY GENERATOR | 17.13 | NATURAL GAS | 1818 | HP | Total Suspended Particulates | USE OF NATURAL GAS AS FUEL AND GOOD COMBUSTION PRACTICES | 0.01 | LB/H | 0.00 |
| LA-0257 | 12/06/2011  ACT | Generator Engines (2) | 17.13 | Natural Gas | 2012 | hp | Particulate matter, total (TPM) | fueled by natural gas | 0.75 | LB/H | 0.17 |
| LA-0287 | 07/21/2014  ACT | Emergency Generator Reciprocating Engine (G30, EQT 15) | 17.13 | Natural Gas | 1175 | HP | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices; use of natural gas as fuel; limit non-emergency use to <= 100 hours per year; adherence to the permittee's operating and maintenance practices | 0.004 | LB/HR | 0.00 |
| MI-0396 | 05/08/2012  ACT | (1) Caterpillar 3516 Generator Engine ("Engine 7") | 17.14 | Landfill gas | 800 | KW | Particulate matter, total < 2.5 Âµ (TPM2.5) | Proper operation and maintenance | 0.2 | G/B-HP-H | 0.20 |
| MI-0396 | 05/08/2012  ACT | (1) Caterpillar 3512 Generator Engine ("Engine 8") | 17.14 | Landfill gas | 615 | KW | Particulate matter, total < 2.5 Âµ (TPM2.5) | Proper operation and maintenance | 0.2 | G/B-HP-H | 0.20 |
| MI-0396 | 05/08/2012  ACT | (2) Landfill Gas Generator Engine ("Engines 9&10") | 17.14 | Landfill gas | 1600 | KW | Particulate matter, total < 2.5 Âµ (TPM2.5) | Proper operation and maintenance | 0.2 | G/B-HP-H | 0.20 |
| MI-0401 | 12/21/2011  ACT | Emergency generator | 17.13 | Natural gas | 1200 | kW output | Particulate matter, total < 10 Âµ (TPM10) | | 9.99 | E-3 LB/MMBTU | |
| MI-0412 | 12/04/2013  ACT | Emergency Engine--natural gas (EUNGENGINE) | 17.13 | natural gas | 1000 | kW | Particulate matter, filterable (FPM) | Good combustion practices | 0.0001 | LB/MMBTU | 0.00 |
| OK-0148 | 09/12/2012  ACT | Large Internal Combustion Engines (>500 hp) | 17.13 | Natural Gas | 1775 | Horsepower | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0.01 | LB/MMBTU | 0.03 |
| OK-0153 | 03/01/2013  ACT | COMPRESSOR ENGINE 1,775-HP CAT G3606LE | 17.13 | NATURAL GAS | 1775 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | NATURAL GAS COMBUSTION PRACTICES. | 0.01 | LB/MMBTU | 0.03 |
| *OR-0052 | 06/21/2013  ACT | Caterpillar 3520C internal combustion engines which drive electric generators | 17.14 | landfill gas | 2328 | MMdscf/year | Particulate matter, total (TPM) | | 0.492 | LB/HOUR | 0.10 |
| *OR-0052 | 06/21/2013  ACT | Caterpillar 3516 internal combustion engines which drive electric generators | 17.14 | landfill gas | 1400 | MMdscf/year | Particulate matter, total (TPM) | | 0.1 | G/HP-HR | 0.10 |
| TX-0692 | 12/20/2013  ACT | (12) reciprocating internal combustion engines | 17.13 | natural gas | 18 | MW | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0 | | |
| CA-1192 | 06/21/2011  ACT | EMERGENCY IC ENGINE | 17.13 | NATURAL GAS | 550 | KW | Particulate matter, total (TPM) | USE PUC QUALITY PIPELINE NATURAL GAS | 0.34 | G/HP-H | 0.34 |
| FL-0326 | 08/25/2011  ACT | Landfill Gas-to-Energy | 17.14 | Landfill gas | 4000 | scfm | Particulate matter, total < 2.5 Âµ (TPM2.5) | Pretreatment of landfill gas and good combustion practices | 10 | % OPACITY | 0.24 |
| MI-0397 | 06/29/2011  ACT | Landfill gas fired generator engines-2 | 17.14 | Landfill gas | 260880 | MMBTU/yr | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices of gas treated according to NSPS WWW. | 0.23 | G/B-HP-H | 0.23 |
| MI-0398 | 06/17/2011  ACT | Landfill gas fired generator engine | 17.14 | Landfill gas | 264.38 | MMSCF/YR | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good combustion practices of gas treated according to NSPS WWW. | 0.15 | G/B-HP-H | 0.15 |
| OH-0347 | 07/05/2011  ACT | 2 caterpillar engines 2233 HP | 17.14 | Landfill gas | 2233 | HP | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.98 | LB/H | 0.20 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - PM (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0348 | 09/14/2011  ACT | Reciprocationg Internal Combustion Engines (10) | 17.14 | Landfill Gas | 2233 | HP | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.49 | LB/H | 0.10 |
| *PA-0279 | 12/13/2010  ACT | RIC ENGINES (2) | 17.14 | Treated Landfil Gas | 66876 | CF/H | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.17 | G/B-HP-H | 0.17 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *AK-0085 | 08/13/2020  ACT | One (1) Black Start Generator Engine | 17.11 | ULSD | 186.6 | gph | Particulate matter, total (TPM) | Good combustion practices, ULSD, and limit operation to 500 hours per year. | 0.045 | G/HP-HR | 0.05 |
| AR-0161 | 09/23/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Particulate matter, filterable (FPM) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 0.02 | G/KW-H | 0.01 |
| AR-0163 | 06/09/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Particulate matter, filterable (FPM) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 0.2 | G/KW-HR | 0.15 |
| *IA-0117 | 03/17/2021  ACT | Emergency Fire Pump Engine | 17.11 | diesel | 510 | bhp | Particulate matter, total (TPM) | | 0.17 | LB/HR | 0.15 |
| IL-0130 | 12/31/2018  ACT | Emergency Engine | 17.11 | Ultra-Low Sulfur Diesel | 1500 | kW | Particulate matter, total (TPM) | | 0.2 | G/KW-HR | 0.15 |
| IN-0317 | 06/11/2019  ACT | Emergency generator EU-6006 | 17.11 | Diesel | 2800 | HP | Particulate matter, total (TPM) | Tier II diesel engine | 0.2 | G/KWH | 0.15 |
| IN-0317 | 06/11/2019  ACT | Emergency fire pump EU-6008 | 17.11 | Diesel | 750 | HP | Particulate matter, total (TPM) | Engine that complies with Table 4 to Subpart IIII of Part 60 | 0.2 | G/KWH | 0.15 |
| KY-0110 | 07/23/2020  ACT | EP 10-02 - North Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Particulate matter, filterable (FPM) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.15 |
| KY-0110 | 07/23/2020  ACT | EP 10-03 - South Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Particulate matter, filterable (FPM) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.15 |
| KY-0110 | 07/23/2020  ACT | EP 10-04 - Emergency Fire Water Pump | 17.11 | Diesel | 920 | HP | Particulate matter, filterable (FPM) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.15 |
| KY-0110 | 07/23/2020  ACT | EP 10-07 - Air Separation Plant Emergency Generator | 17.11 | Diesel | 700 | HP | Particulate matter, filterable (FPM) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.15 |
| KY-0110 | 07/23/2020  ACT | EP 10-01 - Caster Emergency Generator | 17.11 | Diesel | 2922 | HP | Particulate matter, filterable (FPM) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.15 |
| KY-0115 | 04/19/2021  ACT | New Pumphouse (XB13) Emergency Generator #1 (EP 08-05) | 17.11 | Diesel | 2922 | HP | Particulate matter, filterable (FPM) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.15 |
| KY-0115 | 04/19/2021  ACT | Tunnel Furnace Emergency Generator (EP 08-06) | 17.11 | Diesel | 2937 | HP | Particulate matter, filterable (FPM) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0.15 | G/HP-HR | 0.15 |
| KY-0115 | 04/19/2021  ACT | Caster B Emergency Generator (EP 08-07) | 17.11 | Diesel | 2937 | HP | Particulate matter, filterable (FPM) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0.15 | G/HP-HR | 0.15 |
| KY-0115 | 04/19/2021  ACT | Air Separation Unit Emergency Generator (EP 08-08) | 17.11 | Diesel | 700 | HP | Particulate matter, filterable (FPM) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0.15 | G/HP-HR | 0.15 |
| *LA-0364 | 01/06/2020  ACT | Emergency Generator Diesel Engines | 17.11 | Diesel Fuel | 550 | hp | Particulate matter, total < 10 Âµ (TPM10) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| *MI-0442 | 08/21/2019  ACT | FGEMENGINE | 17.11 | Diesel | 1100 | KW | Particulate matter, total (TPM) | Good combustion practices and ultra low sulfur diesel | 0.04 | G/HP-H | 0.04 |
| *MI-0445 | 11/26/2019  ACT | EUEMENGINE (diesel fuel emergency engine) | 17.11 | diesel fuel | 22.68 | MMBTU/H | Particulate matter, filterable (FPM) | Good Combustion Practices and meeting NSPS Subpart IIII requirements | 0.2 | G/KW-H | 0.15 |
| OH-0379 | 02/06/2019  ACT | Emergency Generators (P005 and P006) | 17.11 | Diesel fuel | 3131 | HP | Particulate matter, filterable < 10 Âµ (FPM10) | Tier IV engine Good combustion practices | 0.15 | LB/H | 0.02 |
| TX-0876 | 02/06/2020  ACT | Emergency generator | 17.11 | DIESEL | 0 | | Particulate matter, filterable < 10 Âµ (FPM10) | Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101, limited to 100 hours per year of non-emergency operation | 0 | | |
| TX-0882 | 01/17/2020  ACT | EMERGENCY ENGINES | 17.12 | DIESEL | 0 | | Particulate matter, total (TPM) | GOOD COMBUSTION PRACTICES, CLEAN FUEL, 100 HR/YR, ULTRA LOW SULFUR FUEL | 0.0001 | LB/MMBTU | |
| TX-0888 | 04/23/2020  ACT | EMERGENCY GENERATORS & FIRE WATER PUMP ENGINES | 17.11 | Ultra-low Sulfur Diesel | 0 | | Particulate matter, filterable (FPM) | well-designed and properly maintained engines and each limited to 100 hours per year of non-emergency use. | 0 | | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *TX-0904 | 09/09/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Particulate matter, filterable (FPM) | 100 HOURS OPERATIONS, Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101 | 0 | | |
| *TX-0905 | 09/16/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Particulate matter, filterable (FPM) | limited to 100 hours per year of non-emergency operation | 0 | | |
| *TX-0915 | 03/17/2021  ACT | DIESEL GENERATOR | 17.11 | DIESEL | 0 | | Particulate matter, filterable (FPM) | LIMITED 500 HR/YR OPERATION | 0.022 | G/HPHR | 0.02 |
| VA-0332 | 06/24/2019  ACT | Emergency Diesel Generator - 300 kW | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 0.15 | G/HP-HR | 0.15 |
| *VA-0333 | 12/09/2020  ACT | One (1) emergency engine generator | 17.11 | ULSD | 2220 | HP | Particulate matter, total < 10 Âµ (TPM10) | | 1.1 | LB | 0.22 |
| AK-0084 | 06/30/2017  ACT | Black Start and Emergency Internal Cumbustion Engines | 17.11 | Diesel | 1500 | kWe | Particulate matter, total (TPM) | Clean Fuel and Good Combustion Practices | 0.25 | G/KW-HR | 0.19 |
| AK-0084 | 06/30/2017  ACT | Twelve (12) Large ULSD/Natural Gas-Fired Internal Combustion Engines | 17.11 | Diesel and Natural Gas | 143.5 | MMBtu/hr | Particulate matter, total (TPM) | Clean Fuel and Good Combustion Practices | 0.29 | G/KW-HR (ULSD) | 0.22 |
| *AL-0318 | 12/18/2017  ACT | 250 Hp Emergency CI, Diesel-fired RICE | 17.11 | Diesel | 0 | | Particulate matter, total (TPM) | | 0 | | |
| *FL-0363 | 12/04/2017  ACT | Two 3300 kW emergency generators | 17.11 | ULSD | 0 | | Particulate matter, filterable (FPM) | Clean fuel | 0.2 | GRAMS PER KWH | 0.15 |
| *FL-0367 | 07/27/2018  ACT | 1,500 kW Emergency Diesel Generator | 17.11 | ULSD | 14.82 | MMBtu/hour | Particulate matter, filterable (FPM) | Operate and maintain the engine according to the manufacturer's written instructions | 0.2 | G/KW-HOUR | 0.15 |
| IL-0129 | 07/30/2018  ACT | Emergency Engines | 17.11 | Ultra-low sulfur diesel | 0 | | Particulate matter, total (TPM) | | 0 | | |
| *LA-0312 | 06/30/2017  ACT | DFP1-13 - Diesel Fire Pump Engine (EQT0013) | 17.11 | Diesel | 650 | horsepower | Particulate matter, total < 10 Âµ (TPM10) | Compliance with NSPS Subpart IIII | 0.15 | LB/HR | 0.10 |
| *LA-0312 | 06/30/2017  ACT | DEG1-13 - Diesel Fired Emergency Generator Engine (EQT0012) | 17.11 | Diesel | 1474 | horsepower | Particulate matter, total < 10 Âµ (TPM10) | Compliance with NSPS Subpart IIII | 0.08 | LB/HR | 0.02 |
| LA-0331 | 09/21/2018  ACT | Firewater Pumps | 17.11 | Diesel Fuel | 634 | kW | Particulate matter, total < 10 Âµ (TPM10) | Good combustion and operating practices. | 0.3 | G/HP-H | 0.30 |
| LA-0331 | 09/21/2018  ACT | Large Emergency Engines (>50kW) | 17.11 | Diesel Fuel | 5364 | HP | Particulate matter, total < 10 Âµ (TPM10) | Good combustion and operating practices. | 0.2 | G/KW-H | 0.15 |
| *MA-0043 | 06/21/2017  ACT | Cold Start Engine | 17.11 | ULSD | 19.04 | MMBTU/HR | Particulate matter, total < 10 Âµ (TPM10) | | 0.4 | LB/HR | |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE1 in FGRICE (Emergency diesel generator engine) | 17.11 | Diesel | 500 | H/YR | Particulate matter, filterable (FPM) | Certified engines, good design, operation and combustion practices. Operational restrictions/limited use. | 0.66 | LB/H | 0.15 |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE2 in FGRICE (Emergency Diesel Generator Engine) | 17.11 | Diesel | 500 | H/YR | Particulate matter, filterable (FPM) | Certified engines, good design, operation and combustion practices. Operational restrictions/limited use. | 0.22 | LB/H | 0.15 |
| MI-0425 | 05/09/2017  ACT | EUFIREPUMP in FGRICE (Diesel fire pump engine) | 17.11 | Diesel | 500 | H/YR | Particulate matter, filterable (FPM) | Certified engines. Good design, operation and combustion practices. Operational restrictions/limited use. | 0.18 | LB/H | 0.15 |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (North Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Particulate matter, filterable (FPM) | Diesel particulate filter, good combustion practices and meeting NSPS Subpart IIII requirements. | 0.2 | G/KW-H | 0.15 |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (South Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Particulate matter, filterable (FPM) | Diesel particulate filter, good combustion practices and meeting NSPS IIII requirements. | 0.2 | G/KW-H | 0.15 |
| MI-0435 | 07/16/2018  ACT | EUEMENGINE: Emergency engine | 17.11 | Diesel | 2 | MW | Particulate matter, filterable (FPM) | State of the art combustion design | 0.2 | G/KW-H | 0.15 |
| *MI-0441 | 12/21/2018  ACT | EUEMGD1--A 1500 HP diesel fueled emergency engine | 17.11 | Diesel | 1500 | HP | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices, burn ultra-low sulfur diesel fuel and be NSPS compliant. | 0.69 | LB/H | 0.21 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *MI-0441 | 12/21/2018  ACT | EUEMGD2--A 6000 HP diesel fuel fired emergency engine | 17.11 | Diesel | 6000 | HP | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices, burn ultra low sulfur diesel fuel, and be NSPS compliant. | 2.7 | LB/H | 0.20 |
| OH-0370 | 09/07/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Particulate matter, total < 10 Âµ (TPM10) | Ultra low sulfur diesel fuel | 0.5 | LB/H | 0.15 |
| OH-0372 | 09/27/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Particulate matter, total < 10 Âµ (TPM10) | Ultra low sulfur diesel fuel | 0.5 | LB/H | 0.15 |
| OH-0374 | 10/23/2017  ACT | Emergency Generators (2 identical, P004 and P005) | 17.11 | Diesel fuel | 2206 | HP | Particulate matter, total (TPM) | Certified to the meet the emissions standards in 40 CFR 89.112 and 89.113 pursuant to 40 CFR 60.4205(b) and 60.4202(a)(2). Good combustion practices per the manufacturerâ€™s operating manual. | 0.73 | LB/H | 0.15 |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Generator Engine (P001) | 17.11 | Diesel fuel | 2206 | HP | Particulate matter, total (TPM) | Good combustion design | 0.73 | LB/H | 0.15 |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Fire Pump Engine (P002) | 17.11 | Diesel fuel | 700 | HP | Particulate matter, total (TPM) | Good combustion design | 0.23 | LB/H | 0.15 |
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fired generator (P007) | 17.11 | Diesel fuel | 2682 | HP | Particulate matter, total < 10 Âµ (TPM10) | Comply with NSPS 40 CFR 60 Subpart IIII | 1.01 | LB/H | 0.17 |
| OH-0377 | 04/19/2018  ACT | Emergency Diesel Generator (P003) | 17.11 | Diesel fuel | 1860 | HP | Particulate matter, total (TPM) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 0.62 | LB/H | 0.15 |
| OH-0378 | 12/21/2018  ACT | Emergency Diesel-fired Generator Engine (P007) | 17.11 | Diesel fuel | 3353 | HP | Particulate matter, total (TPM) | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 1.1 | LB/H | 0.15 |
| OH-0378 | 12/21/2018  ACT | 1,000 kW Emergency Generators (P008 - P010) | 17.11 | Diesel fuel | 1341 | HP | Particulate matter, total (TPM) | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 0.44 | LB/H | 0.15 |
| *PA-0313 | 07/27/2017  ACT | Emergency Generator | 17.11 | Diesel | 2500 | bhp | Particulate matter, total (TPM) | | 0.2 | G | 0.20 |
| VA-0328 | 04/26/2018  ACT | Emergency Diesel GEN | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Particulate matter, filterable (FPM) | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 0.15 | G/HP H | 0.15 |
| *WI-0284 | 04/24/2018  ACT | Diesel-Fired Emergency Generators | 17.11 | Diesel Fuel | 0 | | Particulate matter, total (TPM) | The Use of Ultra-Low Sulfur Fuel and Good Combustion Practices | 0.17 | G/KWH | 0.13 |
| *WI-0286 | 04/24/2018  ACT | P42 -Diesel Fired Emergency Generator | 17.11 | Diesel Fuel | 0 | | Particulate matter, total (TPM) | Good Combustion Practices and The Use of Ultra-low Sulfur Fuel | 0.17 | G/KWH | 0.13 |
| WV-0027 | 09/15/2017  ACT | Emergency Generator - ESDG14 | 17.11 | ULSD | 900 | bhp | Particulate matter, total < 10 Âµ (TPM10) | ULSD | 0.2 | G/HP-HR | 0.20 |
| FL-0356 | 03/09/2016  ACT | Three 3300-kW ULSD emergency generators | 17.11 | ULSD | 0 | | Particulate matter, total (TPM) | Use of clean fuel | 0.2 | G / KW-HR | 0.15 |
| IN-0263 | 03/23/2017  ACT | EMERGENCY GENERATORS (EU014A AND EU-014B) | 17.11 | DISTILLATE OIL | 3600 | HP EACH | Particulate matter, total (TPM) | GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H EACH | 0.15 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| KY-0109 | 10/24/2016  ACT | Emergency Generators #1, #2, & #3 (EU72, EU73, & EU74) | 17.11 | Diesel | 53.6 | gal/hr | Particulate matter, filterable (FPM) | The permittee shall prepare and maintain for EU72, EU73, and EU74, within 90 days of startup, a good combustion and operation practices plan (GCOP) that defines, measures and verifies the use of operational and design practices determined as BACT for minimizing CO, VOC, PM, PM10, and PM2.5 emissions. Any revisions requested by the Division shall be made and the plan shall be maintained on site. The permittee shall operate according to the provisions of this plan at all times, including periods of startup, shutdown, and malfunction. The plan shall be incorporated into the plant standard operating procedures (SOP) and shall be made available for the Divisionâ€™s inspection. The plan shall include, but not be limited to:<br>i. A list of combustion optimization practices and a means of verifying the practices have occurred.<br>ii. A list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred.<br>iii. A list of the design choices determined to be BACT and verification that designs were implemented in the final construction. | 0.149 | G/HP-HR (EU72 &EU73) | 0.15 |
| LA-0292 | 01/22/2016  ACT | Emergency Generators No. 1 & No. 2 | 17.11 | Diesel | 1341 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Use of a certified engine, low sulfur diesel, and limiting non-emergency use to no more than 100 hours per year | 0.44 | LB/HR | 0.15 |
| LA-0305 | 06/30/2016  ACT | Diesel Engines (Emergency) | 17.11 | Diesel | 4023 | hp | Particulate matter, total < 10 Âµ (TPM10) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0307 | 03/21/2016  ACT | Diesel Engines | 17.11 | Diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | good combustion practices, Use ultra low sulfur diesel, and comply with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0309 | 06/04/2015  ACT | Emergency Generator Engines | 17.11 | Diesel | 2922 | hp (each) | Particulate matter, total < 10 Âµ (TPM10) | Complying with 40 CFR 60 Subpart IIII | 0.2 | G/KW-HR | 0.15 |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Generator 1 | 17.11 | Diesel | 2584 | HP | Particulate matter, filterable < 10 Âµ (FPM10) | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel). | 0.86 | LB/H | 0.15 |
| LA-0316 | 02/17/2017  ACT | emergency generator engines (6 units) | 17.11 | diesel | 3353 | hp | Particulate matter, total < 10 Âµ (TPM10) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0317 | 12/22/2016  ACT | Emergency Generator Engines (4 units) | 17.11 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | complying with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0 | | |
| LA-0317 | 12/22/2016  ACT | Firewater pump Engines (4 units) | 17.11 | diesel | 896 | hp (each) | Particulate matter, total < 10 Âµ (TPM10) | complying with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0 | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 3 Engine | 17.11 | Diesel Fuel | 600 | hp | Particulate matter, total < 10 Âµ (TPM10) | Proper operation and limits on hours operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 4 Engine | 17.11 | Diesel Fuel | 600 | hp | Particulate matter, total < 10 Âµ (TPM10) | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| MI-0421 | 08/26/2016  ACT | Emergency Diesel Generator Engine (EUEMRGRICE in FGRICE) | 17.11 | Diesel | 500 | H/YR | Particulate matter, filterable (FPM) | Certified engines, good design, operation and combustion practices. Operational restrictions/limited use. | 1.41 | LB/H | 0.15 |

## BACT Determinations for Large Internal Combustion Engines (> 500 HP) - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0421 | 08/26/2016  ACT | Dieself fire pump engine (EUFIREPUMP in FGRICE) | 17.11 | Diesel | 500 | H/YR | Particulate matter, filterable (FPM) | Certified engines, good design, operation and combustion practices. Operational restrictions/limited use. | 0.18 | LB/H | 0.15 |
| MI-0423 | 01/04/2017  ACT | EUEMENGINE (Diesel fuel emergency engine) | 17.11 | Diesel Fuel | 22.68 | MMBTU/H | Particulate matter, filterable (FPM) | Good combustion practices and meeting NSPS Subpart IIII requirements. | 0.2 | G/KW-H | 0.15 |
| NJ-0084 | 03/10/2016  ACT | Diesel Fired Emergency Generator | 17.11 | ULSD | 44 | H/YR | Particulate matter, filterable (FPM) | use of ULSD a clean burning fuel, and limited hours of operation | 0.26 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Black start generator | 17.11 | ultra low sulfur diesel | 3000 | KW | Particulate matter, filterable (FPM) | Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations. | 0.15 | G/BHP-H | 0.15 |
| OH-0366 | 08/25/2015  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2346 | HP | Particulate matter, total < 10 Âµ (TPM10) | State-of-the-art combustion design | 0.77 | LB/H | 0.15 |
| OH-0367 | 09/23/2016  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2947 | HP | Particulate matter, total < 10 Âµ (TPM10) | State-of-the-art combustion design | 0.97 | LB/H | 0.15 |
| OH-0368 | 04/19/2017  ACT | Emergency Generator (P009) | 17.11 | Diesel fuel | 5000 | HP | Particulate matter, total < 10 Âµ (TPM10) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 0.2 | LB/H | 0.02 |
| PA-0309 | 12/23/2015  ACT | 2000 kW Emergency Generator | 17.11 | Ultra-low sulfur Diesel | 0 | | Particulate matter, filterable (FPM) | | 0.025 | GM/HP-HR | 0.03 |
| PA-0310 | 09/02/2016  ACT | Emergency Generator Engines | 17.11 | ULSD | 0 | | Particulate matter, total (TPM) | | 0.15 | G/BHP-HR | 0.15 |
| PA-0311 | 09/01/2015  ACT | Fire Pump Engine | 17.11 | diesel | 0 | | Particulate matter, total (TPM) | | 0.2 | G/HP-HR | 0.20 |
| *SC-0193 | 04/15/2016  ACT | Emergency Generators and Fire Pump | 17.11 | No. 2 Fuel Oil | 1500 | hp | Particulate matter, total (TPM) | Meet emission standards of 40 CFR 60, Subpart IIII | 100 | HRS/YR | |
| TX-0728 | 04/01/2015  ACT | Emergency Diesel Generator | 17.11 | Diesel | 1500 | hp | Particulate matter, filterable (FPM) | Minimized hours of operations Tier II engine | 0.15 | LB/H | 0.05 |
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED EMERGENCY GENERATOR 3000 kW (1) | 17.11 | DIESEL FUEL | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Ultra Low Sulfur Diesel/Fuel (15 ppm max) | 0.4 | G/KW | 0.30 |
| AK-0076 | 08/20/2012  ACT | Combustion of Diesel by ICEs | 17.11 | ULSD | 1750 | kW | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0.2 | G/KW-H | 0.15 |
| AK-0080 | 06/06/2013  ACT | Combustion | 17.13 | Ultra Low Sulfur Diesel | 2000 | ekW | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good Combustion and Operating Practices | 0.2 | G/KW-H | 0.15 |
| AK-0081 | 06/12/2013  ACT | Combustion | 17.11 | ULSD | 610 | hp | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good operation and combustion practices | 0.15 | G/KW-H | 0.11 |
| AK-0082 | 01/23/2015  ACT | Emergency Camp Generators | 17.11 | Ultra Low Sulfur Diesel | 2695 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.15 | GRAMS/HP-H | 0.15 |
| AK-0082 | 01/23/2015  ACT | Fine Water Pumps | 17.11 | Ultra Low Sulfur Diesel | 610 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.15 | GRAMS/HP-H | 0.15 |
| AK-0082 | 01/23/2015  ACT | Bulk Tank Generator Engines | 17.11 | Ultra Low Sulfur Diesel | 891 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.15 | GRAMS/HP-H | 0.15 |
| AL-0301 | 07/22/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | DIESEL | 800 | HP | Particulate matter, filterable (FPM) | | 0.0007 | LB/HP-H | 0.32 |
| AR-0140 | 09/18/2013  ACT | EMERGENCY GENERATORS | 17.11 | DIESEL | 1500 | KW | Particulate matter, filterable (FPM) | GOOD OPERATING PRACTICES, LIMITED HOURS OF OPERATION, COMPLIANCE WITH NSPS SUBPART IIII | 0.02 | G/KW-H | 0.01 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0338 | 05/30/2012  ACT | Main Propulsion Engines - Development Driller 1 | 17.11 | Diesel | 0 | | Particulate matter, filterable (FPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler. | 0.43 | G/KW-H | 0.32 |
| FL-0338 | 05/30/2012  ACT | Main Propulsion Engines - C.R. Luigs | 17.11 | Diesel | 5875 | hp | Particulate matter, filterable (FPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers measurement system, positive crankcase ventilation, turbocharger and aftercooler, and high pressure fuel injection with aftercooler. | 0.43 | G/KW-H | 0.32 |
| FL-0338 | 05/30/2012  ACT | Fast Rescue Craft Diesel Engine - C.R. Luigs | 17.11 | diesel | 142 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines and use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - Development Driller 1 | 17.11 | Diesel | 2229 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 0.03 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - C.R. Luigs | 17.11 | diesel | 2064 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 0.04 | T/12MO ROLLING TOTAL | |
| FL-0346 | 04/22/2014  ACT | Four 3100 kW black start emergency generators | 17.11 | ULSD | 2.32 | MMBtu/hr (HHV) per engine | Particulate matter, total (TPM) | Good combustion practice | 0.2 | GRAMS PER KW-HR | 0.15 |
| FL-0347 | 09/16/2014  ACT | Main Propulsion Generator Diesel Engines | 17.11 | Diesel | 9910 | hp | Particulate matter, total < 10 Âµ (TPM10) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0.24 | G/KW-H | 0.18 |
| FL-0347 | 09/16/2014  ACT | Emergency Diesel Engine | 17.11 | Diesel | 3300 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0348 | 05/15/2012  ACT | Source Wide Emission Limit | 17.11 | Diesel | 0 | | Particulate matter, total (TPM) | PSD Avoidance Limit | 9.9 | TONS PER YEAR | |
| IA-0105 | 10/26/2012  ACT | Emergency Generator | 17.11 | diesel fuel | 142 | GAL/H | Particulate matter, total (TPM) | good combustion practices | 0.2 | G/KW-H | 0.15 |
| IA-0106 | 07/12/2013  ACT | Emergency Generators | 17.11 | diesel fuel | 180 | GAL/H | Particulate matter, total (TPM) | good combustion practices | 0.2 | G/KW-H | 0.15 |
| IL-0114 | 09/05/2014  ACT | Emergency Generator | 17.11 | distillate fuel oil | 3755 | HP | Particulate matter, filterable (FPM) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 0.1 | G/KW-H | 0.07 |
| IN-0158 | 12/03/2012  ACT | TWO (2) EMERGENCY DIESEL GENERATORS | 17.11 | DIESEL | 1006 | HP EACH | Particulate matter, filterable (FPM) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 0.15 | G/HP-H | 0.15 |
| IN-0158 | 12/03/2012  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 2012 | HP | Particulate matter, filterable (FPM) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 0.15 | G/HP-H | 0.15 |
| IN-0166 | 06/27/2012  ACT | TWO (2) EMERGENCY GENERATORS | 17.11 | DIESEL | 1341 | HORSEPOWER, EACH | Particulate matter, total < 10 Âµ (TPM10) | USE OF LOW-S DIESEL AND LIMITED HOURS OF NON-EMERGENCY OPERATION | 15 | PPM SULFUR | |
| IN-0166 | 06/27/2012  ACT | THREE (3) FIREWATER PUMP ENGINES | 17.11 | DIESEL | 575 | HORSEPOWER, EACH | Particulate matter, filterable (FPM) | USE OF LOW-S DIESEL AND LIMITED HOURS OF NON-EMERGENCY OPERATION | 15 | PPM SULFUR | |
| IN-0173 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Particulate matter, filterable (FPM) | GOOD COMBUSTION PRACTICES | 0.15 | G/BHP-H | 0.15 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR | 17.11 | NO. 2 FUEL OIL | 4690 | B-HP | Particulate matter, filterable (FPM) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.15 |
| IN-0180 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Particulate matter, filterable (FPM) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.15 |
| IN-0185 | 04/24/2014  ACT | DIESEL FIRE PUMP | 17.11 | DIESEL | 300 | HP | Particulate matter, filterable (FPM) | | 0.15 | G/HP-H | 0.15 |
| *KS-0036 | 03/18/2013  ACT | Caterpillar C18DITA Diesel Engine Generator | 17.11 | No. 2 Distillate Fuel Oil | 900 | BHP | Particulate matter, total < 10 Âµ (TPM10) | utilize efficient combustion/design technology | 0.066 | G/BHP-H | 0.07 |
| LA-0296 | 05/23/2014  ACT | Emergency Diesel Generators (EQTs 622, 671, 773, 850, 994, 995, 996, 1033, 1077, 1105, & 1202) | 17.11 | Diesel | 2682 | HP | Particulate matter, total < 10 Âµ (TPM10) | Compliance with 40 CFR 60 Subpart IIII; operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage. | 0.88 | LB/HR | 0.15 |
| LA-0308 | 09/26/2013  ACT | 2000 KW Diesel Fired Emergency Generator Engine | 17.11 | Diesel | 20.4 | MMBTU/hr | Particulate matter, filterable < 10 Âµ (FPM10) | Good combustion and maintenance practices, and compliance with NSPS 40 CFR 60 Subpart IIII | 1.06 | LB/H | |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 1 | 17.11 | Diesel | 5364 | HP | Particulate matter, total < 10 Âµ (TPM10) | Proper design and operation; use of ultra-low sulfur diesel | 1.76 | LB/H | 0.15 |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 2 | 17.11 | Diesel | 5364 | HP | Particulate matter, total < 10 Âµ (TPM10) | Proper design and operation; use of ultra-low sulfur diesel | 1.76 | LB/H | 0.15 |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 1 | 17.11 | Diesel | 751 | HP | Particulate matter, total < 10 Âµ (TPM10) | Proper design and operation; use of ultra-low sulfur diesel | 0.25 | LB/H | 0.15 |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 2 | 17.11 | Diesel | 751 | HP | Particulate matter, total < 10 Âµ (TPM10) | Proper design and operation; use of ultra-low sulfur diesel | 0.25 | LB/H | 0.15 |
| MA-0039 | 01/30/2014  ACT | Emergency Engine/Generator | 17.11 | ULSD | 7.4 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | | 0.15 | GM/BHP-H | 0.15 |
| MD-0042 | 04/08/2014  ACT | EMERGENCY GENERATOR 1 | 17.11 | ULTRA LOW SULFU DIESEL | 2250 | KW | Particulate matter, filterable (FPM) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND DESIGNED TO ACHIEVE EMISSION LIMITS | 0.15 | G/HP-H | 0.15 |
| MD-0043 | 07/01/2014  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 1300 | HP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND EXCLUSIVE USE OF ULSD | 0.17 | G/HP-H | 0.17 |
| MD-0044 | 06/09/2014  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 1550 | HP | Particulate matter, filterable (FPM) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION LIMITS | 0.15 | G/HP-H | 0.15 |
| MI-0406 | 11/01/2013  ACT | FG-EMGEN7-8; Two (2) 1,000kW diesel-fueled emergency reciprocating internal combustion engines | 17.11 | Diesel | 1000 | kW | Particulate matter, filterable (FPM) | Good combustion practices. | 0.15 | G/B-HP-H | 0.15 |
| NJ-0079 | 07/25/2012  ACT | Emergency Generator | 17.11 | Ultra Low Sulfur distillate Diesel | 100 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Use of ULSD oil | 0.13 | LB/H | |
| NJ-0080 | 11/01/2012  ACT | Emergency Generator | 17.11 | ULSD | 200 | H/YR | Particulate matter, filterable (FPM) | use of ULSD, a low sulfur clean fuel | 0.59 | LB/H | |
| NY-0104 | 08/01/2013  ACT | Emergency generator | 17.11 | ultra low sulfur diesel | 0 | | Particulate matter, filterable (FPM) | Ultra low sulfur diesel with maximum sulfur content 0.0015 percent. | 0.03 | G/BHP-H | 0.03 |
| OH-0352 | 06/18/2013  ACT | Emergency generator | 17.11 | diesel | 2250 | KW | Particulate matter, total < 10 Âµ (TPM10) | Purchased certified to the standards in NSPS Subpart IIII | 0.99 | LB/H | 0.15 |
| OH-0355 | 05/07/2013  ACT | Test Cell 1 for Aircraft Engines and Turbines | 17.11 | JET FUEL | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.038 | LB/MMBTU | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0360 | 11/05/2013  ACT | Emergency generator (P003) | 17.11 | diesel | 1112 | KW | Particulate matter, total < 10 Âµ (TPM10) | Purchased certified to the standards in NSPS Subpart IIII | 0.49 | LB/H | 0.15 |
| OH-0363 | 11/05/2014  ACT | Emergency generator (P002) | 17.11 | Diesel fuel | 1100 | KW | Particulate matter, total (TPM) | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 0.77 | LB/H | 0.24 |
| OK-0154 | 07/02/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR ENGINE | 17.11 | DIESEL | 1341 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | COMBUSTION CONTROL. | 0.44 | LB/HR | 0.15 |
| OK-0156 | 07/31/2013  ACT | Fire Pump Engine | 17.11 | Diesel | 550 | hp | Particulate matter, total < 10 Âµ (TPM10) | | 0.2 | GM/HP-HR | 0.20 |
| PA-0278 | 10/10/2012  ACT | Emergency Generator | 17.11 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.02 | G/B-HP-H | 0.02 |
| PA-0286 | 01/31/2013  ACT | EMERGENCY GENERATOR-ENGINE | 17.13 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.02 | GM/B-HP-H | 0.02 |
| PA-0291 | 04/23/2013  ACT | EMERGENCY GENERATOR | 17.11 | Ultra Low sulfur Distillate | 7.8 | MMBTU/H | Particulate matter, total (TPM) | | 0.02 | TPY | |
| *PA-0292 | 06/01/2012  ACT | DIESEL GENERATOR (2.25 MW EACH) - 5 UNITS | 17.11 | #2 Oil | 0 | | Particulate matter, total (TPM) | | 0.28 | LB/H | |
| WV-0025 | 11/21/2014  ACT | Emergency Generator | 17.11 | Diesel | 2015.7 | HP | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | | 0 | | 0.15 |
| AK-0072 | 07/14/2011  ACT | EU 15 Caterpillar C-280-16 | 17.11 | ULSD | 4400 | KW | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | Positive Crankcase Ventilation Installed as part of the design | 0.5 | G/KW-H | 0.37 |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.11 | DIESEL | 2683 | HP | Particulate matter, total (TPM) | USE ULTRA LOW SULFUR FUEL | 0.2 | G/KW-H | 0.15 |
| FL-0328 | 10/27/2011  ACT | Main Propulsion Engines | 17.11 | Diesel | 0 | | Particulate matter, filterable (FPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers (DEWT) measurement system. | 0.43 | G/KW-H | 0.32 |
| FL-0328 | 10/27/2011  ACT | Crane Engines (units 1 and 2) | 17.11 | Diesel | 0 | | Particulate matter, total (TPM) | Use of certified EPA Tier 1 engines and good combustion practices based on the current manufacturerâ€™s specifications for this engine. | 0.6 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Crane Engines (units 3 and 4) | 17.11 | Diesel | 0 | | Particulate matter, total (TPM) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 1.3 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Emergency Engine | 17.11 | Diesel | 0 | | Particulate matter, total (TPM) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.03 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Emergency Fire Pump Engine | 17.11 | Diesel | 0 | | Particulate matter, total (TPM) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.002 | TONS PER YEAR | |
| FL-0332 | 09/23/2011  ACT | 600 HP Emergency Equipment | 17.11 | Ultra-Low Sulfur Oil | 0 | | Particulate matter, total (TPM) | See Pollutant Notes. | 0.15 | G/HP-H | 0.15 |
| LA-0251 | 04/26/2011  ACT | Large Generator Engines (17 units) | 17.11 | Diesel | 0 | | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.01 | LB/H | 0.15 |
| LA-0254 | 08/16/2011  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 1250 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H | 0.15 |
| MI-0400 | 06/29/2011  ACT | Emergency generator | 17.11 | Diesel | 4000 | HP | Particulate matter, filterable (FPM) | | 0.15 | G/HP-H | 0.15 |
| MI-0402 | 11/17/2011  ACT | Diesel fuel-fired combustion engine (RICE) | 17.11 | Diesel | 732 | HP | Particulate matter, filterable (FPM) | Good combustion practices | 0.05 | G/HP-H | 0.05 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *SD-0005 | 06/29/2010  ACT | Emergency Generator | 17.11 | Distillate Oil | 2000 | Kilowatts | Particulate matter, filterable (FPM) | | 0 | | |
| *SD-0005 | 06/29/2010  ACT | Fire Water Pump | 17.11 | Distillate Oil | 577 | horsepower | Particulate matter, filterable (FPM) | | 0 | | |

## BACT Determinations for Large Internal Combustion Engines (> 500 HP) - VOC (Gas-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *FL-0368 | 02/14/2019  ACT | Emergency Engines | 17.13 | Natural gas | 0 | | Volatile Organic Compounds (VOC) | Good combustion practices | 1 | G/HP-HR | 1.00 |
| KY-0110 | 07/23/2020  ACT | EP 10-05 - Austenitizing Furnace Rolls Emergency Generator | 17.13 | Natural Gas | 636 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 1 | G/HP-HR | 1.00 |
| KY-0110 | 07/23/2020  ACT | EP 10-06 - Tempering Furnace Rolls Emergency Generator | 17.13 | Natural Gas | 636 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 1 | G/HP-HR | 1.00 |
| *MI-0440 | 05/22/2019  ACT | FGENGINES | 17.13 | natural gas | 16500 | HP | Volatile Organic Compounds (VOC) | Oxidation catalyst | 11 | LB/H | 0.30 |
| *MI-0443 | 04/26/2019  ACT | EUEMERGEN1 | 17.13 | natural gas | 500 | h/yr | Volatile Organic Compounds (VOC) | | 0.5 | G/HP-H | 0.50 |
| *MI-0443 | 04/26/2019  ACT | EUEMERGEN2 | 17.13 | natural gas | 500 | h/yr | Volatile Organic Compounds (VOC) | | 0.5 | G/HP-H | 0.50 |
| *MI-0443 | 04/26/2019  ACT | EUEMERGEN3 | 17.13 | natural gas | 500 | h/yr | Volatile Organic Compounds (VOC) | | 0.5 | G/HP-H | 0.50 |
| *MI-0444 | 08/26/2019  ACT | FGNGEMENG (multiple emission units in this flexible group) | 17.13 | natural gas | 0 | | Volatile Organic Compounds (VOC) | Combustion of pipeline quality natural gas only. | 0.5 | G/HP-H | 0.50 |
| *MI-0446 | 10/30/2020  ACT | EUEMERGEN1 | 17.13 | Natural gas | 500 | h/yr | Volatile Organic Compounds (VOC) | | 0.5 | G/HP-H | 0.50 |
| *MI-0446 | 10/30/2020  ACT | EUEMERGEN2 | 17.13 | Natural gas | 500 | h/yr | Volatile Organic Compounds (VOC) | | 0.5 | G/HP-H | 0.50 |
| AK-0084 | 06/30/2017  ACT | Twelve (12) Large ULSD/Natural Gas-Fired Internal Combustion Engines | 17.11 | Diesel and Natural Gas | 143.5 | MMBtu/hr | Volatile Organic Compounds (VOC) | Oxidation Catalyst and Good Combustion Practices | 0.21 | G/KW-HR (ULSD) | 0.07 |
| *LA-0346 | 01/04/2018  ACT | emergency generators (4 units) | 17.11 | natural gas | 13410 | hp (each) | Volatile Organic Compounds (VOC) | Comply with standards of 40 CFR 60 Subpart JJJJ | 1 | G/BHP-HR | 1.00 |
| *MI-0441 | 12/21/2018  ACT | EUEMGNG1--A 1500 HP natural gas fueled emergency engine | 17.13 | Natural gas | 1500 | HP | Volatile Organic Compounds (VOC) | Burn natural gas and be NSPS compliant | 1 | G/HP-H | 1.00 |
| *MI-0441 | 12/21/2018  ACT | EUEMGNG2 | 17.13 | NATURAL GAS | 6000 | HP | Volatile Organic Compounds (VOC) | Burn natural gas and be NSPS compliant. | 1 | G/HP-H | 1.00 |
| CA-1240 | 03/17/2017  ACT | Internal Combustion Engine | 17.13 | Natural gas | 881 | bhp | Volatile Organic Compounds (VOC) | Oxidation catalyst | 25 | PPMVD | 0.28 |
| CA-1241 | 08/19/2016  ACT | ICE Landfill or digested gas fired | 17.14 | Digester gas | 1573 | bhp | Volatile Organic Compounds (VOC) | SCR/Oxidation catalyst | 26 | PPMV | 0.29 |
| *KS-0030 | 03/31/2016  ACT | Spark ignition RICE emergency AC generators | 17.13 | Natural gas | 450 | kW | Volatile Organic Compounds (VOC) | | 1 | G/HP-HR | 1.00 |
| *KS-0030 | 03/31/2016  ACT | Spark ignition RICE electricity generating units (EGUs) | 17.13 | Natural Gas | 10 | MW | Volatile Organic Compounds (VOC) | | 5.82 | LB/H | 0.20 |
| LA-0292 | 01/22/2016  ACT | Waukesha 16V-275GL Compressor Engines Nos. 1-12 | 17.13 | Natural Gas | 5000 | HP | Volatile Organic Compounds (VOC) | CO oxidation catalyst, use of natural gas as fuel, good equipment design, and proper combustion techniques | 1.25 | LB/HR | 0.11 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - VOC (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0295 | 07/12/2016  ACT | Reciprocating Internal Combustion Engines 1 and 2 (1-08, EQT 321 & 2-08, EQT 322) | 17.15 | NATURAL GAS AND VENT GAS | 11265 | HP | Volatile Organic Compounds (VOC) | Oxidation catalyst and good combustion practices, including good equipment design, use of gaseous fuels for good mixing, and proper combustion techniques (see notes below) | 3.35 | LB/H | 0.13 |
| MI-0424 | 12/05/2016  ACT | EUNGENGINE (Emergency engine--natural gas) | 17.13 | Natural gas | 500 | H/YR | Volatile Organic Compounds (VOC) | Oxidation catalyst and good combustion practices. | 0.5 | G/HP-H | 0.50 |
| TX-0755 | 05/21/2015  ACT | Internal Combustion Compressor Engines | 17.13 | Residue gas equivalent to natural gas | 206149 | MMBtu/yr | Volatile Organic Compounds (VOC) | Ultra lean-burn engines firing residue gas which is equivalent to natural gas, , and use of oxidation catalysts | 0.091 | G/HP HR | 0.09 |
| CA-1227 | 09/25/2013  ACT | ICE LANDFILL GAS FIRED ENGINE | 17.14 | LANDFILL GAS | 2233 | BHP | Volatile Organic Compounds (VOC) | ENGINE DESIGN | 20 | PPM@15%O2 | 0.22 |
| FL-0333 | 07/05/2012  ACT | 1.6 MW Caterpillar Model G3520C lean-burn internal combustion engine | 17.14 | biogas | 0 | | Volatile Organic Compounds (VOC) | Engine design and good combustion practices.<br>Bio-scrubber. | 4.9 | LB/H | 1.04 |
| FL-0339 | 09/15/2014  ACT | 12 LFG-fired RICE/generator sets, 1.6 MW each | 17.14 | Landfill gas | 14.96 | MMBTU/hr, LHV | Volatile Organic Compounds (VOC) | Engine combustion characteristics | 0.56 | G/BHP-H | 0.56 |
| IL-0113 | 12/23/2013  ACT | Engines | 17.14 | Treated landfill gas | 2.6 | MW | Volatile Organic Compounds (VOC) | | 0.71 | G/HP-H | 0.71 |
| KS-0035 | 01/24/2014  ACT | spark ignition four stroke lean burn reciprocating internal combustion engine (RICE) electric generating units (EGUs) | 17.13 | Natural gas | 12526 | BHP | Volatile Organic Compounds (VOC) | selective catalytic reduction (SCR) system and an oxidation catalyst | 2.67 | LBS PER HOUR | 0.10 |
| LA-0257 | 12/06/2011  ACT | Generator Engines (2) | 17.13 | Natural Gas | 2012 | hp | Volatile Organic Compounds (VOC) | Comply with 40 CFR 60 Subpart JJJJ | 4.43 | LB/H | 1.00 |
| MI-0411 | 12/11/2013  ACT | FGENGINES7R-10 (4 CAT engines using landfill gas) | 17.14 | Landfill gas | 1600 | KW | Volatile Organic Compounds (VOC) | | 0.63 | G/B-HP-H | 0.63 |
| MI-0412 | 12/04/2013  ACT | Emergency Engine--natural gas (EUNGENGINE) | 17.13 | natural gas | 1000 | kW | Volatile Organic Compounds (VOC) | Oxidation catalyst and good combustion practices | 0.5 | G/HP-H | 0.50 |
| OK-0148 | 09/12/2012  ACT | Large Internal Combustion Engines (>500 hp) | 17.13 | Natural Gas | 1775 | Horsepower | Volatile Organic Compounds (VOC) | Oxidation Catalyst | 0.22 | GM/HP-HR | 0.22 |
| OK-0148 | 09/12/2012  ACT | Large Internal Combustion Engines (>500 hp) | 17.13 | Natural Gas | 2370 | Horsepower | Volatile Organic Compounds (VOC) | Oxidation Catalyst | 0.22 | GM/HP-HR | 0.22 |
| OK-0153 | 03/01/2013  ACT | COMPRESSOR ENGINE 1,775-HP CAT G3606LE | 17.13 | NATURAL GAS | 1775 | HP | Volatile Organic Compounds (VOC) | EACH ENGINE EQUIPPED W/OXIDATION CATALYST. | 0.13 | GM/HP-HR | 0.13 |
| OK-0153 | 03/01/2013  ACT | EMERGENCY GENERATORS 2,889-HP CAT G3520C IM | 17.13 | NATURAL GAS | 2889 | HP | Volatile Organic Compounds (VOC) | OXIDATION CATALYST | 0.44 | GM/HP-HR | 0.44 |
| *OR-0052 | 06/21/2013  ACT | Caterpillar 3520C internal combustion engines which drive electric generators | 17.14 | landfill gas | 2328 | MMdscf/year | Volatile Organic Compounds (VOC) | | 20 | PPM @ 3% O2 | 0.07 |
| *OR-0052 | 06/21/2013  ACT | Caterpillar 3516 internal combustion engines which drive electric generators | 17.14 | landfill gas | 1400 | MMdscf/year | Volatile Organic Compounds (VOC) | | 5.4 | LB/MMDSCF | |
| PA-0297 | 05/23/2013  ACT | 3.11 MW GENERATORS (WAUKESHA) #1 and #2 | 17.13 | Natural Gas | 0 | | Volatile Organic Compounds (VOC) | | 0.176 | G/BHP-HR | 0.18 |
| PA-0301 | 03/31/2014  ACT | Three Four Stroke Lean Burn Engine - Caterpillar G3608 TA, 2370 BHP | 17.13 | Natural Gas | 0 | | Volatile Organic Compounds (VOC) | Oxidation Catalyst | 0.25 | G/BHP-HR | 0.25 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - VOC (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PA-0301 | 03/31/2014  ACT | One four stroke lean burn engine, Caterpillar Model G3612 TA, 3550 bhp | 17.13 | Natural Gas | 0 | | Volatile Organic Compounds (VOC) | Oxidation Catalyst | 0.25 | G-BHP-HR | 0.25 |
| PA-0302 | 04/16/2014  ACT | Spark Ignited 4 stroke Rich Burn Engine (7 units) | 17.13 | Natural Gas | 0 | | Volatile Organic Compounds (VOC) | NONE | 0.2 | G/BHP-HR | 0.20 |
| TX-0680 | 06/14/2013  ACT | Refrigeration compressor engine | 17.13 | natural gas | 1183 | hp | Volatile Organic Compounds (VOC) | oxidation catalyst | 0.245 | G/HP-HR | 0.25 |
| TX-0680 | 06/14/2013  ACT | Recompression compressor engine | 17.13 | natural gas | 1380 | hp | Volatile Organic Compounds (VOC) | oxidation catalyst | 0.245 | G/HP-HR | 0.25 |
| TX-0692 | 12/20/2013  ACT | (12) reciprocating internal combustion engines | 17.13 | natural gas | 18 | MW | Volatile Organic Compounds (VOC) | oxidation catalyst | 0.3 | G/HP-HR | 0.30 |
| CA-1186 | 08/26/2011  ACT | Internal Combustion Engine | 17.14 | Landfill Gas | 1966 | BHP | Volatile Organic Compounds (VOC) | Lean-burn engine with air-fuel ratio controller | 86 | PPMVD@15% O2 | 0.96 |
| CA-1222 | 09/22/2011  ACT | ICE: Spark Igition | 17.13 | natural gas | 2889 | bhp | Volatile Organic Compounds (VOC) | Oxidation Catalyst | 30 | PPMVD@15% O2 | 0.34 |
| FL-0326 | 08/25/2011  ACT | Landfill Gas-to-Energy | 17.14 | Landfill gas | 4000 | scfm | Volatile Organic Compounds (VOC) | | 1 | G/B-HP-H | 1.00 |
| OH-0347 | 07/05/2011  ACT | 2 caterpillar engines 2233 HP | 17.14 | Landfill gas | 2233 | HP | Volatile Organic Compounds (VOC) | | 1.64 | LB/H | 0.33 |
| OH-0348 | 09/14/2011  ACT | Reciprocationg Internal Combustion Engines (10) | 17.14 | Landfill Gas | 2233 | HP | Volatile Organic Compounds (VOC) | | 28.72 | LB/H | 5.83 |
| *PA-0279 | 12/13/2010  ACT | RIC ENGINES (2) | 17.14 | Treated Landfil Gas | 66876 | CF/H | Volatile Organic Compounds (VOC) | | 0.32 | G/B-HP-H | 0.32 |
| PA-0287 | 09/27/2011  ACT | CATERPILLAR G3516B COMPRESSOR ENGINES (2) | 17.13 | Natural Gas | 0 | | Volatile Organic Compounds (VOC) | Oxidation Catalyst - Miratech | 0.12 | G/B-HP-H | 0.12 |
| PA-0287 | 09/27/2011  ACT | WAUKESHA P9390GSI COMPRESSOR ENGINES (4) (1980 BHP) | 17.13 | Natural Gas | 0 | | Volatile Organic Compounds (VOC) | 3-way catalyst, Johnson Matthey | 0.12 | G/B-HP-H | 0.12 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *AK-0085 | 08/13/2020  ACT | One (1) Black Start Generator Engine | 17.11 | ULSD | 186.6 | gph | Volatile Organic Compounds (VOC) | Oxidation Catalyst, Good combustion practices, and limit operation to 500 hours per year. | 0.18 | G/HP-HR | 0.18 |
| AR-0161 | 09/23/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 1.9 | G/KW-HR | 1.42 |
| AR-0163 | 06/09/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 1.55 | G/KW-HR | 1.16 |
| IN-0317 | 06/11/2019  ACT | Emergency generator EU-6006 | 17.11 | Diesel | 2800 | HP | Volatile Organic Compounds (VOC) | Tier II diesel engine | 6.4 | G/KWH | 4.77 |
| IN-0317 | 06/11/2019  ACT | Emergency fire pump EU-6008 | 17.11 | Diesel | 750 | HP | Volatile Organic Compounds (VOC) | Engine that complies with Table 4 to Subpart IIII of Part 60 | 4 | G/KWH | 2.98 |
| KY-0110 | 07/23/2020  ACT | EP 10-02 - North Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 10-03 - South Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 10-04 - Emergency Fire Water Pump | 17.11 | Diesel | 920 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 10-07 - Air Separation Plant Emergency Generator | 17.11 | Diesel | 700 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 10-01 - Caster Emergency Generator | 17.11 | Diesel | 2922 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| *LA-0364 | 01/06/2020  ACT | Emergency Generator Diesel Engines | 17.11 | Diesel Fuel | 550 | hp | Volatile Organic Compounds (VOC) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| *LA-0364 | 01/06/2020  ACT | Emergency Fire Water Pumps | 17.11 | Diesel Fuel | 550 | hp | Volatile Organic Compounds (VOC) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| *MI-0442 | 08/21/2019  ACT | FGEMENGINE | 17.11 | Diesel | 1100 | KW | Volatile Organic Compounds (VOC) | | 0.86 | LB/H | 0.26 |
| *OK-0181 | 09/11/2019  ACT | EMERGENCY USE ENGINES > 500 HP | 17.11 | DIESEL | 0 | | Volatile Organic Compounds (VOC) | Good combustion practices. Certified to meet EPA Tier 3 engine standards. Each engine shall be limited to operate not more than 500 hours per year. | 3 | GM/HP-HR | 3.00 |
| TX-0859 | 06/12/2019  ACT | Fuel Storage Tanks | 17.12 | diesel | 0 | | Volatile Organic Compounds (VOC) | Two fixed roof storage tanks will store diesel fuel, which has a VOC vapor pressure than less than 0.5 psia at 95Â° F. The permit requires that the tanks be painted white and use submerged fill | 0 | | |
| TX-0872 | 10/31/2019  ACT | Emergency Generators | 17.11 | ultra low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | Limiting duration and frequency of generator use to 100 hr/yr. Good combustion practices will be used to reduce VOC including maintaining proper air-to-fuel ratio. | 0.12 | G/KW HR | 0.09 |
| TX-0876 | 02/06/2020  ACT | Emergency generator | 17.11 | DIESEL | 0 | | Volatile Organic Compounds (VOC) | Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101, limited to 100 hours per year of non-emergency operation | 0 | | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0879 | 02/19/2020  ACT | Emergency Firewater Engine | 17.11 | Ultra-low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs/yr of non-emergency operation. Have a non-resettable runtime meter. | 0.1 | G/HP HR | 0.10 |
| TX-0882 | 01/17/2020  ACT | EMERGENCY ENGINES | 17.12 | DIESEL | 0 | | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES, CLEAN FUEL, 100 HR/YR, ULTRA LOW SULFUR FUEL | 0.001 | LB/MMBTU | |
| TX-0888 | 04/23/2020  ACT | EMERGENCY GENERATORS & FIRE WATER PUMP ENGINES | 17.11 | Ultra-low Sulfur Diesel | 0 | | Volatile Organic Compounds (VOC) | well-designed and properly maintained engines and each limited to 100 hours per year of non-emergency use. | 0 | | |
| *TX-0904 | 09/09/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Volatile Organic Compounds (VOC) | 100 HOURS OPERATIONS, Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101 | 0 | | |
| *TX-0905 | 09/16/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Volatile Organic Compounds (VOC) | limited to 100 hours per year of non-emergency operation | 0 | | |
| *TX-0915 | 03/17/2021  ACT | DIESEL GENERATOR | 17.11 | DIESEL | 0 | | Volatile Organic Compounds (VOC) | LIMITED 500 HR/YR OPERATION | 0.5 | G/HPHR | 0.50 |
| AK-0084 | 06/30/2017  ACT | Twelve (12) Large ULSD/Natural Gas-Fired Internal Combustion Engines | 17.11 | Diesel and Natural Gas | 143.5 | MMBtu/hr | Volatile Organic Compounds (VOC) | Oxidation Catalyst and Good Combustion Practices | 0.21 | G/KW-HR (ULSD) | 0.16 |
| *AL-0318 | 12/18/2017  ACT | 250 Hp Emergency CI, Diesel-fired RICE | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| *AL-0318 | 12/18/2017  ACT | 250 Hp Emergency CI, Diesel-fired RICE | 17.11 | Diesel | 0 | | Formaldehyde | | 0 | | |
| *LA-0312 | 06/30/2017  ACT | DFP1-13 - Diesel Fire Pump Engine (EQT0013) | 17.11 | Diesel | 650 | horsepower | Volatile Organic Compounds (VOC) | Compliance with NNSPS Subpart IIII | 0.13 | LB/HR | 0.10 |
| *LA-0312 | 06/30/2017  ACT | DEG1-13 - Diesel Fired Emergency Generator Engine (EQT0012) | 17.11 | Diesel | 1474 | horsepower | Volatile Organic Compounds (VOC) | Compliance with NSPS Subpart IIII | 0.04 | LB/HR | 0.03 |
| LA-0331 | 09/21/2018  ACT | Firewater Pumps | 17.11 | Diesel Fuel | 634 | kW | Volatile Organic Compounds (VOC) | Good combustion and operating practices. | 0.44 | G/HP-H | 0.44 |
| LA-0331 | 09/21/2018  ACT | Large Emergency Engines (>50kW) | 17.11 | Diesel Fuel | 5364 | HP | Volatile Organic Compounds (VOC) | Good combustion and operating practices. | 0.79 | G/KW-H | 0.59 |
| *MA-0043 | 06/21/2017  ACT | Cold Start Engine | 17.11 | ULSD | 19.04 | MMBTU/HR | Volatile Organic Compounds (VOC) | | 0.85 | LB/HR | 0.14 |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (North Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Volatile Organic Compounds (VOC) | Good combustion practices. | 0.86 | LB/H | 0.29 |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (South Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Volatile Organic Compounds (VOC) | Good combustion practices | 0.86 | LB/H | 0.29 |
| MI-0435 | 07/16/2018  ACT | EUEMENGINE: Emergency engine | 17.11 | Diesel | 2 | MW | Volatile Organic Compounds (VOC) | State of the art combustion design. | 1.89 | LB/H | 0.32 |
| OH-0370 | 09/07/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 2 | LB/H | 0.59 |
| OH-0372 | 09/27/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 2 | LB/H | 0.59 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0374 | 10/23/2017  ACT | Emergency Generators (2 identical, P004 and P005) | 17.11 | Diesel fuel | 2206 | HP | Volatile Organic Compounds (VOC) | Certified to the meet the emissions standards in 40 CFR 89.112 and 89.113 pursuant to 40 CFR 60.4205(b) and 60.4202(a)(2). Good combustion practices per the manufacturerâ€™s operating manual. | 23.21 | LB/H | 4.77 |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Generator Engine (P001) | 17.11 | Diesel fuel | 2206 | HP | Volatile Organic Compounds (VOC) | Good combustion design | 24.71 | LB/H | 4.80 |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Fire Pump Engine (P002) | 17.11 | Diesel fuel | 700 | HP | Volatile Organic Compounds (VOC) | Good combustion design | 4.97 | LB/H | 3.00 |
| OH-0377 | 04/19/2018  ACT | Emergency Diesel Generator (P003) | 17.11 | Diesel fuel | 1860 | HP | Volatile Organic Compounds (VOC) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 19.68 | LB/H | 4.80 |
| OH-0378 | 12/21/2018  ACT | Emergency Diesel-fired Generator Engine (P007) | 17.11 | Diesel fuel | 3353 | HP | Volatile Organic Compounds (VOC) | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 37.41 | LB/H | 4.80 |
| OH-0378 | 12/21/2018  ACT | 1,000 kW Emergency Generators (P008 - P010) | 17.11 | Diesel fuel | 1341 | HP | Volatile Organic Compounds (VOC) | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 14.96 | LB/H | 4.80 |
| OK-0175 | 06/29/2017  ACT | Emergency Use Engines > 500 HP | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Good combustion practices. Certified to meet EPA Tier 3 engine standards. Shall be limited to operate at no more than 500 hr/yr. | 3 | GM/HP-HR | 3.00 |
| *PA-0313 | 07/27/2017  ACT | Emergency Generator | 17.11 | Diesel | 2500 | bhp | Volatile Organic Compounds (VOC) | | 3.5 | G | 2.61 |
| VA-0327 | 07/12/2017  ACT | Emergency Generator | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.49 | LB/HR | |
| *WI-0284 | 04/24/2018  ACT | Diesel-Fired Emergency Generators | 17.11 | Diesel Fuel | 0 | | Volatile Organic Compounds (VOC) | Good Combustion Practices | 0.56 | G/KWH | 0.42 |
| *WI-0286 | 04/24/2018  ACT | P42 -Diesel Fired Emergency Generator | 17.11 | Diesel Fuel | 0 | | Volatile Organic Compounds (VOC) | Good Combustion Practices | 0.56 | G/KWH | 0.42 |
| IN-0263 | 03/23/2017  ACT | EMERGENCY GENERATORS (EU014A AND EU-014B) | 17.11 | DISTILLATE OIL | 3600 | HP EACH | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.35 | G/HP-H EACH | 0.35 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| KY-0109 | 10/24/2016  ACT | Emergency Generators #1, #2, & #3 (EU72, EU73, & EU74) | 17.11 | Diesel | 53.6 | gal/hr | Volatile Organic Compounds (VOC) | The permittee shall prepare and maintain for EU72, EU73, and EU74, within 90 days of startup, a good combustion and operation practices plan (GCOP) that defines, measures and verifies the use of operational and design practices determined as BACT for minimizing CO, VOC, PM, PM10, and PM2.5 emissions. Any revisions requested by the Division shall be made and the plan shall be maintained on site. The permittee shall operate according to the provisions of this plan at all times, including periods of startup, shutdown, and malfunction. The plan shall be incorporated into the plant standard operating procedures (SOP) and shall be made available for the Divisionâ€™s inspection. The plan shall include, but not be limited to: i. A list of combustion optimization practices and a means of verifying the practices have occurred. ii. A list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred. iii. A list of the design choices determined to be BACT and verification that designs were implemented in the final construction. | 4.77 | G/HP-HR (EU72 &EU73) | 4.77 |
| LA-0276 | 12/15/2016  ACT | Fire Pump Engines (2 units) | 17.11 | Diesel | 700 | hp | Volatile Organic Compounds (VOC) | Comply with standards of NSPS Subpart IIII | 0 | | |
| LA-0292 | 01/22/2016  ACT | Emergency Generators No. 1 & No. 2 | 17.11 | Diesel | 1341 | HP | Volatile Organic Compounds (VOC) | Good combustion practices consistent with the manufacturer's recommendations to maximize fuel efficiency and minimize emissions | 0.83 | LB/HR | 0.28 |
| LA-0307 | 03/21/2016  ACT | Diesel Engines | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | good combustion practices, Use ultra low sulfur diesel, and comply with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0309 | 06/04/2015  ACT | Emergency Generator Engines | 17.11 | Diesel | 2922 | hp (each) | Volatile Organic Compounds (VOC) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Generator 1 | 17.11 | Diesel | 2584 | HP | Volatile Organic Compounds (VOC) | Good combustion practices | 27.34 | LB/H | 4.80 |
| LA-0316 | 02/17/2017  ACT | emergency generator engines (6 units) | 17.11 | diesel | 3353 | hp | Volatile Organic Compounds (VOC) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| MI-0423 | 01/04/2017  ACT | EUEMENGINE (Diesel fuel emergency engine) | 17.11 | Diesel Fuel | 22.68 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices. | 1.87 | LB/H | 0.26 |
| NJ-0084 | 03/10/2016  ACT | Diesel Fired Emergency Generator | 17.11 | ULSD | 44 | H/YR | Volatile Organic Compounds (VOC) | use of ULSD a clean burning fuel, and limited hours of operation | 1 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Black start generator | 17.11 | ultra low sulfur diesel | 3000 | KW | Volatile Organic Compounds (VOC) | Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations. | 0.11 | G/BHP-H | 0.11 |
| OH-0366 | 08/25/2015  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2346 | HP | Volatile Organic Compounds (VOC) | | 3.1 | LB/H | 0.60 |
| OH-0367 | 09/23/2016  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2947 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 3.84 | LB/H | 0.59 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0368 | 04/19/2017  ACT | Emergency Generator (P009) | 17.11 | Diesel fuel | 5000 | HP | Volatile Organic Compounds (VOC) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 1.6 | LB/H | 0.15 |
| PA-0309 | 12/23/2015  ACT | 2000 kW Emergency Generator | 17.11 | Ultra-low sulfur Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.22 | GM/HP-HR | 0.22 |
| PA-0311 | 09/01/2015  ACT | Fire Pump Engine | 17.11 | diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.2 | G/HP-HR | 0.20 |
| *SC-0193 | 04/15/2016  ACT | Emergency Generators and Fire Pump | 17.11 | No. 2 Fuel Oil | 1500 | hp | Volatile Organic Compounds (VOC) | Must meet the standards of 40 CFR 60, Subpart IIII | 100 | HR/YR | |
| TX-0728 | 04/01/2015  ACT | Emergency Diesel Generator | 17.11 | Diesel | 1500 | hp | Volatile Organic Compounds (VOC) | Minimized hours of operations Tier II engine | 0.7 | LB/H | 0.21 |
| TX-0799 | 06/08/2016  ACT | Fire pump engines | 17.11 | diesel | 0 | | Volatile Organic Compounds (VOC) | Equipment specifications and good combustion practices. Operation limited to 100 hours per year. | 0.0007 | LB/HP-HR | 0.32 |
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED EMERGENCY GENERATOR 3000 kW (1) | 17.11 | DIESEL FUEL | 0 | | Volatile Organic Compounds (VOC) | Good Combustion Practices/Maintenance | 6.4 | G/KW | 4.77 |
| AK-0082 | 01/23/2015  ACT | Emergency Camp Generators | 17.11 | Ultra Low Sulfur Diesel | 2695 | hp | Volatile Organic Compounds (VOC) | | 0.0007 | LB/HP-H | 0.32 |
| AK-0082 | 01/23/2015  ACT | Fine Water Pumps | 17.11 | Ultra Low Sulfur Diesel | 610 | hp | Volatile Organic Compounds (VOC) | | 0.0007 | LB/HP-H | 0.32 |
| AK-0082 | 01/23/2015  ACT | Bulk Tank Generator Engines | 17.11 | Ultra Low Sulfur Diesel | 891 | hp | Volatile Organic Compounds (VOC) | | 0.0007 | LB/HP-H | 0.32 |
| FL-0338 | 05/30/2012  ACT | Main Propulsion Engines - Development Driller 1 | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler. | 0.62 | G/KW-H | 0.46 |
| FL-0338 | 05/30/2012  ACT | Main Propulsion Engines - C.R. Luigs | 17.11 | Diesel | 5875 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers measurement system, positive crankcase ventilation, turbocharger and aftercooler, and high pressure fuel injection with aftercooler. | 0.39 | G/KW-H | 0.29 |
| FL-0338 | 05/30/2012  ACT | Fast Rescue Craft Diesel Engine - C.R. Luigs | 17.11 | diesel | 142 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines and use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - Development Driller 1 | 17.11 | Diesel | 2229 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 0.04 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - C.R. Luigs | 17.11 | diesel | 2064 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 0.04 | T/12MO ROLLING TOTAL | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0347 | 09/16/2014  ACT | Main Propulsion Generator Diesel Engines | 17.11 | Diesel | 9910 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0.35 | G/KW-H | 0.26 |
| FL-0347 | 09/16/2014  ACT | Emergency Diesel Engine | 17.11 | Diesel | 3300 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0348 | 05/15/2012  ACT | Source Wide Emission Limit | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | PSD Avoidance | 39 | TONS PER YEAR | |
| IA-0105 | 10/26/2012  ACT | Emergency Generator | 17.11 | diesel fuel | 142 | GAL/H | Volatile Organic Compounds (VOC) | good combustion practices | 0.4 | G/KW-H | 0.30 |
| IA-0106 | 07/12/2013  ACT | Emergency Generators | 17.11 | diesel fuel | 180 | GAL/H | Volatile Organic Compounds (VOC) | good combustion practices | 4 | G/KW-H | 2.98 |
| IL-0114 | 09/05/2014  ACT | Emergency Generator | 17.11 | distillate fuel oil | 3755 | HP | Volatile Organic Compounds (VOC) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 0.4 | G/KW-H | 0.30 |
| IN-0158 | 12/03/2012  ACT | TWO (2) EMERGENCY DIESEL GENERATORS | 17.11 | DIESEL | 1006 | HP EACH | Volatile Organic Compounds (VOC) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 1.04 | LB/H | 0.47 |
| IN-0158 | 12/03/2012  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 2012 | HP | Volatile Organic Compounds (VOC) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 1.04 | LB/H | 0.23 |
| IN-0173 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.31 | G/BHP-H | 0.31 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR | 17.11 | NO. 2 FUEL OIL | 4690 | B-HP | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.31 | G/B-HP-H | 0.31 |
| IN-0180 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.31 | G/B-HP-H | 0.31 |
| *KS-0036 | 03/18/2013  ACT | Caterpillar C18DITA Diesel Engine Generator | 17.11 | No. 2 Distillate Fuel Oil | 900 | BHP | Volatile Organic Compounds (VOC) | utilize efficient combustion/design technology | 0.015 | G/BHP-H | 0.02 |
| LA-0296 | 05/23/2014  ACT | Emergency Diesel Generators (EQTs 622, 671, 773, 850, 994, 995, 996, 1033, 1077, 1105, & 1202) | 17.11 | Diesel | 2682 | HP | Volatile Organic Compounds (VOC) | Compliance with 40 CFR 60 Subpart IIII; operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage. | 0.85 | LB/HR | 0.14 |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 1 | 17.11 | Diesel | 5364 | HP | Volatile Organic Compounds (VOC) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 3.86 | LB/H | 4.80 |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 2 | 17.11 | Diesel | 5364 | HP | Volatile Organic Compounds (VOC) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 3.86 | LB/H | 4.80 |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 1 | 17.11 | Diesel | 751 | HP | Volatile Organic Compounds (VOC) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0.34 | LB/H | 4.80 |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 2 | 17.11 | Diesel | 751 | HP | Volatile Organic Compounds (VOC) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0.34 | LB/H | 4.80 |
| MD-0044 | 06/09/2014  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 1550 | HP | Volatile Organic Compounds (VOC) | USE ONLY ULSD, GOOD COMBUSTION PRACTICES, AND DESIGNED TO ACHIEVE EMISSION LIMIT | 4.8 | G/HP-H | 4.80 |
| NJ-0079 | 07/25/2012  ACT | Emergency Generator | 17.11 | Ultra Low Sulfur distillate Diesel | 100 | H/YR | Volatile Organic Compounds (VOC) | Use of ULSD oil | 0.49 | LB/H | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NJ-0080 | 11/01/2012  ACT | Emergency Generator | 17.11 | ULSD | 200 | H/YR | Volatile Organic Compounds (VOC) | use of ULSD, a low sulfur clean fuel | 2.62 | LB/H | |
| NY-0104 | 08/01/2013  ACT | Emergency generator | 17.11 | ultra low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | Good combustion practice. | 0.0331 | LB/MMBTU | 0.01 |
| OH-0352 | 06/18/2013  ACT | Emergency generator | 17.11 | diesel | 2250 | KW | Volatile Organic Compounds (VOC) | Purchased certified to the standards in NSPS Subpart IIII | 3.93 | LB/H | 0.59 |
| OH-0355 | 05/07/2013  ACT | Test Cell 1 for Aircraft Engines and Turbines | 17.11 | JET FUEL | 0 | | Volatile Organic Compounds (VOC) | | 0.7 | LB/MMBTU | 0.22 |
| OH-0355 | 05/07/2013  ACT | Test Cell 2 for Aircraft Engines and Turbines | 17.11 | JET FUEL | 0 | | Volatile Organic Compounds (VOC) | | 0.7 | LB/MMBTU | 0.22 |
| OH-0360 | 11/05/2013  ACT | Emergency generator (P003) | 17.11 | diesel | 1112 | KW | Volatile Organic Compounds (VOC) | Purchased certified to the standards in NSPS Subpart IIII | 1.93 | LB/H | 0.59 |
| OK-0154 | 07/02/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR ENGINE | 17.11 | DIESEL | 1341 | HP | Volatile Organic Compounds (VOC) | COMBUSTION CONTROL. | 0.0007 | LB/HP-HR | 0.32 |
| OK-0156 | 07/31/2013  ACT | Fire Pump Engine | 17.11 | Diesel | 550 | hp | Volatile Organic Compounds (VOC) | Good Combustion | 0.35 | LB/MMBTU | 0.11 |
| OK-0164 | 01/08/2015  ACT | Jet Engine Testing Cells | 17.11 | KEROSENE TYPE JET FUEL | 65000 | FT-LB THRUST | Volatile Organic Compounds (VOC) | | 1.7 | TONS PER YEAR | |
| PA-0278 | 10/10/2012  ACT | Emergency Generator | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.01 | G/B-HP-H | 0.01 |
| PA-0286 | 01/31/2013  ACT | EMERGENCY GENERATOR-ENGINE | 17.13 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.01 | GM/B-HP-H | 0.01 |
| PA-0291 | 04/23/2013  ACT | EMERGENCY GENERATOR | 17.11 | Ultra Low sulfur Distillate | 7.8 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0.7 | LB/H | 0.28 |
| *PA-0292 | 06/01/2012  ACT | DIESEL GENERATOR (2.25 MW EACH) - 5 UNITS | 17.11 | #2 Oil | 0 | | Formaldehyde | | 0.02 | PPMVD AT 15% O2 | |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Generator | 17.11 | ULSD Fuel oil # 2 | 0 | | Volatile Organic Compounds (VOC) | | 0.15 | G/B-HP-H | 0.15 |
| SC-0113 | 02/08/2012  ACT | EMERGENCY GENERATORS 1 THRU 8 | 17.11 | DIESEL | 757 | HP | Volatile Organic Compounds (VOC) | PURCHASE ENGINES CERTIFIED TO COMPLY WITH NSPS, SUBPART IIII. | 4 | GR/KW-H | 2.98 |
| SC-0159 | 07/09/2012  ACT | EMERGENCY GENERATORS, GEN1, GEN2 | 17.11 | DIESEL | 1000 | KW | Volatile Organic Compounds (VOC) | BACT HAS BEEN DETERMINED TO BE COMPLIANCE WITH NSPS, SUBPART IIII, 40 CFR60.4202 AND 40 CFR60.4205. | 6.4 | G/KW-H | 4.77 |
| WV-0025 | 11/21/2014  ACT | Emergency Generator | 17.11 | Diesel | 2015.7 | HP | Volatile Organic Compounds (VOC) | | 1.24 | LB/H | 0.28 |
| FL-0328 | 10/27/2011  ACT | Main Propulsion Engines | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers (DEWT) measurement system. | 0.39 | G/KW-H | 0.29 |
| FL-0328 | 10/27/2011  ACT | Crane Engines (units 1 and 2) | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Use of certified EPA Tier 1 engines and good combustion practices based on the current manufacturerâ€™s specifications for this engine. | 1.3 | TONS PER YEAR | |

## BACT Determinations for Large Internal Combustion Engines (> 500 HP) - VOC (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0328 | 10/27/2011  ACT | Crane Engines (units 3 and 4) | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 1.5 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Emergency Engine | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.03 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Emergency Fire Pump Engine | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.002 | TONS PER YEAR | |
| LA-0254 | 08/16/2011  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 1250 | HP | Volatile Organic Compounds (VOC) | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 1 | G/HP-H | 1.00 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - GHG (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AR-0163 | 06/09/2019  ACT | Lime Injector Burners | 17.13 | Natural Gas | 0 | | Carbon Dioxide | Good operating practices | 117 | LB/MMBTU | 371.49 |
| *FL-0368 | 02/14/2019  ACT | Emergency Engines | 17.13 | Natural gas | 0 | | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 117.1 | LB/MMBTU | 371.81 |
| KY-0110 | 07/23/2020  ACT | EP 10-05 - Austenitizing Furnace Rolls Emergency Generator | 17.13 | Natural Gas | 636 | HP | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 10-06 - Tempering Furnace Rolls Emergency Generator | 17.13 | Natural Gas | 636 | HP | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| *MI-0440 | 05/22/2019  ACT | FGENGINES | 17.13 | natural gas | 16500 | HP | Carbon Dioxide Equivalent (CO2e) | Utilize low-carbon fuels and implement energy efficiency measures and preventative maintenance pursuant to manufacturer recommendations. | 48724 | T/YR | 305.81 |
| AK-0084 | 06/30/2017  ACT | Twelve (12) Large ULSD/Natural Gas-Fired Internal Combustion Engines | 17.11 | Diesel and Natural Gas | 143.5 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | Good Cumbustion Practices | 1299630 | TPY (ULSD) | 371.52 |
| *MI-0441 | 12/21/2018  ACT | EUEMGNG1--A 1500 HP natural gas fueled emergency engine | 17.13 | Natural gas | 1500 | HP | Carbon Dioxide Equivalent (CO2e) | Burn pipeline quality natural gas | 300 | T/YR | |
| *MI-0441 | 12/21/2018  ACT | EUEMGNG2 | 17.13 | NATURAL GAS | 6000 | HP | Carbon Dioxide Equivalent (CO2e) | Burn pipeline quality natural gas. | 1171 | T/YR | |
| *WV-0031 | 06/14/2018  ACT | EG-1 - Auxiliary (Emergency) Generator | 17.13 | Natural Gas | 755 | hp | Carbon Dioxide Equivalent (CO2e) | Engine Manufacturer's design; limited to natural gas; and tune-up the engine once every five years. | 0 | | |
| *KS-0030 | 03/31/2016  ACT | Spark ignition RICE electricity generating units (EGUs) | 17.13 | Natural Gas | 10 | MW | Carbon Dioxide Equivalent (CO2e) | | 10692 | LB/H | 361.65 |
| *KS-0030 | 03/31/2016  ACT | Spark ignition RICE electricity generating units (EGUs) | 17.13 | Natural Gas | 10 | MW | Carbon Dioxide | | 1.25 | LB/KWH | 422.80 |
| LA-0292 | 01/22/2016  ACT | Waukesha 16V-275GL Compressor Engines Nos. 1-12 | 17.13 | Natural Gas | 5000 | HP | Carbon Dioxide Equivalent (CO2e) | | 21170 | TPY | 438.47 |
| MI-0420 | 06/03/2016  ACT | EUN_EM_GEN | 17.13 | Natural gas | 225 | H/YR | Carbon Dioxide Equivalent (CO2e) | Use of pipeline quality natural gas and energy efficiency measures. | 198 | T/YR | 395.29 |
| MI-0424 | 12/05/2016  ACT | EUNGENGINE (Emergency engine--natural gas) | 17.13 | Natural gas | 500 | H/YR | Carbon Dioxide Equivalent (CO2e) | Good combustion practices. | 116 | T/YR | 499.85 |
| MI-0426 | 03/24/2017  ACT | EUN_EM_GEN (Natural gas emergency engine). | 17.13 | Natural gas | 205 | H/YR | Carbon Dioxide Equivalent (CO2e) | Use of pipeline quality natural gas and energy efficiency measures. | 247 | T/YR | 601.23 |
| IN-0167 | 04/16/2013  ACT | EMERGENCY GENERATOR | 17.13 | NATURAL GAS | 620 | HP | Carbon Dioxide Equivalent (CO2e) | USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES | 144 | T/YR | 421.40 |
| IN-0185 | 04/24/2014  ACT | EMERGENCY GENERATORS | 17.13 | NATURAL GAS | 620 | HP | Carbon Dioxide Equivalent (CO2e) | | 500 | H | |
| KS-0035 | 01/24/2014  ACT | spark ignition four stroke lean burn reciprocating internal combustion engine (RICE) electric generating units (EGUs) | 17.13 | Natural gas | 12526 | BHP | Carbon Dioxide Equivalent (CO2e) | | 9330 | LBS PER HOUR | 337.86 |
| KS-0035 | 01/24/2014  ACT | spark ignition four stroke lean burn reciprocating internal combustion engine (RICE) electric generating units (EGUs) | 17.13 | Natural gas | 12526 | BHP | Carbon Dioxide | selective catalytic reduction (SCR) system and an oxidation catalyst | 1.08 | LBS PER KWH | 365.30 |
| LA-0256 | 12/06/2011  ACT | EMERGENCY GENERATOR | 17.13 | NATURAL GAS | 1818 | HP | Carbon Dioxide Equivalent (CO2e) | USE OF NATURAL GAS AS FUEL AND GOOD COMBUSTION PRACTICES | 1509.23 | LB/H | 376.55 |
| LA-0257 | 12/06/2011  ACT | Generator Engines (2) | 17.13 | Natural Gas | 2012 | hp | Carbon Dioxide Equivalent (CO2e) | Fueled by natural gas, good combustion/operating practices | 412 | TONS/YR | |
| LA-0266 | 05/01/2013  ACT | Compressor Engines 1, 2, & 3 (EQT 0057, 0058, & 0059) | 17.13 | Natural gas | 3550 | HP | Carbon Dioxide Equivalent (CO2e) | Compliance with NSPS JJJJ | 0 | | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - GHG (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0287 | 07/21/2014  ACT | Emergency Generator Reciprocating Engine (G30, EQT 15) | 17.13 | Natural Gas | 1175 | HP | Carbon Dioxide Equivalent (CO2e) | Good combustion practices and use of natural gas as fuel | 1160 | LB/HR | 447.80 |
| LA-0311 | 07/15/2013  ACT | No. 5 Urea Plant Emergency Generator B (33-13, EQT 182) | 17.13 | Natural Gas | 2500 | HP | Carbon Dioxide Equivalent (CO2e) | Proper combustion controls (electronic air-to-fuel ratio controller, timing control, pre-chamber ignition, and turbochargers); selecting a fuel efficient engine; using natural gas as fuel. | 526.51 | TPY | 424.57 |
| LA-0311 | 07/15/2013  ACT | No. 5 Urea Plant Emergency Generator B (33-13, EQT 182) | 17.13 | Natural Gas | 2500 | HP | Carbon Dioxide | Proper combustion controls (electronic air-to-fuel ratio controller, timing control, pre-chamber ignition, and turbochargers); selecting a fuel efficient engine; using natural gas as fuel. | 526 | TPY | 424.16 |
| MI-0412 | 12/04/2013  ACT | Emergency Engine--natural gas (EUNGENGINE) | 17.13 | natural gas | 1000 | kW | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 116 | T/YR | 156.94 |
| OK-0142 | 01/17/2012  ACT | Large Internal Combustion Engines (>500 hp) | 17.13 | Natural Gas | 3550 | HORSEPOWER | Carbon Dioxide Equivalent (CO2e) | | 0 | | |
| OK-0148 | 09/12/2012  ACT | Large Internal Combustion Engines (>500 hp) | 17.13 | Natural Gas | 1775 | Horsepower | Carbon Dioxide Equivalent (CO2e) | | 7900 | BTU/BHP-HR | |
| OK-0148 | 09/12/2012  ACT | Large Internal Combustion Engines (>500 hp) | 17.13 | Natural Gas | 2370 | Horsepower | Carbon Dioxide Equivalent (CO2e) | | 7900 | BTU/BHP-HR | |
| OK-0153 | 03/01/2013  ACT | COMPRESSOR ENGINE 1,775-HP CAT G3606LE | 17.13 | NATURAL GAS | 1775 | HP | Carbon Dioxide Equivalent (CO2e) | | 8452 | BTU/BHP-HR | |
| OK-0153 | 03/01/2013  ACT | EMERGENCY GENERATORS 2,889-HP CAT G3520C IM | 17.13 | NATURAL GAS | 2889 | HP | Carbon Dioxide Equivalent (CO2e) | EFFICIENT DESIGN AND COMBUSTION. | 8212 | BTU/BHP-HR | |
| TX-0627 | 05/24/2012  ACT | Compressor Engine Groups | 17.13 | Natural Gas | 4775 | HP | Carbon Dioxide | | 1871.7 | LB/MMSCF CO2 | |
| TX-0636 | 03/08/2013  ACT | Combustion Turbines | 17.13 | Natural Gas | 15000 | HP | Carbon Dioxide | | 65033 | T/YR | 334.81 |
| TX-0636 | 03/08/2013  ACT | Combustion Turbines | 17.13 | Natural Gas | 15000 | HP | Carbon Dioxide Equivalent (CO2e) | | 65097 | T/YR | 335.14 |
| TX-0741 | 03/13/2014  ACT | Emergency Generator | 17.13 | Natural Gas | 8600 | scf/hr | Carbon Dioxide Equivalent (CO2e) | | 23 | TPY OF CO2E | |
| TX-0742 | 04/14/2014  ACT | Emergency Generator | 17.13 | Natural Gas | 0 | | Carbon Dioxide Equivalent (CO2e) | | 23 | TPY OF CO2E | |
| TX-0746 | 11/18/2014  ACT | Gas-Fired Internal Combustion Compression Engines | 17.13 | Natural Gas | 206149 | MMBtu/yr | Carbon Dioxide Equivalent (CO2e) | | 412.3 | LB CO2/MMSCF | |
| IN-0135 | 11/10/2011  ACT | 4-STROKE LEAN BURN COAL BED METHANE (CBM)-FIRED RECIPROCATING INTERNAL COMUBSTION ENGINES (RICE) | 17.15 | COAL BED METHANE | 4601 | BRAKE HORSEPOWER | Carbon Dioxide | GOOD COMBUSTION PRACTICES AND PROPER MAINTENANCE | 1100 | LB/MW-H | 372.07 |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - GHG (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *AK-0085 | 08/13/2020  ACT | One (1) Black Start Generator Engine | 17.11 | ULSD | 186.6 | gph | Carbon Dioxide Equivalent (CO2e) | Good combustion practices and limit operation to 500 hours per year | 163.6 | LB/MMBTU | 519.45 |
| AR-0161 | 09/23/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices | 164 | LB/MMBTU | 520.72 |
| AR-0163 | 06/09/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Carbon Dioxide | Good Combustion Practices | 163 | LB/MMBTU | 517.55 |
| IL-0130 | 12/31/2018  ACT | Emergency Engine | 17.11 | Ultra-Low Sulfur Diesel | 1500 | kW | Carbon Dioxide Equivalent (CO2e) | | 225 | TONS/YEAR | |
| IN-0317 | 06/11/2019  ACT | Emergency generator EU-6006 | 17.11 | Diesel | 2800 | HP | Carbon Dioxide Equivalent (CO2e) | Tier II diesel engine | 811 | TONS | |
| IN-0317 | 06/11/2019  ACT | Emergency fire pump EU-6008 | 17.11 | Diesel | 750 | HP | Carbon Dioxide Equivalent (CO2e) | Engine that complies with Table 4 to Subpart IIII of Part 60 | 217 | TONS | |
| KY-0110 | 07/23/2020  ACT | EP 10-02 - North Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 10-03 - South Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 10-04 - Emergency Fire Water Pump | 17.11 | Diesel | 920 | HP | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 10-07 - Air Separation Plant Emergency Generator | 17.11 | Diesel | 700 | HP | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 10-01 - Caster Emergency Generator | 17.11 | Diesel | 2922 | HP | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| *LA-0364 | 01/06/2020  ACT | Emergency Generator Diesel Engines | 17.11 | Diesel Fuel | 550 | hp | Carbon Dioxide Equivalent (CO2e) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| *LA-0364 | 01/06/2020  ACT | Emergency Fire Water Pumps | 17.11 | Diesel Fuel | 550 | hp | Carbon Dioxide Equivalent (CO2e) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| *MI-0442 | 08/21/2019  ACT | FGEMENGINE | 17.11 | Diesel | 1100 | KW | Carbon Dioxide Equivalent (CO2e) | | 444 | T/YR | |
| *MI-0445 | 11/26/2019  ACT | EUEMENGINE (diesel fuel emergency engine) | 17.11 | diesel fuel | 22.68 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 928 | T/YR | |
| OH-0379 | 02/06/2019  ACT | Emergency Generators (P005 and P006) | 17.11 | Diesel fuel | 3131 | HP | Carbon Dioxide Equivalent (CO2e) | Tier IV engine Good combustion practices | 3632 | LB/H | 526.60 |
| TX-0872 | 10/31/2019  ACT | Emergency Generators | 17.11 | ultra low sulfur diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | Limiting duration and frequency of generator use to 100 hr/yr. Good combustion practices will be used to reduce VOC including maintaining proper air-to-fuel ratio. | 0 | | |
| TX-0876 | 02/06/2020  ACT | Emergency generator | 17.11 | DIESEL | 0 | | Carbon Dioxide Equivalent (CO2e) | Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101, limited to 100 hours per year of non-emergency operation | 0 | | |
| TX-0882 | 01/17/2020  ACT | EMERGENCY ENGINES | 17.12 | DIESEL | 0 | | Carbon Dioxide Equivalent (CO2e) | GOOD COMBUSTION PRACTICES, CLEAN FUEL, 100 HR/YR, ULTRA LOW SULFUR FUEL | 114.53 | LB/MMBTU | 363.65 |
| TX-0888 | 04/23/2020  ACT | EMERGENCY GENERATORS & FIRE WATER PUMP ENGINES | 17.11 | Ultra-low Sulfur Diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | well-designed and properly maintained engines and each limited to 100 hours per year of non-emergency use. | 0 | | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - GHG (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *TX-0905 | 09/16/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Carbon Dioxide Equivalent (CO2e) | limited to 100 hours per year of non-emergency operation | 0 | | |
| *TX-0915 | 03/17/2021  ACT | DIESEL GENERATOR | 17.11 | DIESEL | 0 | | Carbon Dioxide Equivalent (CO2e) | LIMITED 500 HR/YR OPERATION | 0 | | |
| VA-0332 | 06/24/2019  ACT | Emergency Diesel Generator - 300 kW | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Carbon Dioxide Equivalent (CO2e) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 1203 | T/YR | |
| *VA-0333 | 12/09/2020  ACT | One (1) emergency engine generator | 17.11 | ULSD | 2220 | HP | Carbon Dioxide Equivalent (CO2e) | | 2.543 | LB | |
| AK-0084 | 06/30/2017  ACT | Black Start and Emergency Internal Cumbustion Engines | 17.11 | Diesel | 1500 | kWe | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices | 2781 | TPY | |
| AK-0084 | 06/30/2017  ACT | Twelve (12) Large ULSD/Natural Gas-Fired Internal Combustion Engines | 17.11 | Diesel and Natural Gas | 143.5 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | Good Cumbustion Practices | 1299630 | TPY (ULSD) | |
| IL-0129 | 07/30/2018  ACT | Emergency Engines | 17.11 | Ultra-low sulfur diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | | 0 | | |
| *LA-0312 | 06/30/2017  ACT | DFP1-13 - Diesel Fire Pump Engine (EQT0013) | 17.11 | Diesel | 650 | horsepower | Carbon Dioxide Equivalent (CO2e) | Compliance with NSPS Subpart IIII | 37 | TPY | |
| *LA-0312 | 06/30/2017  ACT | DEG1-13 - Diesel Fired Emergency Generator Engine (EQT0012) | 17.11 | Diesel | 1474 | horsepower | Carbon Dioxide Equivalent (CO2e) | Compliance with NSPS Subpart IIII | 84 | TPY | |
| LA-0331 | 09/21/2018  ACT | Firewater Pumps | 17.11 | Diesel Fuel | 634 | kW | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices and Good Operation and Maintenance Practices. | 44 | T/YR | |
| LA-0331 | 09/21/2018  ACT | Large Emergency Engines (>50kW) | 17.11 | Diesel Fuel | 5364 | HP | Carbon Dioxide Equivalent (CO2e) | Good Combustion of Practices and Good Operation and Maintenance Practices | 1481 | T/YR | |
| *MA-0043 | 06/21/2017  ACT | Cold Start Engine | 17.11 | ULSD | 19.04 | MMBTU/HR | Carbon Dioxide Equivalent (CO2e) | | 163.61 | LB/MMBTU | 519.45 |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE1 in FGRICE (Emergency diesel generator engine) | 17.11 | Diesel | 500 | H/YR | Carbon Dioxide Equivalent (CO2e) | Good combustion and design practices. | 209 | T/YR | |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE2 in FGRICE (Emergency Diesel Generator Engine) | 17.11 | Diesel | 500 | H/YR | Carbon Dioxide Equivalent (CO2e) | Good combustion and design practices. | 70 | T/YR | |
| MI-0425 | 05/09/2017  ACT | EUFIREPUMP in FGRICE (Diesel fire pump engine) | 17.11 | Diesel | 500 | H/YR | Carbon Dioxide Equivalent (CO2e) | Good combustion and design practices. | 56 | T/YR | |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (North Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Carbon Dioxide Equivalent (CO2e) | Good combustion practices. | 383 | T/YR | |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (South Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Carbon Dioxide Equivalent (CO2e) | Good combustion practices. | 383 | T/YR | |
| MI-0435 | 07/16/2018  ACT | EUEMENGINE: Emergency engine | 17.11 | Diesel | 2 | MW | Carbon Dioxide Equivalent (CO2e) | Energy efficient design. | 161 | T/YR | |
| *MI-0441 | 12/21/2018  ACT | EUEMGD1--A 1500 HP diesel fueled emergency engine | 17.11 | Diesel | 1500 | HP | Carbon Dioxide Equivalent (CO2e) | Good combustion practices and energy efficiency measures. | 406 | T/YR | |
| *MI-0441 | 12/21/2018  ACT | EUEMGD2--A 6000 HP diesel fuel fired emergency engine | 17.11 | Diesel | 6000 | HP | Carbon Dioxide Equivalent (CO2e) | Good combustion practices and energy efficiency measures. | 1590 | T/YR | |
| OH-0370 | 09/07/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Carbon Dioxide Equivalent (CO2e) | Efficient design | 445 | T/YR | |
| OH-0372 | 09/27/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Carbon Dioxide Equivalent (CO2e) | state of the art combustion design | 445 | T/YR | |
| OH-0374 | 10/23/2017  ACT | Emergency Generators (2 identical, P004 and P005) | 17.11 | Diesel fuel | 2206 | HP | Carbon Dioxide Equivalent (CO2e) | good operating practices (proper maintenance and operation) | 120 | T/YR | |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Generator Engine (P001) | 17.11 | Diesel fuel | 2206 | HP | Carbon Dioxide Equivalent (CO2e) | Efficient design | 116.8 | T/YR | |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Fire Pump Engine (P002) | 17.11 | Diesel fuel | 700 | HP | Carbon Dioxide Equivalent (CO2e) | Efficient design | 40.1 | T/YR | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - GHG (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fired generator (P007) | 17.11 | Diesel fuel | 2682 | HP | Carbon Dioxide Equivalent (CO2e) | Equipment design and maintenance requirements | 163.6 | LB/MMBTU | 519.45 |
| OH-0377 | 04/19/2018  ACT | Emergency Diesel Generator (P003) | 17.11 | Diesel fuel | 1860 | HP | Carbon Dioxide Equivalent (CO2e) | Efficient design and proper maintenance and operation | 109.2 | T/YR | |
| OH-0378 | 12/21/2018  ACT | Emergency Diesel-fired Generator Engine (P007) | 17.11 | Diesel fuel | 3353 | HP | Carbon Dioxide Equivalent (CO2e) | good operating practices (proper maintenance and operation) | 200 | T/YR | |
| OH-0378 | 12/21/2018  ACT | 1,000 kW Emergency Generators (P008 - P010) | 17.11 | Diesel fuel | 1341 | HP | Carbon Dioxide Equivalent (CO2e) | good operating practices (proper maintenance and operation) | 80 | T/YR | |
| VA-0328 | 04/26/2018  ACT | Emergency Diesel GEN | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Carbon Dioxide Equivalent (CO2e) | use of S15 ULSD and high efficiency design and operation | 981 | T/YR | |
| *WI-0284 | 04/24/2018  ACT | Diesel-Fired Emergency Generators | 17.11 | Diesel Fuel | 0 | | Carbon Dioxide Equivalent (CO2e) | The Use of Ultra-Low Sulfur Fuel and Good Combustion Practices | 0 | | |
| *WI-0286 | 04/24/2018  ACT | P42 -Diesel Fired Emergency Generator | 17.11 | Diesel Fuel | 0 | | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices and The Use of Ultra-low Sulfur Fuel | 0 | | |
| IN-0263 | 03/23/2017  ACT | EMERGENCY GENERATORS (EU014A AND EU-014B) | 17.11 | DISTILLATE OIL | 3600 | HP EACH | Carbon Dioxide | GOOD COMBUSTION PRACTICES | 1044 | TON/12 CONSEC. MONTH | |
| LA-0292 | 01/22/2016  ACT | Emergency Generators No. 1 & No. 2 | 17.11 | Diesel | 1341 | HP | Carbon Dioxide Equivalent (CO2e) | | 77 | TPY | |
| LA-0305 | 06/30/2016  ACT | Diesel Engines (Emergency) | 17.11 | Diesel | 4023 | hp | Carbon Dioxide Equivalent (CO2e) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0307 | 03/21/2016  ACT | Diesel Engines | 17.11 | Diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | good combustion/operating/maintenance practices | 0 | | |
| LA-0309 | 06/04/2015  ACT | Emergency Generator Engines | 17.11 | Diesel | 2922 | hp (each) | Carbon Dioxide Equivalent (CO2e) | | 0 | | |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Generator 1 | 17.11 | Diesel | 2584 | HP | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 0 | | 526.39 |
| LA-0316 | 02/17/2017  ACT | emergency generator engines (6 units) | 17.11 | diesel | 3353 | hp | Carbon Dioxide Equivalent (CO2e) | good combustion practices | 0 | | |
| LA-0317 | 12/22/2016  ACT | Emergency Generator Engines (4 units) | 17.11 | Diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | complying with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0 | | |
| LA-0317 | 12/22/2016  ACT | Firewater pump Engines (4 units) | 17.11 | diesel | 896 | hp (each) | Carbon Dioxide Equivalent (CO2e) | complying with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0 | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 3 Engine | 17.11 | Diesel Fuel | 600 | hp | Carbon Dioxide Equivalent (CO2e) | Proper operation and limits on hours operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 4 Engine | 17.11 | Diesel Fuel | 600 | hp | Carbon Dioxide Equivalent (CO2e) | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| MI-0421 | 08/26/2016  ACT | Emergency Diesel Generator Engine (EUEMRGRICE in FGRICE) | 17.11 | Diesel | 500 | H/YR | Carbon Dioxide Equivalent (CO2e) | Good combustion and design practices. | 223 | T/YR | |
| MI-0421 | 08/26/2016  ACT | Dieself fire pump engine (EUFIREPUMP in FGRICE) | 17.11 | Diesel | 500 | H/YR | Carbon Dioxide Equivalent (CO2e) | Good combustion and design practices. | 56 | T/YR | |
| MI-0423 | 01/04/2017  ACT | EUEMENGINE (Diesel fuel emergency engine) | 17.11 | Diesel Fuel | 22.68 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 928 | T/YR | |
| OH-0366 | 08/25/2015  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2346 | HP | Carbon Dioxide Equivalent (CO2e) | Efficient design | 683 | T/YR | |
| OH-0367 | 09/23/2016  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2947 | HP | Carbon Dioxide Equivalent (CO2e) | Efficient design | 858 | T/YR | |
| OH-0368 | 04/19/2017  ACT | Emergency Generator (P009) | 17.11 | Diesel fuel | 5000 | HP | Carbon Dioxide Equivalent (CO2e) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 1289 | T/YR | |
| PA-0309 | 12/23/2015  ACT | 2000 kW Emergency Generator | 17.11 | Ultra-low sulfur Diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | | 81 | TONS | |
| PA-0311 | 09/01/2015  ACT | Fire Pump Engine | 17.11 | diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | | 14 | TPY | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - GHG (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0766 | 09/11/2015  ACT | Emergency Engine Generators | 17.11 | Diesel | 750 | hp | Carbon Dioxide Equivalent (CO2e) | Equipment specifications & work practices - Good combustion practices and limited operational hours | 40 | HR/YR | |
| TX-0799 | 06/08/2016  ACT | Fire pump engines | 17.11 | diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | Equipment specifications and good combustion practices. Operation limited to 100 hours per year. | 72.16 | T/YR | |
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED EMERGENCY GENERATOR 3000 kW (1) | 17.11 | DIESEL FUEL | 0 | | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices/Maintenance | 163.6 | LB/MMBTU | 519.45 |
| AK-0076 | 08/20/2012  ACT | Combustion of Diesel by ICEs | 17.11 | ULSD | 1750 | kW | Carbon Dioxide | Good Combustion Practices and 40 CFR 60 Subpart IIII requirements | 0 | | |
| AK-0080 | 06/06/2013  ACT | Combustion | 17.13 | Ultra Low Sulfur Diesel | 2000 | ekW | Carbon Dioxide Equivalent (CO2e) | Good Combustion and Operation practices | 0 | | |
| AK-0081 | 06/12/2013  ACT | Combustion | 17.11 | ULSD | 610 | hp | Carbon Dioxide Equivalent (CO2e) | Good Combustion and Operating Practices | 0 | | |
| AK-0082 | 01/23/2015  ACT | Emergency Camp Generators | 17.11 | Ultra Low Sulfur Diesel | 2695 | hp | Carbon Dioxide Equivalent (CO2e) | | 2332 | TONS/YEAR | |
| AK-0082 | 01/23/2015  ACT | Fine Water Pumps | 17.11 | Ultra Low Sulfur Diesel | 610 | hp | Carbon Dioxide Equivalent (CO2e) | | 565 | TONS/YEAR | |
| AK-0082 | 01/23/2015  ACT | Bulk Tank Generator Engines | 17.11 | Ultra Low Sulfur Diesel | 891 | hp | Carbon Dioxide Equivalent (CO2e) | | 7194 | TONS/YEAR | |
| CO-0067 | 06/04/2013  ACT | Emergency Generator | 17.11 | diesel | 19950 | gal per year | Carbon Dioxide Equivalent (CO2e) | NSPS IIII compliant. | 0 | | |
| FL-0338 | 05/30/2012  ACT | Main Propulsion Engines - Development Driller 1 | 17.11 | Diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler. | 829 | G/KW-H | 618.19 |
| FL-0338 | 05/30/2012  ACT | Main Propulsion Engines - C.R. Luigs | 17.11 | Diesel | 5875 | hp | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers measurement system, positive crankcase ventilation, turbocharger and aftercooler, and high pressure fuel injection with aftercooler. | 705 | G/KW-H | 525.72 |
| FL-0338 | 05/30/2012  ACT | Fast Rescue Craft Diesel Engine - C.R. Luigs | 17.11 | diesel | 142 | hp | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines and use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - Development Driller 1 | 17.11 | Diesel | 2229 | hp | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 77.84 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - C.R. Luigs | 17.11 | diesel | 2064 | hp | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 72.06 | T/12MO ROLLING TOTAL | |

**BACT Determinations for Large Internal Combustion Engines (> 500 HP) - GHG (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0347 | 09/16/2014  ACT | Source Wide Emissions | 17.11 | Diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure where applicable | 74571 | TONS | |
| IA-0105 | 10/26/2012  ACT | Emergency Generator | 17.11 | diesel fuel | 142 | GAL/H | Carbon Dioxide Equivalent (CO2e) | good combustion practices | 788.5 | TONS/YR | |
| IA-0105 | 10/26/2012  ACT | Emergency Generator | 17.11 | diesel fuel | 142 | GAL/H | Carbon Dioxide | good combustion practices | 1.55 | G/KW-H | |
| IA-0106 | 07/12/2013  ACT | Emergency Generators | 17.11 | diesel fuel | 180 | GAL/H | Carbon Dioxide | good combustion practices | 1.55 | LB/KW-H | 524.28 |
| IA-0106 | 07/12/2013  ACT | Emergency Generators | 17.11 | diesel fuel | 180 | GAL/H | Carbon Dioxide Equivalent (CO2e) | good combustion practices | 509 | TONS/YR | |
| IL-0114 | 09/05/2014  ACT | Emergency Generator | 17.11 | distillate fuel oil | 3755 | HP | Carbon Dioxide Equivalent (CO2e) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 432 | TPY | |
| IN-0158 | 12/03/2012  ACT | TWO (2) EMERGENCY DIESEL GENERATORS | 17.11 | DIESEL | 1006 | HP EACH | Carbon Dioxide Equivalent (CO2e) | GOOD ENGINEERING DESIGN AND FUEL EFFICIENT DESIGN | 1186 | TONS | |
| IN-0158 | 12/03/2012  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 2012 | HP | Carbon Dioxide Equivalent (CO2e) | GOOD ENGINEERING DESIGN AND FUEL EFFICIENT DESIGN POST COMBUSTION CARBON CAPTURE | 1186 | TONS | |
| IN-0166 | 06/27/2012  ACT | TWO (2) EMERGENCY GENERATORS | 17.11 | DIESEL | 1341 | HORSEPOWER, EACH | Carbon Dioxide | USE OF GOOD ENGINEERING DESIGN AND EFFICIENT ENGINES MEETING APPLICABLE NSPS AND MACT STANDARDS | 84 | T/YR | |
| IN-0166 | 06/27/2012  ACT | THREE (3) FIREWATER PUMP ENGINES | 17.11 | DIESEL | 575 | HORSEPOWER, EACH | Carbon Dioxide | USE OF GOOD ENGINEERING DESIGN AND EFFICIENT ENGINES MEETING APPLICABLE NSPS AND MACT STANDARDS | 84 | T/YR | |
| IN-0173 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Carbon Dioxide | GOOD COMBUSTION PRACTICES | 526.39 | G/BHP-H | 526.39 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR | 17.11 | NO. 2 FUEL OIL | 4690 | B-HP | Carbon Dioxide | GOOD COMBUSTION PRACTICES | 526.39 | G/B-HP-H | 526.39 |
| IN-0180 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Carbon Dioxide | GOOD COMBUSTION PRACTICES | 526.39 | G/B-HP-H | 526.39 |
| IN-0185 | 04/24/2014  ACT | DIESEL FIRE PUMP | 17.11 | DIESEL | 300 | HP | Carbon Dioxide Equivalent (CO2e) | | 31.11 | CO2E | |
| LA-0296 | 05/23/2014  ACT | Emergency Diesel Generators (EQTs 622, 671, 773, 850, 994, 995, 996, 1033, 1077, 1105, & 1202) | 17.11 | Diesel | 2682 | HP | Carbon Dioxide Equivalent (CO2e) | Compliance with 40 CFR 60 Subpart IIII; operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage. | 56 | TPY | |
| LA-0308 | 09/26/2013  ACT | 2000 KW Diesel Fired Emergency Generator Engine | 17.11 | Diesel | 20.4 | MMBTU/hr | Carbon Dioxide | Good combustion practices | 0 | | 517.55 |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 1 | 17.11 | Diesel | 5364 | HP | Carbon Dioxide Equivalent (CO2e) | Proper design and operation; energy efficiency measures | 0 | | |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 2 | 17.11 | Diesel | 5364 | HP | Carbon Dioxide Equivalent (CO2e) | Proper design and operation; energy efficiency measures | 0 | | |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 1 | 17.11 | Diesel | 751 | HP | Carbon Dioxide Equivalent (CO2e) | Proper design and operation; use of ultra-low sulfur diesel | 0 | | |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 2 | 17.11 | Diesel | 751 | HP | Carbon Dioxide Equivalent (CO2e) | Proper design and operation; use of ultra-low sulfur diesel | 0 | | |
| MA-0039 | 01/30/2014  ACT | Emergency Engine/Generator | 17.11 | ULSD | 7.4 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 162.85 | LB/MMBTU | 517.07 |

## BACT Determinations for Large Internal Combustion Engines (> 500 HP) - GHG (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/hp-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0406 | 11/01/2013  ACT | FG-EMGEN7-8; Two (2) 1,000kW diesel-fueled emergency reciprocating internal combustion engines | 17.11 | Diesel | 1000 | kW | Carbon Dioxide Equivalent (CO2e) | Good combustion practices. | 1731.4 | T/YR | |
| OH-0352 | 06/18/2013  ACT | Emergency generator | 17.11 | diesel | 2250 | KW | Carbon Dioxide Equivalent (CO2e) | | 878 | T/YR | |
| OH-0355 | 05/07/2013  ACT | Test Cell 1 for Aircraft Engines and Turbines | 17.11 | JET FUEL | 0 | | Carbon Dioxide Equivalent (CO2e) | | 74000 | T/YR | |
| OH-0355 | 05/07/2013  ACT | Test Cell 2 for Aircraft Engines and Turbines | 17.11 | JET FUEL | 0 | | Carbon Dioxide Equivalent (CO2e) | | 74000 | T/YR | |
| OH-0359 | 03/31/2014  ACT | black start generator w/ 1,141 hp diesel engine (P002) | 17.11 | diesel fuel | 1141 | HP | Carbon Dioxide Equivalent (CO2e) | Fuel efficient engine (good combustion practices) | 65.3 | T/YR | |
| OH-0360 | 11/05/2013  ACT | Emergency generator (P003) | 17.11 | diesel | 1112 | KW | Carbon Dioxide Equivalent (CO2e) | | 433.96 | T/YR | |
| OH-0363 | 11/05/2014  ACT | Emergency generator (P002) | 17.11 | Diesel fuel | 1100 | KW | Carbon Dioxide Equivalent (CO2e) | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 474 | T/YR | |
| OK-0154 | 07/02/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR ENGINE | 17.11 | DIESEL | 1341 | HP | Carbon Dioxide Equivalent (CO2e) | A TIER 3 CERTIFIED ENGINE OPERATED < 100 HR/YR. | 81.2 | TPY | |
| OK-0156 | 07/31/2013  ACT | Fire Pump Engine | 17.11 | Diesel | 550 | hp | Carbon Dioxide | Good Combustion | 0 | | |
| OK-0164 | 01/08/2015  ACT | Jet Engine Testing Cells | 17.11 | KEROSENE TYPE JET FUEL | 65000 | FT-LB THRUST | Carbon Dioxide Equivalent (CO2e) | | 2481 | TONS PER YEAR | |
| PA-0291 | 04/23/2013  ACT | EMERGENCY GENERATOR | 17.11 | Ultra Low sulfur Distillate | 7.8 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 80.5 | TPY | |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Generator | 17.11 | ULSD Fuel oil # 2 | 0 | | Carbon Dioxide Equivalent (CO2e) | | 183 | T/YR | |
| WV-0025 | 11/21/2014  ACT | Emergency Generator | 17.11 | Diesel | 2015.7 | HP | Carbon Dioxide Equivalent (CO2e) | | 2416 | LB/H | |
| FL-0328 | 10/27/2011  ACT | Main Propulsion Engines | 17.11 | Diesel | 0 | | Carbon Dioxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers (DEWT) measurement system. | 700 | G/KW-H | 521.99 |
| FL-0328 | 10/27/2011  ACT | Crane Engines (units 1 and 2) | 17.11 | Diesel | 0 | | Carbon Dioxide | Use of certified EPA Tier 1 engines and good combustion practices based on the current manufacturerâ€™s specifications for this engine. | 722 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Crane Engines (units 3 and 4) | 17.11 | Diesel | 0 | | Carbon Dioxide | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 687 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Emergency Engine | 17.11 | Diesel | 0 | | Carbon Dioxide | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 14.6 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Emergency Fire Pump Engine | 17.11 | Diesel | 0 | | Carbon Dioxide | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 2.4 | TONS PER YEAR | |
| LA-0254 | 08/16/2011  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 1250 | HP | Carbon Dioxide | PROPER OPERATION AND GOOD COMBUSTION PRACTICES | 163 | LB/MMBTU | 517.55 |
| MI-0402 | 11/17/2011  ACT | Diesel fuel-fired combustion engine (RICE) | 17.11 | Diesel | 732 | HP | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 716.6 | LB/H | 444.05 |

## BACT Determinations for Crusher Circuit Sources - Particulates

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit gr/dscf |
|---|---|---|---|---|---|---|---|---|---|---|
| AK-0084 | 06/30/2017  ACT | Ore Crushing and Transfers (Enclosures) | 90.021 | 5100 | tph | Particulate matter, total (TPM) | Enclosures | 0.0005 | GR/DSCF | 0.00050 |
| AK-0084 | 06/30/2017  ACT | Ore Crushing and Transfers (Dust Collector) | 90.021 | 5100 | tph | Particulate matter, total (TPM) | Dust Collector | 0.01 | GR/DSCF | 0.01000 |
| MI-0400 | 06/29/2011  ACT | Coal crushers (EUFUELCRUSHER) | 90.011 | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Fabric filter dust collector | 27.6 | E-4 LB/H | |
| MN-0085 | 05/10/2012  ACT | SECONDARY SCREENING CRUSHER/COBBER LINE 1 | 90.031 | 0 | | Particulate Matter (PM) | FABRIC FILTER WITH LEAK DETECTION | 0.002 | GR/DSCF | 0.00200 |
| MN-0085 | 05/10/2012  ACT | SECONDARY SCREENING CRUSHER/COBBER LINE 2 | 90.031 | 0 | | Particulate Matter (PM) | FABRIC FILTER WITH LEAK DETECTION | 0.002 | GR/DSCF | 0.00200 |
| MN-0085 | 05/10/2012  ACT | SECONDARY SCREENING CRUSHER/COBBER LINE 3 | 90.031 | 0 | | Particulate Matter (PM) | FABRIC FILTER WITH LEAK DETECTION | 0.002 | GR/DSCF | 0.00200 |
| MN-0085 | 05/10/2012  ACT | SECONDARY SCREENING CRUSHER/COBBER LINE 4 | 90.031 | 0 | | Particulate Matter (PM) | FABRIC FILTER WITH LEAK DETECTION | 0.002 | GR/DSCF | 0.00200 |
| OH-0380 | 08/07/2019  ACT | Recycle Prep Crushing (P903) | 81.59 | 5 | T/H | Particulate matter, filterable < 10 Âµ (FPM10) | i.Ensure the recycle prep crushing loadout transfer point shall occur within the melt shop feed handling building;<br>ii.Minimize the recycle prep crushing loadout transfer point drop height to the extent possible; and<br>iii.Equip the screener and load-out points with a hood or enclosure vented to a baghouse capable of achieving 90% capture efficiency for partially enclosed transfer points. | 0.002 | GR/DSCF | 0.00200 |
| OH-0380 | 08/07/2019  ACT | FeV Crushing and Screening (P908) | 81.59 | 10 | T/H | Particulate matter, filterable < 10 Âµ (FPM10) | Baghouse with a 99.9% control efficiency, a 90% capture efficiency for load-in and a 99% capture efficiency for crushing and screening. | 0.002 | GR/DSCF | 0.00200 |
| TX-0869 | 11/06/2019  ACT | Stone Handling Area Crusher | 90.019 | 1428 | TON/H | Particulate matter, total (TPM) | WATER SPRAYS | 0 | | |
| TX-0869 | 11/06/2019  ACT | Lime Belt Crusher | 90.019 | 0 | | Particulate matter, total (TPM) | BAGHOUSE | 0.009 | GR/DSCF | 0.00900 |
| WI-0262 | 06/30/2017  ACT | Coal crusher house, P06 | 90.011 | 1600 | tons per hour | Particulate matter, total (TPM) | Building enclosure. New dust collection system, new baghouse. | 1.12 | LBS/HR | 0.00200 |
| *WY-0078 | 03/27/2017  ACT | DC-08C Crusher Bldg Screens, 4C-36 and 4C-37A | 90.017 | 0 | | Particulate matter, filterable (FPM) | baghouse | 0.24 | LB/H | 0.00200 |
| *WY-0078 | 03/27/2017  ACT | DC-09A Crusher Bldg, Housekeeping C-24, 4C-28 and 4C-29 | 90.017 | 0 | | Particulate matter, filterable (FPM) | baghouse | 0.1 | LB/H | 0.00200 |

**BACT Determinations for Crusher Circuit Sources (Conveyors) - Particulates**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit gr/dscf |
|---|---|---|---|---|---|---|---|---|---|---|
| IN-0166 | 06/27/2012  ACT | BARGE UNLOADING FROM THE HOPPER TO THE BELT AND BARGE CONVEYOR TRANSFER POINTS | 90.011 | 750 | T/H | Particulate matter, total < 10 Âµ (TPM10) | WET DUST EXTRACTION OR A BAGHOUSE | 0.003 | GR/DSCF | 0.00300 |
| IN-0166 | 06/27/2012  ACT | RAIL HOPPERS UNLOADING TO THE CONVEYOR BELTS AND RAIL CONVEYOR BELT TO THE STACKER | 90.011 | 750 | T/H | Particulate matter, total < 10 Âµ (TPM10) | WET DUST EXTRACTION OR BAGHOUSE | 0.003 | GR/DSCF | 0.00300 |
| IN-0166 | 06/27/2012  ACT | TRANSFER SYSTEMS CONSISTING OF HOPPERS AND CONVEYOR BELTS TRANSFERRING FEED STOCK FROM THE PILES TO CLASSIFICATION TOWERS; CLASSIFICATION TOWERS; AND | 90.011 | 750 | T/H | Particulate matter, total < 10 Âµ (TPM10) | WET DUST EXTRACTION OR A BAGHOUSE | 0.003 | GR/DSCF | 0.00300 |
| IN-0166 | 06/27/2012  ACT | TRUCK/RAIL CONVEYOR TRANSFER TOWER; TRUCK STATIONS UNLOADING TO A TRUCK HOPPER; AND TRUCK HOPPER UNLOADING TO THE CONVEYOR BELTS | 90.011 | 750 | T/H | Particulate matter, total < 10 Âµ (TPM10) | ENCLOSED VENT TO A DUST EXTRACTION SYSTEM OR BAGHOUSE | 0.003 | GR/DSCF | 0.00300 |
| IN-0167 | 04/16/2013  ACT | LIMESTONE CONVEYOR & ENCLOSED STORAGE (PILE) | 90.019 | 495 | T/H | Particulate matter, total < 10 Âµ (TPM10) | DEVELOPMENT, MAINTENANCE, AND IMPLEMENTATION OF A SITE-SPECIFIC FUGITIVE DUST CONTROL PLAN AND ENCLOSURE | 0.02 | LB/H | |
| IN-0167 | 04/16/2013  ACT | DOLOMITE CONVEYOR & ENCLOSED STORAGE (PILE) | 90.024 | 495 | T/H | Particulate matter, total < 10 Âµ (TPM10) | DEVELOPMENT, MAINTENANCE, AND IMPLEMENTATION OF A SITE-SPECIFIC FUGITIVE DUST CONTROL PLAN | 0.01 | LB/H | |
| IN-0317 | 06/11/2019  ACT | unloading conveyor, transfer station EU-1001 | 90.011 | 5000 | TONS/H | Particulate matter, total < 10 Âµ (TPM10) | baghouse | 0.002 | GR/DSCF | 0.00200 |
| IN-0317 | 06/11/2019  ACT | closed coal screw conveyor | 90.011 | 500 | TONS/H | Particulate matter, total < 10 Âµ (TPM10) | coal handling system filter EU-2005 | 0.002 | GR/DSCF | 0.00200 |
| IN-0317 | 06/11/2019  ACT | coarse additive conveyor EU-2006 | 90.999 | 0 | TONS/H | Particulate matter, total < 10 Âµ (TPM10) | Filter EU-2006 | 0.002 | GR/DSCF | 0.00200 |

**BACT Determinations for Crusher Circuit Sources (Conveyors) - Particulates**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit gr/dscf |
|---|---|---|---|---|---|---|---|---|---|---|
| KY-0110 | 07/23/2020  ACT | EP 07-06 - DRI Transfer Conveyors | 90.021 | 577500 | ton/yr | Particulate matter, total < 10 Âµ (TPM10) | For the DRI Transfer Conveyors (EP 07-06): The permittee shall install, operate, and maintain dust collectors on DRI transfer conveyor #3 and #4, each designed to control particulate grain loading to 0.001 grain/dscf and the flow rate to 1200 dscf/min. | 0.001 | GR/DSCF | 0.00100 |
| LA-0248 | 01/27/2011  ACT | DRI-105 DRI Unit #1 Furnace Feed Conveyor Baghouse | 81.9 | 3858090 | Tons/yr | Particulate matter, filterable < 10 Âµ (FPM10) | Fabric filter baghouse achieving at least 99.5% control of PM10/PM2.5. Additionally, hooded conveyors and enclosed transfer stations will be installed to limit emissions from material handling | 0.1 | LB/H | 0.00200 |
| LA-0248 | 01/27/2011  ACT | DRI-205 DRI Unit #2 Furnace Feed Conveyor Baghouse | 81.9 | 3858090 | | Particulate matter, filterable < 10 Âµ (FPM10) | Fabric filter baghouse achieving at least 99.5% control of PM10/PM2.5. Additionally, hooded conveyors and enclosed transfer stations will be installed to limit emissions from material handling | 0.1 | LB/H | 0.00200 |
| *LA-0345 | 06/13/2019  ACT | material transfers and conveyors | 81.49 | 0 | | Particulate matter, total < 10 Âµ (TPM10) | baghouses and/or enclosed conveyors | 0 | | |
| MI-0430 | 03/30/2017  ACT | EU-10A Sand legs & vibratory mold dumper/conveyor at HCI facility | 81.39 | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Baghouse #864 (32,000 dscfm dust collector) and baghouse #776 (24,000 dscfm dust collector). Both are reverse air. | 0.66 | LB/H | 0.00241 |
| MI-0430 | 03/30/2017  ACT | EU-02 A-line shake out sand elevator and conveyor at HCI facility | 81.39 | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Baghouse #788 20,000 dscfm pulse jet type | 0.09 | LB/H | 0.00053 |
| MN-0084 | 12/06/2011  ACT | PELLET PRODUCT CONVEYOR & REJECT DISCHARGE, PHASE III | 90.031 | 0 | | Particulate Matter (PM) | WET SCRUBBER | 2.6 | LB/H | 0.00500 |
| MN-0084 | 12/06/2011  ACT | FINAL TRANSFER CONVEYORS AND LOADOUT CONVEYOR | 90.031 | 0 | | Particulate Matter (PM) | BAGHOUSE W/ LEAK DETECTION | 0.21 | LB/H | 0.00200 |
| MN-0084 | 12/06/2011  ACT | RECLAIM CONVEYOR | 90.031 | 0 | | Particulate Matter (PM) | BAGHOUSE W/ LEAK DETECTION | 0.31 | LB/H | 0.00200 |
| MN-0084 | 12/06/2011  ACT | EMERGENCY PELLET CONVEYOR TRANSFER, PHASE III | 90.031 | 0 | | Particulate Matter (PM) | BAGHOUSE W/ LEAK DETECTION | 0.21 | LB/H | 0.00200 |
| MN-0085 | 05/10/2012  ACT | OXIDE PELLET STOCKPILE CONVEYOR GALLERY | 90.031 | 0 | | Particulate Matter (PM) | FABRIC FILTER WITH LEAK DETECTION | 0.002 | GR/DSCF | 0.00200 |
| MN-0085 | 05/10/2012  ACT | PELLET SCREENINGS TO REGRIND CONVEYORS | 90.031 | 0 | | Particulate Matter (PM) | FABRIC FILTER WITH LEAK DETECTION | 0.002 | GR/DSCF | 0.00200 |

**BACT Determinations for Crusher Circuit Sources (Conveyors) - Particulates**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit gr/dscf |
|---|---|---|---|---|---|---|---|---|---|---|
| OH-0376 | 02/09/2018  ACT | HBI Conveyor Transfers with Scrubbers and loadout building (P902) | 81.9 | 0 | | Particulate matter, filterable < 10 Âµ (FPM10) | Use of venturi scrubbers, use of partial enclosures and use of water/chemical suppressants | 0.47 | LB/H | 0.00250 |
| TX-0725 | 03/13/2014  ACT | HBI Cooling Conveyor No. 1 and No. 2 | 81.9 | 2205000 | | Particulate matter, filterable < 10 Âµ (FPM10) | High energy wet scrubber having an OLGL not greater than 0.0079 gr/dscf for control of PM. | 0.0079 | GR/DSCF | 0.00790 |
| TX-0869 | 11/06/2019  ACT | Material Handling (Conveyors and Feeders) | 90.019 | 0 | | Particulate matter, filterable < 10 Âµ (FPM10) | BAGHOUSE | 0.005 | GR/DSCF | 0.00500 |

## BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - CO (Gas-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0083 | 01/06/2015  ACT | Five (5) Waste Heat Boilers | 13.31 | Natural Gas | 50 | MMBTU/H | Carbon Monoxide | | 50 | PPMV | 0.0370 |
| *AK-0085 | 08/13/2020  ACT | Two (2) Buyback Gas Bath Heaters and Three (3) Operations Camp Heaters | 13.31 | Natural Gas | 32 | MMBtu/hr | Carbon Monoxide | Good Combustion Practices, Clean Fuels, and Limited Operation of 500 hours per year per heater. | 0.087 | LB/MMBTU | 0.0870 |
| AL-0307 | 10/09/2015  ACT | PACKAGE BOILER | 13.31 | NATURAL GAS | 17.5 | MMBTU/H | Carbon Monoxide | GCP | 0.08 | LB/MMBTU | 0.0800 |
| AL-0307 | 10/09/2015  ACT | 2 CALP LINE BOILERS | 13.31 | NATURAL GAS | 24.59 | MMBTU/H | Carbon Monoxide | GCP | 0.08 | LB/MMBTU | 0.0800 |
| *AL-0329 | 09/21/2021  ACT | Three Gas Heaters | 13.31 | Natural Gas | 10 | MMBtu/hr | Carbon Monoxide | | 0.08 | LB/MMBTU | 0.0800 |
| AR-0138 | 02/17/2012  ACT | VTD BOILER | 13.31 | NATURAL GAS | 50.4 | MMBTU/H | Carbon Monoxide | GOOD COMBUSTION PRACTICE | 3.1 | LB/H | 0.0610 |
| AR-0140 | 09/18/2013  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 67 | MMBTU/H | Carbon Monoxide | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0824 | LB/MMBTU | 0.0824 |
| AR-0140 | 09/18/2013  ACT | BOILERS SN-26 AND 27, GALVANIZING LINE | 13.31 | NATURAL GAS | 24.5 | MMBTU/H | Carbon Monoxide | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0824 | LB/MMBTU | 0.0824 |
| AR-0140 | 09/18/2013  ACT | FURNACES SN-40 AND SN-42, DECARBURIZING LINE | 13.31 | NATURAL GAS | 22 | MMBTU/H | Carbon Monoxide | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0824 | LB/MMBTU | 0.0824 |
| AR-0155 | 11/07/2018  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 53.7 | MMBTU/HR | Carbon Monoxide | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0824 | LB/MMBTU | 0.0824 |
| AR-0155 | 11/07/2018  ACT | BOILER SN-26, GALVANIZING LINE | 13.31 | NATURAL GAS | 53.7 | MMBTU/HR | Carbon Monoxide | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0824 | LB/MMBTU | 0.0824 |
| AR-0155 | 11/07/2018  ACT | PREHEATER, GALVANIZING LINE SN-28 | 13.31 | NATURAL GAS | 78.2 | MMBTU/HR | Carbon Monoxide | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0824 | LB/MMBTU | 0.0824 |
| AR-0159 | 04/05/2019  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 0 | | Carbon Monoxide | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0824 | LB/MMBTU | 0.0824 |
| AR-0159 | 04/05/2019  ACT | PREHEATERS, GALVANIZING LINE SN-28 and SN-29 | 13.31 | NATURAL GAS | 0 | | Carbon Monoxide | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0824 | LB/MMBTU | 0.0824 |
| AR-0159 | 04/05/2019  ACT | BOILER, ANNEALING PICKLE LINE | 13.31 | NATURAL GAS | 0 | | Carbon Monoxide | Combustion of Natural gas and Good Combustion Practice | 0.0824 | LB/MMBTU | 0.0824 |
| AR-0159 | 04/05/2019  ACT | BOILERS SN-26 AND SN-27, GALVANIZING LINE | 13.31 | NATURAL GAS | 0 | | Carbon Monoxide | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0824 | LB/MMBTU | 0.0824 |
| AR-0168 | 03/17/2021  ACT | Galvanizing Line #2 Furnace | 13.31 | Natural Gas | 150.5 | MMBtu/hr | Carbon Monoxide | Combustion of Natural gas and Good Combustion Practice | 0.0824 | LB/MMBTU | 0.0824 |
| AR-0168 | 03/17/2021  ACT | Decarburizing Line Furnace Section | 13.31 | Natural Gas | 58 | MMBtu/hr | Carbon Monoxide | Combustion of Natural gas and Good Combustion Practice | 0.0824 | LB/MMBTU | 0.0824 |
| *AR-0172 | 09/01/2021  ACT | SN-202, 203, 204 Pickle Line Boilers | 13.31 | Natural Gas | 0 | | Carbon Monoxide | Good Combustion Practice | 0.084 | LB/MMBTU | 0.0840 |
| CA-1185 | 06/07/2011  ACT | Boiler, Forced Dratf | 13.31 | Natural gas | 3 | MMBTU/H | Carbon Monoxide | Forced draft, full modulation, flue gas recirculation | 100 | PPMVD@3% O2 | 0.0739 |
| CA-1192 | 06/21/2011  ACT | AUXILIARY BOILER | 13.31 | NATURAL GAS | 37.4 | MMBTU/H | Carbon Monoxide | ULTRA LOW NOX BURNER, USE PUC QUALITY NATURAL GAS, OPERATIONAL RESTRICTION OF 46, 675 MMBTU/YR | 50 | PPMVD | 0.0370 |
| FL-0335 | 09/05/2012  ACT | Four(4) Natural Gas Boilers - 46 MMBtu/hour | 13.31 | Natural Gas | 46 | MMBTU/H | Carbon Monoxide | Good Combustion Practice | 0.039 | LB/MMBTU | 0.0390 |
| FL-0356 | 03/09/2016  ACT | Auxiliary Boiler, 99.8 MMBtu/hr | 13.31 | Natural gas | 99.8 | MMBtu/hr | Carbon Monoxide | Proper combustion prevents CO | 0.08 | LB/MMBTU | 0.0800 |
| *FL-0363 | 12/04/2017  ACT | 99.8 MMBtu/hr auxiliary boiler | 13.31 | Natural gas | 99.8 | MMBtu/hr | Carbon Monoxide | Clean fuel | 0.08 | LB/MMBTU | 0.0800 |
| *FL-0367 | 07/27/2018  ACT | 60 MMBtu/hour Auxiliary Boiler | 13.31 | Natural Gas | 60 | MMBtu/hour | Carbon Monoxide | Good combustion practices and low-NOx burners | 0.08 | LB/MMBTU | 0.0800 |
| IA-0106 | 07/12/2013  ACT | Startup Heater | 13.31 | natural gas | 58.8 | MMBTU/H | Carbon Monoxide | good operating practices & use of natural gas | 0.0194 | LB/MMBTU | 0.0194 |
| IA-0107 | 04/14/2014  ACT | dew point heater | 13.31 | natural gas | 13.32 | mmBtu/hr | Carbon Monoxide | | 0.041 | LB/MMBTU | 0.0410 |
| IA-0107 | 04/14/2014  ACT | auxiliary boiler | 13.31 | natural gas | 60.1 | mmBtu/hr | Carbon Monoxide | CO catalytic oxidizer | 0.0164 | LB/MMBTU | 0.0164 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - CO (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IL-0129 | 07/30/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 96 | mmBtu/hr | Carbon Monoxide | Good combustion practices | 0.037 | LB/MMBTU | 0.0370 |
| IL-0130 | 12/31/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 96 | mmBtu/hr | Carbon Monoxide | Good combustion practice | 0.037 | LB/MMBTU | 0.0370 |
| IN-0158 | 12/03/2012  ACT | TWO (2) NATURAL GAS AUXILIARY BOILERS | 13.31 | NATURAL GAS | 80 | MMBTU/H | Carbon Monoxide | GOOD COMBUTSTION PRACTICES | 0.083 | LB/MMBTU | 0.0830 |
| IN-0263 | 03/23/2017  ACT | STARTUP HEATER EU-002 | 13.31 | NATURAL GAS | 70 | MMBTU/HR | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.556 | LB/H | 0.0365 |
| IN-0285 | 08/02/2017  ACT | Space Heaters | 13.31 | | 0 | | Carbon Monoxide | | 0.038 | LB/MMBTU | 0.0380 |
| *KS-0030 | 03/31/2016  ACT | Indirect fuel-gas heater | 13.31 | | 2 | mmBTU/hr | Carbon Monoxide | | 0.16 | LB/H | 0.0800 |
| KY-0110 | 07/23/2020  ACT | EP 15-01 - Natural Gas Direct-Fired Space Heaters, Process Water Heaters, & Air Makeup Heaters | 13.31 | Natural Gas | 40 | MMBtu/hr, combined | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 84 | LB/MMSCF | 0.0824 |
| KY-0110 | 07/23/2020  ACT | EP 05-01 - Group 1 Car Bottom Furnaces #1 - #3 | 13.31 | Natural Gas | 28 | MMBtu/hr, each | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 84 | LB/MMSCF | 0.0824 |
| KY-0110 | 07/23/2020  ACT | EP 04-02 - Austenitizing Furnace | 13.31 | Natural Gas | 54 | MMBtu/hr | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 84 | LB/MMSCF | 0.0824 |
| KY-0110 | 07/23/2020  ACT | EP 05-02 - Group 2 Car Bottom Furnaces A & B | 13.31 | Natural Gas | 60 | MMBtu/hr, combined | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 84 | LB/MMSCF | 0.0824 |
| KY-0110 | 07/23/2020  ACT | EP 03-02 - Ingot Car Bottom Furnaces #1-#4 | 13.31 | Natural Gas | 37 | MMBtu/hr, each | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 84 | LB/MMSCF | 0.0824 |
| KY-0110 | 07/23/2020  ACT | EP 03-05 - Steckel Mill Coiling Furnaces #1 & #2 | 13.31 | Natural Gas | 17.5 | MMBtu/hr, each | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 84 | LB/MMSCF | 0.0824 |
| KY-0110 | 07/23/2020  ACT | EP 04-03 - Tempering Furnace | 13.31 | Natural Gas | 48 | MMBtu/hr | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 84 | LB/MMSCF | 0.0824 |
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Makeup Air Units (EP 21-19) | 13.31 | Natural Gas | 40 | MMBtu/hr, total | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 84 | LB/MMSCF | 0.0824 |
| KY-0115 | 04/19/2021  ACT | Vacuum Degasser Boiler (EP 20-13) | 13.31 | Natural Gas | 50.4 | MMBtu/hr | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 61 | LB/MMSCF | 0.0598 |
| KY-0115 | 04/19/2021  ACT | Pickle Line #2 â€“ Boiler #1 & #2 (EP 21-04 & EP 21-05) | 13.31 | Natural Gas | 18 | MMBtu/hr, each | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 84 | LB/MMSCF | 0.0824 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Alkali Cleaning Section Heater (EP 21-07B) | 13.31 | Natural Gas | 23 | MMBtu/hr | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 84 | LB/MMSCF | 0.0824 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Radiant Tube Furnace (EP 21-08B) | 13.31 | Natural Gas | 36 | MMBtu/hr | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 84 | LB/MMSCF | 0.0824 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Annealing Furnaces (15) (EP 21-15) | 13.31 | Natural Gas | 4.8 | MMBtu/hr, each | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 84 | LB/MMSCF | 0.0824 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Preheat Furnace (EP 21-08A) | 13.31 | Natural Gas | 94 | MMBtu/hr | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan. | 84 | LB/MMSCF | 0.0824 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Zinc Pot Preheater (EP 21-09) | 13.31 | Natural Gas | 3 | MMBtu/hr | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 84 | LB/MMSCF | 0.0824 |
| KY-0115 | 04/19/2021  ACT | Heated Transfer Table Furnace (EP 02-03) | 13.31 | Natural Gas | 65.5 | MMBtu/hr | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 84 | LB/MMSCF | 0.0824 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - CO (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0305 | 06/30/2016  ACT | Gasifier Start-up Preheat Burners | 13.31 | Natural gas | 23 | MM BTU/hr (each) | Carbon Monoxide | good engineering practices, good combustion technology, and use of clean fuels | 0 | | |
| LA-0305 | 06/30/2016  ACT | WSA Preheat Burners | 13.31 | Natural Gas | 0 | | Carbon Monoxide | good engineering design and practices and use of clean fuels | 0 | | |
| LA-0307 | 03/21/2016  ACT | Regenerative Heaters | 13.31 | natural gas | 7.37 | mm btu/hr | Carbon Monoxide | good combustion practices | 0 | | |
| LA-0311 | 07/15/2013  ACT | No. 6 Ammonia Plant Start-up Heater (4-13, EQT 158) | 13.31 | Natural Gas | 94.5 | MM Btu/hr | Carbon Monoxide | Good combustion practices; proper engineering design | 7.78 | LB/HR | 0.0823 |
| *LA-0315 | 05/23/2014  ACT | Reactor Charge Heater - 53B001 | 13.31 | Natural Gas | 10.1 | MMBTU/HR | Carbon Monoxide | Combustion controls (proper burner design and operation using natural gas) | 0.83 | LB/H | 0.0820 |
| *LA-0315 | 05/23/2014  ACT | Regeneraton Heater - 51B001 | 13.31 | Natural Gas | 61 | MMBTU/HR | Carbon Monoxide | Combustion controls (proper burner design and operation using natural gas) | 5 | LB/H | 0.0820 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002A | 13.31 | Natural Gas | 33 | MMBTU/HR | Carbon Monoxide | Combustion controls (proper burner design and operation using natural gas) | 2.67 | LB/H | 0.0820 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002B | 13.31 | Natural Gas | 33 | MMBTU/HR | Carbon Monoxide | Combustion controls (proper burner design and operation using natural gas) | 2.67 | LB/H | 0.0820 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002C | 13.31 | Natural Gas | 33 | MMBTU/HR | Carbon Monoxide | Combustion controls (proper burner design and operation using natural gas) | 2.67 | LB/H | 0.0820 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002D | 13.31 | Natural Gas | 33 | MMBTU/HR | Carbon Monoxide | Combustion controls (proper burner design and operation using natural gas) | 2.67 | LB/H | 0.0820 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002E | 13.31 | Natural Gas | 33 | MMBTU/HR | Carbon Monoxide | Combustion controls (proper burner design and operation using natural gas) | 2.67 | LB/H | 0.0820 |
| *LA-0349 | 07/10/2018  ACT | Hot Oil Heaters (5) | 13.31 | natural gas | 16.13 | mm btu/hr | Carbon Monoxide | Good Combustion Practices | 0 | | |
| *LA-0364 | 01/06/2020  ACT | Hot Oil Heaters 1 and 2 | 13.31 | Natural Gas | 0 | | Carbon Monoxide | Good combustion practices and compliance with the applicable provisions of 40 CFR 63 Subpart DDDDD. | 0.037 | LB/MMBTU | 0.0370 |
| *LA-0364 | 01/06/2020  ACT | PR Waste Heat Boiler | 13.31 | Natural Gas | 94 | mm btu/h | Carbon Monoxide | Good combustion practices and oxidation catalyst. | 26.21 | LB/H | 0.2788 |
| MA-0039 | 01/30/2014  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 80 | MMBTU/H | Carbon Monoxide | Oxidation catalyst | 4.7 | PPMVD@3% O2 | 0.0035 |
| MD-0041 | 04/23/2014  ACT | AUXILLARY BOILER | 13.31 | NATURAL GAS | 93 | MMBTU/H | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 0.02 | LB/MMBTU | 0.0200 |
| MD-0042 | 04/08/2014  ACT | AUXILLARY BOILER | 13.31 | NATURAL GAS | 45 | MMBTU/H | Carbon Monoxide | EXCLUSIVE USE OF PIPELINE QUALITY NATURAL GAS AND GOOD COMBUSTION PRACTICES | 0.036 | LB/MMBTU | 0.0360 |
| MD-0045 | 11/13/2015  ACT | AUXILIARY BOILER | 13.31 | NATURAL GAS | 42 | MMBTU/H | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 0.037 | LB/MMBTU | 0.0370 |
| MD-0046 | 10/31/2014  ACT | AUXILIARY BOILER | 13.31 | PIPELINE QUALITY NATURAL GAS | 93 | MMBTU/H | Carbon Monoxide | EFFICIENT BOILER DESIGN AND APPLICATION OF GOOD COMBUSTION PRACTICES. | 0.08 | LB/MMBTU | 0.0800 |
| MI-0406 | 11/01/2013  ACT | FG-AUXBOILER1-2; Two (2) natural gas-fired auxiliary boilers. | 13.31 | natural gas | 40 | MMBTU/H | Carbon Monoxide | Good combustion practices | 0.036 | LB/MMBTU | 0.0360 |
| MI-0410 | 07/25/2013  ACT | FGAUXBOILERS: Two auxiliary boilers < 100 MMBTU/H heat input each | 13.31 | natural gas | 100 | MMBTU/H heat input each | Carbon Monoxide | Efficient combustion. | 0.075 | LB/MMBTU | 0.0750 |
| MI-0412 | 12/04/2013  ACT | Fuel pre-heater (EUFUELHTR) | 13.31 | natural gas | 3.7 | MMBTU/H | Carbon Monoxide | Good combustion practices | 0.41 | LB/H | 0.1108 |
| MI-0412 | 12/04/2013  ACT | Auxiliary Boiler B (EUAUXBOILERB) | 13.31 | natural gas | 95 | MMBTU/H | Carbon Monoxide | Good combustion practices. | 0.077 | LB/MMBTU | 0.0770 |
| MI-0412 | 12/04/2013  ACT | Auxiliary Boiler A (EUAUXBOILERA) | 13.31 | natural gas | 55 | MMBTU/H | Carbon Monoxide | Good combustion practices | 0.077 | LB/MMBTU | 0.0770 |
| MI-0420 | 06/03/2016  ACT | FGAUXBOILERS | 13.31 | Natural gas | 6 | MMBTU/H | Carbon Monoxide | Good combustion practices and clean burn fuel (pipeline quality natural gas) | 0.08 | LB/MMBTU | 0.0800 |
| MI-0421 | 08/26/2016  ACT | EUFLTOS1 in FGTOH (Thermal Oil System for Thermally Fused Lamination Lines) | 13.31 | Natural gas | 34 | MMBTU/H | Carbon Monoxide | Good design and operation | 0.082 | LB/MMBTU | 0.0820 |
| MI-0421 | 08/26/2016  ACT | EUTOH (In FGTOH)--Thermal Oil Heater | 13.31 | Natural gas | 34 | MMBTU/H | Carbon Monoxide | Good design and operation | 0.082 | LB/MMBTU | 0.0820 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - CO (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0423 | 01/04/2017  ACT | FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2) | 13.31 | Natural gas | 27 | MMBTU/H | Carbon Monoxide | Good combustion practices. | 2.22 | LB/H | 0.0822 |
| MI-0424 | 12/05/2016  ACT | EUFUELHTR (Fuel pre-heater) | 13.31 | Natural gas | 3.7 | MMBTU/H | Carbon Monoxide | Good combustion practices. | 0.41 | LB/H | 0.1108 |
| MI-0424 | 12/05/2016  ACT | EUAUXBOILER (Auxiliary boiler) | 13.31 | natural gas | 83.5 | MMBTU/H | Carbon Monoxide | Good combustion practices. | 0.077 | LB/MMBTU | 0.0770 |
| MI-0425 | 05/09/2017  ACT | EUTOH in FGTOH | 13.31 | Natural gas | 38 | MMBTU/H | Carbon Monoxide | Good design and operation. | 0.082 | LB/MMBTU | 0.0820 |
| MI-0425 | 05/09/2017  ACT | EUFLTOS1 in FGTOH | 13.31 | Natural gas | 10.2 | MMBTU/H | Carbon Monoxide | Good design and operation. | 0.082 | LB/MMBTU | 0.0820 |
| MI-0426 | 03/24/2017  ACT | FGAUXBOILERS (6 auxiliary boilers EUAUXBOIL2A, EUAUXBOIL3A, EUAUXBOIL2B, EUAUXBOIL3B, EUAUXBOIL2C, EUAUXBOIL3C) | 13.31 | Natural gas | 3 | MMBTU/H | Carbon Monoxide | Good combustion practices and clean burn fuel (pipeline quality natural gas). | 84 | LB/MMSCF | 0.0824 |
| MI-0433 | 06/29/2018  ACT | EUAUXBOILER (North Plant): Auxiliary Boilder | 13.31 | Natural gas | 61.5 | MMBTU/H | Carbon Monoxide | Good combustion practices. | 0.08 | LB/MMBTU | 0.0800 |
| MI-0433 | 06/29/2018  ACT | EUAUXBOILER (South Plant): Auxiliary Boiler | 13.31 | Natural gas | 61.5 | MMBTU/h | Carbon Monoxide | Good combustion practices. | 0.08 | LB/MMBTU | 0.0800 |
| MI-0435 | 07/16/2018  ACT | EUAUXBOILER: Auxiliary Boiler | 13.31 | Natural gas | 99.9 | MMBTU/H | Carbon Monoxide | Good combustion practices | 0.075 | LB/MMBTU | 0.0750 |
| MI-0435 | 07/16/2018  ACT | EUFUELHTR1: Natural gas fired fuel heater | 13.31 | Natural gas | 20.8 | MMBTU/H | Carbon Monoxide | Good combustion controls. | 0.77 | LB/H | 0.0370 |
| MI-0435 | 07/16/2018  ACT | EUFUELHTR2: Natural gas fired fuel heater | 13.31 | Natural gas | 3.8 | MMBTU/H | Carbon Monoxide | Good combustion controls | 0.14 | LB/H | 0.0368 |
| *MI-0440 | 05/22/2019  ACT | FGFUELHEATERS | 13.31 | natural gas | 25 | MMBTU/H | Carbon Monoxide | Good combustion practices. | 0.08 | LB/MMBTU | 0.0800 |
| *MI-0441 | 12/21/2018  ACT | EUAUXBOILER--natural gas fired auxiliary boiler rated at <= 99MMBTU/H | 13.31 | Natural gas | 99 | MMBTU/H | Carbon Monoxide | Good combustion practices | 50 | PPM | 0.0370 |
| *MI-0442 | 08/21/2019  ACT | FGAUXBOILER | 13.31 | Natural gas | 80 | MMBTU/H | Carbon Monoxide | Good combustion practices | 0.037 | LB/MMBTU | 0.0370 |
| *MI-0442 | 08/21/2019  ACT | FGPREHEAT | 13.31 | natural gas | 7 | MMBTU/H | Carbon Monoxide | Good combustion practices | 0.037 | LB/MMBTU | 0.0370 |
| *MI-0445 | 11/26/2019  ACT | FGFUELHTR (2 fuel pre-heaters) | 13.31 | Natural gas | 27 | MMBTU/H | Carbon Monoxide | Good combustion practices | 1.11 | LB/H | 0.0822 |
| MS-0092 | 05/08/2014  ACT | Regeneration Heater, methanol to gasoline | 13.31 | NATURAL GAS | 13 | MMBTU/H | Carbon Monoxide | | 0.08 | LB/MMBTU | 0.0800 |
| MS-0092 | 05/08/2014  ACT | Reactor Heater, 5 | 13.31 | NATURAL GAS | 12 | MMBTU/H | Carbon Monoxide | | 0.08 | LB/MMBTU | 0.0800 |
| NJ-0079 | 07/25/2012  ACT | Commercial/Institutional size boilers less than 100 MMBtu/hr | 13.31 | natural gas | 2000 | hours/year | Carbon Monoxide | Use of natural gas and good combustion practices | 3.44 | LB/H | |
| NJ-0080 | 11/01/2012  ACT | Boiler less than 100 MMBtu/hr | 13.31 | Natural Gas | 51.9 | mmcubic ft/year | Carbon Monoxide | use of natural gas a clean fuel | 2.45 | LB/H | |
| NJ-0084 | 03/10/2016  ACT | Auxiliary Boiler firing natural gas | 13.31 | natural gas | 687 | MMCFT/YR | Carbon Monoxide | Use of good combustion practices and use of natural gas a clean burning fuel | 2.88 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | AUXILIARY BOILER | 13.31 | Natural GAS | 4000 | H/YR | Carbon Monoxide | USE OF NATURAL GAS A CLEAN BURNING FUEL AND GOOD COMBUSTION PRACTICES | 3.61 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Auxiliary boiler | 13.31 | natural gas | 60 | MMBTU/H | Carbon Monoxide | good combustion practice | 0.0375 | LB/MMBTU | 0.0375 |
| NY-0104 | 08/01/2013  ACT | Auxiliary boiler | 13.31 | natural gas | 0 | | Carbon Monoxide | Good combustion practice. | 0.0721 | LB/MMBTU | 0.0721 |
| OH-0350 | 07/18/2012  ACT | Steam Boiler | 13.31 | Natural Gas | 65 | MMBtu/H | Carbon Monoxide | Proper burner design and good combustion practices | 0.04 | LB/MMBTU | 0.0400 |
| OH-0352 | 06/18/2013  ACT | Auxillary Boiler | 13.31 | Natural Gas | 99 | MMBtu/H | Carbon Monoxide | Good combustion practices and using combustion optimization technology | 5.45 | LB/H | 0.0550 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - CO (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0355 | 05/07/2013  ACT | 4 Indirect-Fired Air Preheaters | 13.31 | Natural gas | 0 | | Carbon Monoxide | | 0.15 | LB/MMBTU | 0.1500 |
| OH-0360 | 11/05/2013  ACT | Auxiliary Boiler (B001) | 13.31 | Natural Gas | 99 | MMBtu/H | Carbon Monoxide | Good combustion practices and combustion optimization technology | 5.45 | LB/H | 0.0550 |
| OH-0366 | 08/25/2015  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 34 | MMBTU/H | Carbon Monoxide | Good combustion controls | 1.87 | LB/H | 0.0550 |
| OH-0367 | 09/23/2016  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 99 | MMBTU/H | Carbon Monoxide | Good combustion controls and natural gas/ultra low sulfur diesel | 7.92 | LB/H | 0.0550 |
| OH-0368 | 04/19/2017  ACT | Startup Heater (B001) | 13.31 | Natural gas | 100 | MMBTU/H | Carbon Monoxide | good combustion control (i.e., high temperatures, sufficient excess air, sufficient residence times, and god air/fuel mixing) | 8.24 | LB/H | 0.0824 |
| OH-0370 | 09/07/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 37.8 | MMBTU/H | Carbon Monoxide | Good combustion controls | 2.08 | LB/H | 0.0550 |
| OH-0372 | 09/27/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 37.8 | MMBTU/H | Carbon Monoxide | good combustion controls | 2.08 | LB/H | 0.0550 |
| OH-0374 | 10/23/2017  ACT | Fuel Gas Heaters (2 identical, P007 and P008) | 13.31 | Natural gas | 15 | MMBTU/H | Carbon Monoxide | Combustion control | 0.83 | LB/H | 0.0550 |
| OH-0375 | 11/07/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 26.8 | MMBTU/H | Carbon Monoxide | Good combustion controls | 0.99 | LB/H | 0.0370 |
| OH-0377 | 04/19/2018  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 44.55 | MMBTU/H | Carbon Monoxide | Good combustion practices | 1.67 | LB/H | 0.0375 |
| OH-0377 | 04/19/2018  ACT | Auxiliary Boiler (B002) | 13.31 | Natural gas | 80 | MMBTU/H | Carbon Monoxide | Good combustion practices | 2.48 | LB/H | 0.0310 |
| *OH-0381 | 09/27/2019  ACT | Tunnel Furnace #2 (P018) | 13.31 | Natural Gas | 88 | MMBTU/H | Carbon Monoxide | Use natural gas, use of baffle type burners, good combustion practices and design | 6.16 | LB/H | 0.0700 |
| OK-0142 | 01/17/2012  ACT | Commercial/Institutional Boilers/Furnaces (<100 MMBTUH) | 13.31 | Natural Gas | 5 | MMBTUH | Carbon Monoxide | | 0 | | |
| OK-0148 | 09/12/2012  ACT | Commercial/Institutional Boilers (<100 MMBTUH) | 13.31 | Natural Gas | 11.04 | MMBTUH | Carbon Monoxide | | 0.074 | LB/MMBTU | 0.0740 |
| OK-0153 | 03/01/2013  ACT | REGENERATION HEATERS | 13.31 | NATURAL GAS | 5.61 | MMBTUH | Carbon Monoxide | GOOD COMBUSTION PRACTICES. | 0.0824 | LB/MMBTU | 0.0824 |
| OK-0153 | 03/01/2013  ACT | HOT OIL HEATER | 13.31 | NATURAL GAS | 17.4 | MMBTUH | Carbon Monoxide | Efficient design and combustion. | 0.0824 | LB/MMBTU | 0.0824 |
| OK-0156 | 07/31/2013  ACT | Gas-fired Boiler | 13.31 | Natural Gas | 95 | MMBTUH | Carbon Monoxide | Economizer, Insulation, O2 train control, Energy recapture from blowdowns, and Condensate return system | 146 | LB CO2/1000 LB STEAM | |
| OK-0168 | 05/05/2015  ACT | NATURAL GAS-FIRED BOILER (<100MMBTUH) | 13.31 | NATURAL GAS | 40.4 | MMBTUH | Carbon Monoxide | NO CONTROLS FEASIBLE;GOOD COMBUSTION PRACTICES | 0.0075 | LB/MMBTU | 0.0075 |
| OK-0173 | 01/19/2016  ACT | Heaters (Gas-Fired) | 13.31 | Natural Gas | 0 | | Carbon Monoxide | Natural Gas Fuel. | 0.084 | LB/MMBTU | 0.0840 |
| OR-0050 | 03/05/2014  ACT | Auxiliary boiler | 13.31 | natural gas | 39.8 | MMBTU/H | Carbon Monoxide | Utilize Low-NOx burners and FGR. | 0.04 | LB/MMBTU | 0.0400 |
| PA-0291 | 04/23/2013  ACT | AUXILIARY BOILER | 13.31 | Natural Gas | 40 | MMBTU/H | Carbon Monoxide | | 0.036 | LB/MMBTU | 0.0360 |
| PA-0296 | 12/17/2013  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 40 | MMBTU/H | Carbon Monoxide | | 3.31 | T/YR | |
| PA-0307 | 06/15/2015  ACT | Auxilary Boiler | 13.31 | Natural Gas | 62.04 | MCF/hr | Carbon Monoxide | Good combustion practices | 0.06 | LB/MMBTU | 0.0600 |
| PA-0309 | 12/23/2015  ACT | Auxillary Boiler | 13.31 | Natural gas | 13.31 | MMBtu/hr | Carbon Monoxide | | 0.037 | LB/MMBTU | 0.0370 |
| PA-0310 | 09/02/2016  ACT | Auxilary boiler | 13.31 | Natural Gas | 92.4 | MMBtu/hr | Carbon Monoxide | ULSD and good combustion practices | 0.037 | LB/MMBTU | 0.0370 |
| PA-0311 | 09/01/2015  ACT | Auxilary Boiler | 13.31 | Natural Gas | 55.4 | MMBtu/hr | Carbon Monoxide | | 0.037 | LB/MMBTU | 0.0370 |
| *PA-0316 | 01/26/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 118800 | MMBtu/12 month period | Carbon Monoxide | | 0.036 | LB | |
| *PA-0319 | 08/27/2018  ACT | NATURAL GAS FIRED AUXILIARY BOILER | 13.31 | Natural Gas | 88 | MMBtu/hr | Carbon Monoxide | Lo-NOx burners, Flue Gas Recirculation, good combustion practices, proper operation and maintainance. | 0.055 | LB/MMBTU | 0.0550 |
| SC-0113 | 02/08/2012  ACT | BOILERS | 13.31 | NATURAL GAS | 5 | MMBTU/H | Carbon Monoxide | GOOD COMBUSTION PRACTICES. CONSUMPTION OF NATURAL GAS AND PROPANE. | 0 | | |
| SC-0149 | 01/03/2013  ACT | NATURAL GAS BOILER EU004 | 13.31 | NATURAL GAS | 46 | MMBTU/H | Carbon Monoxide | | 0.039 | LB/MMBTU | 0.0390 |
| SC-0149 | 01/03/2013  ACT | NATURAL GAS BOILER EU005 | 13.31 | NATURAL GAS | 46 | MMBTU/H | Carbon Monoxide | | 0.039 | LB/MMBTU | 0.0390 |

## BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - CO (Gas-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SC-0149 | 01/03/2013  ACT | NATURAL GAS BOILER EU006 | 13.31 | NATURAL GAS | 46 | MMBTU/H | Carbon Monoxide | | 0.039 | LB/MMBTU | 0.0390 |
| SC-0192 | 05/21/2019  ACT | Boiler No. 2 | 13.31 | Natural Gas | 0 | | Carbon Monoxide | Work Practice Standards | 0.0375 | LB/MMBTU | 0.0375 |
| TX-0656 | 05/16/2014  ACT | Heaters | 13.31 | natural gas | 45 | MMBTU/H | Carbon Monoxide | clean fuel and good combustion practices | 50 | PPM | 0.0370 |
| TX-0656 | 05/16/2014  ACT | heaters (5) | 13.31 | natural gas | 24.3 | MMBTU/H | Carbon Monoxide | clean fuel and good combustion practices | 50 | PPM | 0.0370 |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 17 | MMBTU/H | Carbon Monoxide | Good Combustion Practices | 0 | | |
| TX-0663 | 05/25/2012  ACT | 8 Inlet Compressors | 13.31 | Natural Gas or electricity | 4.5 | MMBTU/H | Carbon Monoxide | Oxidation catalyst and Dual Drive (electric/gas) technology | 0.19 | G/HP | |
| TX-0663 | 05/25/2012  ACT | Residue Compressors | 13.31 | Natural Gas | 4735 | hp | Carbon Monoxide | Oxidation catalyst | 0.19 | G/BHP | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 48 | MMBTU/H | Carbon Monoxide | Best combustion practices | 17.39 | TON | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 10 | MMBTU/H | Carbon Monoxide | Good combustion Practices | 0 | | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 3 | MMBTU/H | Carbon Monoxide | Good Combustion Practices | 0 | | |
| TX-0680 | 06/14/2013  ACT | Heater | 13.31 | natural gas | 10 | MMBTU/H | Carbon Monoxide | | 100 | PPMVD | 0.0739 |
| TX-0680 | 06/14/2013  ACT | 2 Heaters | 13.31 | natural gas | 5 | MMBTU/H | Carbon Monoxide | | 100 | PPMVD | 0.0739 |
| TX-0691 | 05/20/2014  ACT | fuel gas heater | 13.31 | natural gas | 18 | MMBTU/H | Carbon Monoxide | | 0.054 | LB/MMBTU | 0.0540 |
| TX-0693 | 04/22/2014  ACT | heater | 13.31 | natural gas | 5.5 | MMBTU/H | Carbon Monoxide | | 0.08 | LB/MMBTU | 0.0800 |
| TX-0694 | 02/02/2015  ACT | heater | 13.31 | natural gas | 3 | MMBTU/H | Carbon Monoxide | | 0.04 | LB/MMBTU | 0.0400 |
| TX-0714 | 12/19/2014  ACT | boiler | 13.31 | natural gas | 80 | MMBTU/H | Carbon Monoxide | low-NOx burners | 0.037 | LB/MMBTU | 0.0370 |
| TX-0751 | 06/18/2015  ACT | Commercial/Institutional Size Boilers (<100 MMBtu) â€" natural gas | 13.31 | natural gas | 73.3 | MMBTU/H | Carbon Monoxide | | 50 | PPM | 0.0370 |
| TX-0755 | 05/21/2015  ACT | Hot Oil Heaters and Regeneration Heaters | 13.31 | Residue gas equivalent to natural gas | 60 | MMBTU/H | Carbon Monoxide | Good combustion practices and firing of residue gas with low carbon content | 50 | PPMVD @ 3% O2 | 0.0370 |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 40 | MMBTU/H | Carbon Monoxide | Good combustion practice to ensure complete combustion. | 50 | PPMVD @ 3% O2 | 0.0370 |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 95.7 | MMBTU/H | Carbon Monoxide | Good combustion practice to ensure complete combustion. | 50 | PPMVD @ 3% O2 | 0.0370 |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 13.2 | MMBTU/H | Carbon Monoxide | Good combustion practice to ensure complete combustion. | 50 | PPMVD @ 3% O2 | 0.0370 |
| TX-0851 | 12/17/2018  ACT | Thermal Oxidizer | 13.31 | NATL GAS | 71.3 | MMBTU/HR | Carbon Monoxide | Natural Gas / Clean Fuel, good combustion practices. | 0.082 | LB/MMBTU | 0.0820 |
| TX-0888 | 04/23/2020  ACT | Heaters | 13.31 | natural gas | 100 | MMBtu | Carbon Monoxide | Good combustion practice and proper design. | 50 | PPMVD | |
| VA-0321 | 03/12/2013  ACT | AUXILIARY BOILER | 13.31 | Natural Gas | 66.7 | MMBTU/H | Carbon Monoxide | Clean fuel and good combustion practices | 50 | PPMVD | 0.0370 |
| VA-0321 | 03/12/2013  ACT | Auxiliary Boiler (30.6 mmBtu/hr) | 13.31 | natural gas | 263000000 | standard cubic ft | Carbon Monoxide | clean fuel (natural gas) and good combustion practices | 50 | PPMVD | 0.0370 |
| WI-0259 | 04/16/2012  ACT | B10 - Natural Gas-Fired Package Boiler | 13.31 | Natural Gas | 33 | MMBtu per hour | Carbon Monoxide | | 0.109 | POUNDS PER MMBTU | 0.1090 |
| *WI-0283 | 04/24/2018  ACT | B01-B12, Boilers | 13.31 | Natural Gas | 28 | mmBTU/hr | Carbon Monoxide | Ultra-low NOx Burners, Flue Gas Recirculation and Good Combustion Practices | 25 | PPMVD | 0.0185 |
| *WI-0284 | 04/24/2018  ACT | B13-B24 & B25-B36 Natural Gas-Fired Boilers | 13.31 | Natural Gas | 28 | mmBTU | Carbon Monoxide | Ultra-Low NOx Burners, Flue Gas Recirculation, and Good Combustion Practices. | 25 | PPMVD | |
| *WI-0291 | 01/28/2019  ACT | P05 Natural Gas Fired Line Heater | 13.31 | Natural Gas | 1.5 | mmBTU/hr | Carbon Monoxide | Good Combustion Practices | 0.082 | LB/MMBTU | 0.0820 |
| *WV-0029 | 03/27/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 77.8 | mmBtu/hr | Carbon Monoxide | Good Combustion Practices | 2.88 | LB/HR | 0.0370 |
| *WV-0032 | 09/18/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas/Ethane | 111.9 | mmBtu/hr | Carbon Monoxide | Good Combustion Practices | 4.14 | LB/HR | 0.0370 |
| WY-0070 | 08/28/2012  ACT | Inlet Air Heater (EP06) | 13.31 | Natural Gas | 16.1 | MMBTU/H | Carbon Monoxide | good combustion practices | 0.08 | LB/MMBTU | 0.0800 |
| WY-0070 | 08/28/2012  ACT | Inlet Air Heater (EP07) | 13.31 | Natural Gas | 16.1 | MMBTU/H | Carbon Monoxide | good combustion practices | 0.08 | LB/MMBTU | 0.0800 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - CO (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WY-0070 | 08/28/2012  ACT | Inlet Air Heater (EP08) | 13.31 | Natural Gas | 16.1 | MMBTU/H | Carbon Monoxide | good combustion practices | 0.08 | LB/MMBTU | 0.0800 |
| WY-0070 | 08/28/2012  ACT | Inlet Air Heater (EP09) | 13.31 | Natural Gas | 16.1 | MMBTU/H | Carbon Monoxide | good combustion practices | 0.08 | LB/MMBTU | 0.0800 |
| WY-0070 | 08/28/2012  ACT | Inlet Air Heater (EP10) | 13.31 | Natural Gas | 16.1 | MMBTU/H | Carbon Monoxide | good combustion practices | 0.08 | LB/MMBTU | 0.0800 |
| WY-0070 | 08/28/2012  ACT | Inlet Air Heater (EP11) | 13.31 | Natural Gas | 16.1 | MMBTU/H | Carbon Monoxide | good combustion practices | 0.08 | LB/MMBTU | 0.0800 |
| WY-0075 | 07/16/2014  ACT | Auxiliary Boiler | 13.31 | natual gas | 25.06 | MMBtu/h | Carbon Monoxide | good combustion | 0.0375 | LB/MMBTU | 0.0375 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - $NO_X$ (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0083 | 01/06/2015  ACT | Five (5) Waste Heat Boilers | 13.31 | Natural Gas | 50 | MMBTU/H | Nitrogen Oxides (NOx) | Selective Catalytic Reduction | 7 | PPMV | 0.0258 |
| *AK-0085 | 08/13/2020  ACT | Two (2) Buyback Gas Bath Heaters and Three (3) Operations Camp Heaters | 13.31 | Natural Gas | 32 | MMBtu/hr | Nitrogen Oxides (NOx) | Low NOx Burners, Good Combustion Practices, Limited Operation of 500 hours per year per heater. | 0.036 | LB/MMBTU | 0.0360 |
| *AL-0329 | 09/21/2021  ACT | Three Gas Heaters | 13.31 | Natural Gas | 10 | MMBtu/hr | Nitrogen Oxides (NOx) | | 0.011 | LB/MMBTU | 0.0110 |
| AL-0307 | 10/09/2015  ACT | PACKAGE BOILER | 13.31 | NATURAL GAS | 17.5 | MMBTU/H | Nitrogen Oxides (NOx) | LOW NOX BURNER<br>FLUE GAS RECIRCULATION<br>GCP | 30 | PPMVD | 0.0364 |
| AL-0307 | 10/09/2015  ACT | 2 CALP LINE BOILERS | 13.31 | NATURAL GAS | 24.59 | MMBTU/H | Nitrogen Oxides (NOx) | LOW NOX BURNER<br>FLUE GAS RECIRCULATION (FGR)<br>GOOD COMBUSTION PRACTICES (GCP) | 30 | PPMVD | 0.0364 |
| AR-0140 | 09/18/2013  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 67 | MMBTU/H | Nitrogen Oxides (NOx) | LOW NOX BURNERS<br>COMBUSTION OF CLEAN FUEL<br>GOOD COMBUSTION PRACTICES | 0.035 | LB/MMBTU | 0.0350 |
| AR-0140 | 09/18/2013  ACT | BOILERS SN-26 AND 27, GALVANIZING LINE | 13.31 | NATURAL GAS | 24.5 | MMBTU/H | Nitrogen Oxides (NOx) | LOW NOX BURNERS<br>COMBUSTION OF CLEAN FUEL<br>GOOD COMBUSTION PRACTICES | 0.035 | LB/MMBTU | 0.0350 |
| AR-0140 | 09/18/2013  ACT | FURNACES SN-40 AND SN-42, DECARBURIZING LINE | 13.31 | NATURAL GAS | 22 | MMBTU/H | Nitrogen Oxides (NOx) | LOW NOX BURNERS<br>SCR<br>COMBUSTION OF CLEAN FUEL<br>GOOD COMBUSTION PRACTICES | 0.1 | LB/MMBTU | 0.1000 |
| AR-0155 | 11/07/2018  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 53.7 | MMBTU/HR | Nitrogen Oxides (NOx) | LOW NOX BURNERS COMBUSTION OF CLEAN FUEL GOOD COMBUSTION PRACTICES | 0.035 | LB/MMBTU | 0.0350 |
| AR-0155 | 11/07/2018  ACT | BOILER SN-26, GALVANIZING LINE | 13.31 | NATURAL GAS | 53.7 | MMBTU/HR | Nitrogen Oxides (NOx) | LOW NOX BURNERS COMBUSTION OF CLEAN FUEL GOOD COMBUSTION PRACTICES | 0.035 | LB/MMBTU | 0.0350 |
| AR-0155 | 11/07/2018  ACT | PREHEATER, GALVANIZING LINE SN-28 | 13.31 | NATURAL GAS | 78.2 | MMBTU/HR | Nitrogen Oxides (NOx) | SCR, LOW NOX BURNERS, AND COMBUSTION OF CLEAN FUEL AND GOOD COMBUSTION PRACTICES | 0.035 | LB/MMBTU | 0.0350 |
| AR-0159 | 04/05/2019  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 0 | | Nitrogen Oxides (NOx) | LOW NOX BURNERS COMBUSTION OF CLEAN FUEL GOOD COMBUSTION PRACTICES | 0.035 | LB/MMBTU | 0.0350 |
| AR-0159 | 04/05/2019  ACT | PREHEATERS, GALVANIZING LINE SN-28 and SN-29 | 13.31 | NATURAL GAS | 0 | | Nitrogen Oxides (NOx) | SCR, LOW NOX BURNERS, AND COMBUSTION OF CLEAN FUEL AND GOOD COMBUSTION PRACTICES | 0.035 | LB/MMBTU | 0.0350 |
| AR-0159 | 04/05/2019  ACT | BOILER, ANNEALING PICKLE LINE | 13.31 | NATURAL GAS | 0 | | Nitrogen Oxides (NOx) | Low NOx burners, Combustion of clean fuel, and Good Combustion Practices | 0.035 | LB/MMBTU | 0.0350 |
| AR-0159 | 04/05/2019  ACT | BOILERS SN-26 AND SN-27, GALVANIZING LINE | 13.31 | NATURAL GAS | 0 | | Nitrogen Oxides (NOx) | LOW NOX BURNERS COMBUSTION OF CLEAN FUEL GOOD COMBUSTION PRACTICES | 0.035 | LB/MMBTU | 0.0350 |
| AR-0167 | 12/01/2020  ACT | SN-803 - #4 Pre-Flash Column Reboiler | 13.31 | Natural Gas | 40 | MMBtu/hr | Nitrogen Oxides (NOx) | Ultra-low NOx burners and good combustion practice | 1.9 | LB/HR | 0.0475 |
| AR-0167 | 12/01/2020  ACT | SN-805 - #4 Pre-Flash Reboiler | 13.31 | Natural Gas | 75 | MMBtu/hr | Nitrogen Oxides (NOx) | Ultra-low NOx burners and good combustion practice | 3.5 | LB/HR | 0.0467 |
| AR-0167 | 12/01/2020  ACT | SN-808 - #7 FCCU Furnace | 13.31 | Natural Gas | 56 | MMBtu/hr | Nitrogen Oxides (NOx) | Good combustion practice | 2.8 | LB/HR | 0.0500 |
| AR-0167 | 12/01/2020  ACT | SN-810 - #9 Hydrotreater Furnace/Reboiler | 13.31 | Natural Gas | 70 | MMBtu/hr | Nitrogen Oxides (NOx) | | 12.7 | LB/HR | 0.1814 |

## BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - $NO_X$ (Gas-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AR-0167 | 12/01/2020  ACT | SN-842 - #12 Unit Distillate Hydrotreater | 13.31 | Natural Gas | 50 | MMBtu/hr | Nitrogen Oxides (NOx) | Good combustion practice | 5.3 | LB/HR | 0.1060 |
| AR-0168 | 03/17/2021  ACT | Galvanizing Line #2 Furnace | 13.31 | Natural Gas | 150.5 | MMBtu/hr | Nitrogen Oxides (NOx) | SCR, Low NOx burners<br>Combustion of clean fuel<br>Good Combustion Practices | 0.035 | LB/MMBTU | 0.0350 |
| AR-0168 | 03/17/2021  ACT | Decarburizing Line Furnace Section | 13.31 | Natural Gas | 58 | MMBtu/hr | Nitrogen Oxides (NOx) | Low NOx burners<br>SCR<br>Combustion of clean fuel<br>Good Combustion Practices | 0.1 | LB/MMBTU | 0.1000 |
| *AR-0172 | 09/01/2021  ACT | SN-202, 203, 204 Pickle Line Boilers | 13.31 | Natural Gas | 0 | | Nitrogen Oxides (NOx) | Low NOx burners | 0.035 | LB/MMBTU | 0.0350 |
| CA-1185 | 06/07/2011  ACT | Boiler, Forced Dratf | 13.31 | Natural gas | 3 | MMBTU/H | Nitrogen Oxides (NOx) | Forced draft, full modulation, flue gas recirculation | 12 | PPMVD@3% O2 | 0.0146 |
| CA-1189 | 01/24/2012  ACT | Boiler | 13.31 | Propane, field gas, PUC natural gas | 2 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx Burner | 20 | PPMVD@3% O2 | 0.0243 |
| CA-1190 | 01/24/2012  ACT | Heater | 13.31 | Propane, field gas, PUC natural gas | 3 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burner | 12 | PPMVD@3% O2 | 0.0146 |
| CA-1192 | 06/21/2011  ACT | AUXILIARY BOILER | 13.31 | NATURAL GAS | 37.4 | MMBTU/H | Nitrogen Oxides (NOx) | ULTRA LOW NOX BURNER, USE PUC QUALITY NATURAL GAS, OPERATIONAL RESTRICTION OF 46, 675 MMBTU/YR | 9 | PPMVD | 0.0109 |
| CT-0159 | 11/30/2015  ACT | Aux Boiler | 13.31 | Natural Gas | 359.6 | MMCF | Nitrogen Oxides (NOx) | Boiler permit does not specify any add-on control other than ultr-low NOx burner. Unit may be required to use additional control options to meet emissions limit. | 7 | PPMVD @3% O2 | 0.0085 |
| FL-0335 | 09/05/2012  ACT | Four(4) Natural Gas Boilers - 46 MMBtu/hour | 13.31 | Natural Gas | 46 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx Burner and Flue Gas Recirculation | 0.036 | LB/MMBTU | 0.0360 |
| FL-0356 | 03/09/2016  ACT | Auxiliary Boiler, 99.8 MMBtu/hr | 13.31 | Natural gas | 99.8 | MMBtu/hr | Nitrogen Oxides (NOx) | Low-NOx burners | 0.05 | LB/MMBTU | 0.0500 |
| FL-0356 | 03/09/2016  ACT | Two natural gas heaters | 13.31 | Natural gas | 10 | MMBtu/hr | Nitrogen Oxides (NOx) | Must have NOx emission design value less than 0.1 lb/MMBtu | 0.1 | LB/MMBTU | 0.1000 |
| *FL-0363 | 12/04/2017  ACT | Two natural gas heaters | 13.31 | Natural gas | 9.9 | MMBtu/hr | Nitrogen Oxides (NOx) | Manufacturer certification | 0.1 | LB/MMBTU | 0.1000 |
| *FL-0367 | 07/27/2018  ACT | 60 MMBtu/hour Auxiliary Boiler | 13.31 | Natural Gas | 60 | MMBtu/hour | Nitrogen Oxides (NOx) | low-NOx burners | 0.05 | LB/MMBTU | 0.0500 |
| IA-0107 | 04/14/2014  ACT | dew point heater | 13.31 | natural gas | 13.32 | mmBtu/hr | Nitrogen Oxides (NOx) | | 0.013 | LB/MMBTU | 0.0130 |
| IA-0107 | 04/14/2014  ACT | auxiliary boiler | 13.31 | natural gas | 60.1 | mmBtu/hr | Nitrogen Oxides (NOx) | | 0.013 | LB/MMBTU | 0.0130 |
| IL-0129 | 07/30/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 96 | mmBtu/hr | Nitrogen Oxides (NOx) | Ultra-low NOx burners and flue gas recirculation, air preheater, automated combustion management system with O2 trim system and automated water blowdown, and good combustion practices. | 0.011 | LB/MMBTU | 0.0110 |
| IL-0130 | 12/31/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 96 | mmBtu/hr | Nitrogen Oxides (NOx) | Ultra low-NOx burners and flue gas recirculation air preheater, automated combustion management systems, automated water blowdown, good combustion practices | 0.01 | LB/MMBTU | 0.0100 |
| IN-0158 | 12/03/2012  ACT | TWO (2) NATURAL GAS AUXILIARY BOILERS | 13.31 | NATURAL GAS | 80 | MMBTU/H | Nitrogen Oxides (NOx) | LOW NOX BURNER WITH FLUE GAS RECIRCULATION | 0.032 | LB/MMBTU | 0.0320 |
| IN-0263 | 03/23/2017  ACT | STARTUP HEATER EU-002 | 13.31 | NATURAL GAS | 70 | MMBTU/HR | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 12.611 | LB/H | 0.1802 |
| IN-0285 | 08/02/2017  ACT | Space Heaters | 13.31 | | 0 | | Nitrogen Oxides (NOx) | | 0.05 | LB/MMBTU | 0.0500 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - $NO_X$ (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *KS-0030 | 03/31/2016  ACT | Indirect fuel-gas heater | 13.31 | | 2 | mmBTU/hr | Nitrogen Oxides (NOx) | | 0.2 | LB/H | 0.1000 |
| KY-0110 | 07/23/2020  ACT | EP 15-01 - Natural Gas Direct-Fired Space Heaters, Process Water Heaters, & Air Makeup Heaters | 13.31 | Natural Gas | 40 | MMBtu/hr, combined | Nitrogen Oxides (NOx) | Low-Nox Burner (Designed to maintain 0.07 lb/MMBtu); and a Good Combustion and Operating Practices (GCOP) Plan. | 70 | LB/MMSCF | 0.0686 |
| KY-0110 | 07/23/2020  ACT | EP 05-01 - Group 1 Car Bottom Furnaces #1 - #3 | 13.31 | Natural Gas | 28 | MMBtu/hr, each | Nitrogen Oxides (NOx) | Low-Nox Burner (Designed to maintain 0.08 lb/MMBtu); and a Good Combustion and Operating Practices (GCOP) Plan. | 81.6 | LB/MMSCF | 0.0800 |
| KY-0110 | 07/23/2020  ACT | EP 04-02 - Austenitizing Furnace | 13.31 | Natural Gas | 54 | MMBtu/hr | Nitrogen Oxides (NOx) | Low-Nox Burner (Designed to maintain 0.15 lb/MMBtu in flameless mode and 0.25 lb/MMBtu in flame mode); and a Good Combustion and Operating Practices (GCOP) Plan. | 158 | LB/MMSCF | 0.1549 |
| KY-0110 | 07/23/2020  ACT | EP 05-02 - Group 2 Car Bottom Furnaces A & B | 13.31 | Natural Gas | 60 | MMBtu/hr, combined | Nitrogen Oxides (NOx) | Low-Nox Burner (Designed to maintain 0.08 lb/MMBtu); and a Good Combustion and Operating Practices (GCOP) Plan. | 81.6 | LB/MMSCF | 0.0800 |
| KY-0110 | 07/23/2020  ACT | EP 03-02 - Ingot Car Bottom Furnaces #1-#4 | 13.31 | Natural Gas | 37 | MMBtu/hr, each | Nitrogen Oxides (NOx) | Low-Nox Burner (Designed to maintain 0.18 lb/MMBtu); and a Good Combustion and Operating Practices (GCOP) Plan. | 181.6 | LB/MMSCF | 0.1780 |
| KY-0110 | 07/23/2020  ACT | EP 03-05 - Steckel Mill Coiling Furnaces #1 & #2 | 13.31 | Natural Gas | 17.5 | MMBtu/hr, each | Nitrogen Oxides (NOx) | Low-Nox Burner (Designed to maintain 0.08 lb/MMBtu); and a Good Combustion and Operating Practices (GCOP) Plan. | 81.6 | LB/MMSCF | 0.0800 |
| KY-0110 | 07/23/2020  ACT | EP 04-03 - Tempering Furnace | 13.31 | Natural Gas | 48 | MMBtu/hr | Nitrogen Oxides (NOx) | Low-Nox Burner (Designed to maintain 0.07 lb/MMBtu); and a Good Combustion and Operating Practices (GCOP) Plan. | 70 | LB/MMSCF | 0.0686 |
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Makeup Air Units (EP 21-19) | 13.31 | Natural Gas | 40 | MMBtu/hr, total | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 100 | LB/MMSCF | 0.0980 |
| KY-0115 | 04/19/2021  ACT | Vacuum Degasser Boiler (EP 20-13) | 13.31 | Natural Gas | 50.4 | MMBtu/hr | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan. Also equipped with low-NOx burners. | 35 | LB/MMSCF | 0.0343 |
| KY-0115 | 04/19/2021  ACT | Pickle Line #2 â€" Boiler #1 & #2 (EP 21-04 & EP 21-05) | 13.31 | Natural Gas | 18 | MMBtu/hr, each | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan. Equipped with low-NOx burners. | 50 | LB/MMSCF | 0.0490 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Alkali Cleaning Section Heater (EP 21-07B) | 13.31 | Natural Gas | 23 | MMBtu/hr | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan. This unit is also required to be equipped with low-NOx burners (0.07 lb/MMBtu). | 50 | LB/MMSCF | 0.0490 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Radiant Tube Furnace (EP 21-08B) | 13.31 | Natural Gas | 36 | MMBtu/hr | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan. This unit is also equipped with a SCR/SNCR system to control emissions. During a cold start, SCR does not reach operating temperature for approximately 30 minutes. During this time, only low-NOx burners are controlling emissions of NOx. NSG estimates the unit may undergo 1 cold start every two (2) weeks. | 7.5 | LB/MMSCF | 0.0074 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - $NO_X$ (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Annealing Furnaces (15) (EP 21-15) | 13.31 | Natural Gas | 4.8 | MMBtu/hr, each | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan. This unit is equipped with low-NOx burners. | 50 | LB/MMSCF | 0.0490 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Preheat Furnace (EP 21-08A) | 13.31 | Natural Gas | 94 | MMBtu/hr | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan. This unit is also equipped with a SCR/SNCR system to control emissions. During a cold start, SCR does not reach operating temperature for approximately 30 minutes. During this time, only low-NOx burners are controlling emissions of NOx. NSG estimates the unit may undergo 1 cold start every two (2) weeks. | 7.5 | LB/MMSCF | 0.0074 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Zinc Pot Preheater (EP 21-09) | 13.31 | Natural Gas | 3 | MMBtu/hr | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan. This unit is equipped with a low-NOx burner. | 70 | LB/MMSCF | 0.0686 |
| KY-0115 | 04/19/2021  ACT | Heated Transfer Table Furnace (EP 02-03) | 13.31 | Natural Gas | 65.5 | MMBtu/hr | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan. Equipped with low NOx burners (0.07 lb/MMBtu). | 70 | LB/MMSCF | 0.0686 |
| LA-0305 | 06/30/2016  ACT | Gasifier Start-up Preheat Burners | 13.31 | Natural gas | 23 | MM BTU/hr (each) | Nitrogen Oxides (NOx) | good engineering practices, good combustion technology, and use of clean fuels | 0 | | |
| LA-0305 | 06/30/2016  ACT | WSA Preheat Burners | 13.31 | Natural Gas | 0 | | Nitrogen Oxides (NOx) | good engineering design and practices and use of clean fuels | 0 | | |
| LA-0307 | 03/21/2016  ACT | Regenerative Heaters | 13.31 | natural gas | 7.37 | mm btu/hr | Nitrogen Oxides (NOx) | good combustion practices | 0 | | |
| *LA-0315 | 05/23/2014  ACT | Reactor Charge Heater - 53B001 | 13.31 | Natural Gas | 10.1 | MMBTU/HR | Nitrogen Oxides (NOx) | Ultra-Low NOx Burners (ULNB) | 0.4 | LB/H | 0.0400 |
| *LA-0315 | 05/23/2014  ACT | Regeneraton Heater - 51B001 | 13.31 | Natural Gas | 61 | MMBTU/HR | Nitrogen Oxides (NOx) | Ultra-Low NOx Burners (ULNB) | 2.44 | LB/H | 0.0400 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002A | 13.31 | Natural Gas | 33 | MMBTU/HR | Nitrogen Oxides (NOx) | Ultra-Low NOx Burners (ULNB) | 1.3 | LB/H | 0.0400 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002B | 13.31 | Natural Gas | 33 | MMBTU/HR | Nitrogen Oxides (NOx) | Ultra-Low NOx Burners (ULNB) | 1.3 | LB/H | 0.0400 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002C | 13.31 | Natural Gas | 33 | MMBTU/HR | Nitrogen Oxides (NOx) | Ultra-Low NOx Burners (ULNB) | 1.3 | LB/H | 0.0400 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002D | 13.31 | Natural Gas | 33 | MMBTU/HR | Nitrogen Oxides (NOx) | Ultra-Low NOx Burners (ULNB) | 1.3 | LB/H | 0.0400 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002E | 13.31 | Natural Gas | 33 | MMBTU/HR | Nitrogen Oxides (NOx) | Ultra-Low NOx Burners (ULNB) | 1.3 | LB/H | 0.0400 |
| *LA-0349 | 07/10/2018  ACT | Hot Oil Heaters (5) | 13.31 | natural gas | 16.13 | mm btu/hr | Nitrogen Oxides (NOx) | ULNB and Good Combustion Practices | 0 | | |
| *LA-0364 | 01/06/2020  ACT | Hot Oil Heaters 1 and 2 | 13.31 | Natural Gas | 0 | | Nitrogen Oxides (NOx) | LNB | 0.06 | LB/MMBTU | 0.0600 |
| *LA-0364 | 01/06/2020  ACT | PR Waste Heat Boiler | 13.31 | Natural Gas | 94 | mm btu/h | Nitrogen Oxides (NOx) | SCR and LNB | 14.41 | LB/H | 0.1533 |
| MA-0039 | 01/30/2014  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 80 | MMBTU/H | Nitrogen Oxides (NOx) | ultra low NOx burners | 0.011 | LB/MMBTU | 0.0110 |
| MD-0041 | 04/23/2014  ACT | AUXILLARY BOILER | 13.31 | NATURAL GAS | 93 | MMBTU/H | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF NATURAL GAS, ULTRA LOW-NOX BURNERS, AND FLUE GAS RECIRCULATION (FGR) | 0.011 | LB/MMBTU | 0.0110 |
| MD-0042 | 04/08/2014  ACT | AUXILLARY BOILER | 13.31 | NATURAL GAS | 45 | MMBTU/H | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF PIPELINE QUALITY NATURAL GAS AND GOOD COMBUSTION PRACTICES | 0.01 | LB/MMBTU | 0.0100 |

## BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - $NO_X$ (Gas-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MD-0045 | 11/13/2015  ACT | AUXILIARY BOILER | 13.31 | NATURAL GAS | 42 | MMBTU/H | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF PIPELINE QUALITY NATURAL GAS, ULTRA LOW-NOX BURNERS, AND GOOD COMBUSTION PRACTICES | 0.01 | LB/MMBTU | 0.0100 |
| MD-0046 | 10/31/2014  ACT | AUXILIARY BOILER | 13.31 | PIPELINE QUALITY NATURAL GAS | 93 | MMBTU/H | Nitrogen Oxides (NOx) | EFFICIENT BOILER DESIGN WITH ULTRA LOW NOX BURNER, EXCLUSIVE USE OF PIPELINE QUALITY NATURAL GAS, AND APPLICATION OF GOOD COMBUSTION PRACTICES | 0.01 | LB/MMBTU | 0.0100 |
| MI-0406 | 11/01/2013  ACT | FG-AUXBOILER1-2; Two (2) natural gas-fired auxiliary boilers. | 13.31 | natural gas | 40 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices. | 0.035 | LB/MMBTU | 0.0350 |
| MI-0410 | 07/25/2013  ACT | FGAUXBOILERS: Two auxiliary boilers < 100 MMBTU/H heat input each | 13.31 | natural gas | 100 | MMBTU/H heat input each | Nitrogen Oxides (NOx) | Low NOx burners and flue gas recirculation. | 0.05 | LB/MMBTU | 0.0500 |
| MI-0412 | 12/04/2013  ACT | Fuel pre-heater (EUFUELHTR) | 13.31 | natural gas | 3.7 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices. | 0.55 | LB/H | 0.1486 |
| MI-0412 | 12/04/2013  ACT | Auxiliary Boiler B (EUAUXBOILERB) | 13.31 | natural gas | 95 | MMBTU/H | Nitrogen Oxides (NOx) | Dry low NOx burners, flue gas recirculation and good combustion practices. | 0.05 | LB/MMBTU | 0.0500 |
| MI-0412 | 12/04/2013  ACT | Auxiliary Boiler A (EUAUXBOILERA) | 13.31 | natural gas | 55 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burners and good combustion practices | 0.05 | LB/MMBTU | 0.0500 |
| MI-0420 | 06/03/2016  ACT | FGAUXBOILERS | 13.31 | Natural gas | 6 | MMBTU/H | Nitrogen Oxides (NOx) | Ultra low NOx burners and good combustion practices. | 14 | PPMVOL | 0.0516 |
| MI-0421 | 08/26/2016  ACT | EUFLTOS1 in FGTOH (Thermal Oil System for Thermally Fused Lamination Lines) | 13.31 | Natural gas | 34 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burners and good design and combustion practices. | 0.05 | LB/MMBTU | 0.0500 |
| MI-0421 | 08/26/2016  ACT | EUTOH (In FGTOH)--Thermal Oil Heater | 13.31 | Natural gas | 34 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burners and good design and combustion practices. | 0.05 | LB/MMBTU | 0.0500 |
| MI-0423 | 01/04/2017  ACT | FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2) | 13.31 | Natural gas | 27 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices. | 2.65 | LB/H | 0.0981 |
| MI-0424 | 12/05/2016  ACT | EUFUELHTR (Fuel pre-heater) | 13.31 | Natural gas | 3.7 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices. | 0.55 | LB/H | 0.1486 |
| MI-0424 | 12/05/2016  ACT | EUAUXBOILER (Auxiliary boiler) | 13.31 | natural gas | 83.5 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burners/Internal flue gas recirculation and good combustion practices. | 0.05 | LB/MMBTU | 0.0500 |
| MI-0425 | 05/09/2017  ACT | EUTOH in FGTOH | 13.31 | Natural gas | 38 | MMBTU/H | Nitrogen Oxides (NOx) | Good design and combustion practices, Low NOx burners. | 0.05 | LB/MMBTU | 0.0500 |
| MI-0425 | 05/09/2017  ACT | EUFLTOS1 in FGTOH | 13.31 | Natural gas | 10.2 | MMBTU/H | Nitrogen Oxides (NOx) | Good design and combustion practices, low NOx burners. | 0.05 | LB/MMBTU | 0.0500 |
| MI-0426 | 03/24/2017  ACT | FGAUXBOILERS (6 auxiliary boilers EUAUXBOIL2A, EUAUXBOIL3A, EUAUXBOIL2B, EUAUXBOIL3B, EUAUXBOIL2C, EUAUXBOIL3C) | 13.31 | Natural gas | 3 | MMBTU/H | Nitrogen Oxides (NOx) | Ultra-low NOx burners and good combustion practices. | 20 | PPM AT 3% O2 | 0.0243 |

## BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - $NO_X$ (Gas-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0433 | 06/29/2018  ACT | EUAUXBOILER (North Plant): Auxiliary Boilder | 13.31 | Natural gas | 61.5 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burners/flue gas recirculation and good combustion practices. | 0.04 | LB/MMBTU | 0.0400 |
| MI-0433 | 06/29/2018  ACT | EUAUXBOILER (South Plant): Auxiliary Boiler | 13.31 | Natural gas | 61.5 | MMBTU/h | Nitrogen Oxides (NOx) | Low NOx burners/flue gas recirculation and good combustion practices. | 0.04 | LB/MMBTU | 0.0400 |
| MI-0435 | 07/16/2018  ACT | EUAUXBOILER: Auxiliary Boiler | 13.31 | Natural gas | 99.9 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burners/Flue gas recirculation. | 0.036 | LB/MMBTU | 0.0360 |
| MI-0435 | 07/16/2018  ACT | EUFUELHTR1: Natural gas fired fuel heater | 13.31 | Natural gas | 20.8 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burner | 0.75 | LB/H | 0.0361 |
| MI-0435 | 07/16/2018  ACT | EUFUELHTR2: Natural gas fired fuel heater | 13.31 | Natural gas | 3.8 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burner | 0.14 | LB/H | 0.0368 |
| *MI-0440 | 05/22/2019  ACT | FGFUELHEATERS | 13.31 | natural gas | 25 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burners and good combustion practices. | 0.05 | LB/MMBTU | 0.0500 |
| *MI-0441 | 12/21/2018  ACT | EUAUXBOILER--natural gas fired auxiliary boiler rated at <= 99MMBTU/H | 13.31 | Natural gas | 99 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burners (LNB) or flue gas recirculation along with good combustion practices. | 30 | PPM | 0.0364 |
| *MI-0442 | 08/21/2019  ACT | FGAUXBOILER | 13.31 | Natural gas | 80 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices and low NOx burners. | 0.036 | LB/MMBTU | 0.0360 |
| *MI-0442 | 08/21/2019  ACT | FGPREHEAT | 13.31 | natural gas | 7 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices and low NOx burners | 0.036 | LB/MMBTU | 0.0360 |
| *MI-0445 | 11/26/2019  ACT | FGFUELHTR (2 fuel pre-heaters) | 13.31 | Natural gas | 27 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices | 1.32 | LB/H | 0.0489 |
| NJ-0079 | 07/25/2012  ACT | Commercial/Institutional size boilers less than 100 MMBtu/hr | 13.31 | natural gas | 2000 | hours/year | Nitrogen Oxides (NOx) | Low NOx burners | 0.01 | LB/MMBTU | 0.0100 |
| NJ-0080 | 11/01/2012  ACT | Boiler less than 100 MMBtu/hr | 13.31 | Natural Gas | 51.9 | mmcubic ft/year | Nitrogen Oxides (NOx) | Low NOx burners and flue gas recirculation | 0.01 | LB/MMBTU | 0.0100 |
| NJ-0084 | 03/10/2016  ACT | Auxiliary Boiler firing natural gas | 13.31 | natural gas | 687 | MMCFT/YR | Nitrogen Oxides (NOx) | low NOx burners and flue gas recirculation (FGR) | 0.8 | LB/H | 0.0100 |
| NJ-0085 | 07/19/2016  ACT | AUXILIARY BOILER | 13.31 | Natural GAS | 4000 | H/YR | Nitrogen Oxides (NOx) | Low NOx burners and Flue Gas Recirculation (FGR) and use of natural gas a clean burning fuel | 0.975 | LB/H | 0.0100 |
| NY-0103 | 02/03/2016  ACT | Auxiliary boiler | 13.31 | natural gas | 60 | MMBTU/H | Nitrogen Oxides (NOx) | flue gas recirculation with low NOx burners | 0.0085 | LB/MMBTU | 0.0085 |
| NY-0104 | 08/01/2013  ACT | Auxiliary boiler | 13.31 | natural gas | 0 | | Nitrogen Oxides (NOx) | Flue gas recirculation with low NOx burners. | 0.045 | LB/MMBTU | 0.0450 |
| OH-0350 | 07/18/2012  ACT | Steam Boiler | 13.31 | Natural Gas | 65 | MMBtu/H | Nitrogen Oxides (NOx) | | 0.07 | LB/MMBTU | 0.0700 |
| OH-0352 | 06/18/2013  ACT | Auxillary Boiler | 13.31 | Natural Gas | 99 | MMBtu/H | Nitrogen Oxides (NOx) | low NOx burners and flue gas recirculation | 1.98 | LB/H | 0.0200 |
| OH-0355 | 05/07/2013  ACT | 4 Indirect-Fired Air Preheaters | 13.31 | Natural gas | 0 | | Nitrogen Oxides (NOx) | | 0.14 | LB/MMBTU | 0.1400 |
| OH-0360 | 11/05/2013  ACT | Auxiliary Boiler (B001) | 13.31 | Natural Gas | 99 | MMBtu/H | Nitrogen Oxides (NOx) | low NOx burners and flue gas recirculation | 1.98 | LB/H | 0.0200 |
| OH-0366 | 08/25/2015  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 34 | MMBTU/H | Nitrogen Oxides (NOx) | Flue gas recirculation (FGR) and low NOx burner | 0.68 | LB/H | 0.0200 |
| OH-0367 | 09/23/2016  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 99 | MMBTU/H | Nitrogen Oxides (NOx) | Flue gas recirculation (FGR), low NOx burner, and natural gas/ultra low sulfur diesel | 9.9 | LB/H | 0.0200 |
| OH-0368 | 04/19/2017  ACT | Startup Heater (B001) | 13.31 | Natural gas | 100 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion control (i.e., high temperatures, sufficient excess air, sufficient residence times, and god air/fuel mixing). | 10 | LB/H | 0.1000 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - $NO_X$ (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0370 | 09/07/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 37.8 | MMBTU/H | Nitrogen Oxides (NOx) | Flue gas recirculation (FGR), low NOx burner | 0.76 | LB/H | 0.0200 |
| OH-0372 | 09/27/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 37.8 | MMBTU/H | Nitrogen Oxides (NOx) | low NOX burners and flue gas recirculation | 0.76 | LB/H | 0.0200 |
| OH-0374 | 10/23/2017  ACT | Fuel Gas Heaters (2 identical, P007 and P008) | 13.31 | Natural gas | 15 | MMBTU/H | Nitrogen Oxides (NOx) | Low-NOx gas burner | 0.3 | LB/H | 0.0200 |
| OH-0375 | 11/07/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 26.8 | MMBTU/H | Nitrogen Oxides (NOx) | Flue gas recirculation and low NOX burner | 0.29 | LB/H | 0.0110 |
| OH-0377 | 04/19/2018  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 44.55 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices and low NOx burner | 1.56 | LB/H | 0.0350 |
| OH-0377 | 04/19/2018  ACT | Auxiliary Boiler (B002) | 13.31 | Natural gas | 80 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices and low NOx burner | 2.19 | LB/H | 0.0270 |
| OH-0379 | 02/06/2019  ACT | Startup boiler (B001) | 13.31 | Natural gas | 15.17 | MMBTU/H | Nitrogen Oxides (NOx) | Low-NOX burners, good combustion practices and the use of natural gas | 0.634 | LB/H | 0.0418 |
| OH-0379 | 02/06/2019  ACT | Ladle Preheaters (P002, P003 and P004) | 13.31 | Natural gas | 15 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices and the use of natural gas | 2.12 | LB/H | 0.1410 |
| *OH-0381 | 09/27/2019  ACT | Tunnel Furnace #2 (P018) | 13.31 | Natural Gas | 88 | MMBTU/H | Nitrogen Oxides (NOx) | Use of natural gas, use of low NOx burners, good combustion practices and design | 6.16 | LB/H | 0.0700 |
| OK-0148 | 09/12/2012  ACT | Commercial/Institutional Boilers (<100 MMBTUH) | 13.31 | Natural Gas | 11.04 | MMBTUH | Nitrogen Oxides (NOx) | Low-NOx burners | 0.045 | LB/MMBTU | 0.0450 |
| OK-0153 | 03/01/2013  ACT | REGENERATION HEATERS | 13.31 | NATURAL GAS | 5.61 | MMBTUH | Nitrogen Oxides (NOx) | LOW-NOx BURNERS | 0.045 | LB/MMBTU | 0.0450 |
| OK-0153 | 03/01/2013  ACT | HOT OIL HEATER | 13.31 | NATURAL GAS | 17.4 | MMBTUH | Nitrogen Oxides (NOx) | LOW-NOx BURNERS. | 0.045 | LB/MMBTU | 0.0450 |
| OK-0156 | 07/31/2013  ACT | Refinery Boiler | 13.31 | Natural Gas | 5 | MMBTUH | Nitrogen Oxides (NOx) | Good Combustion | 0.0075 | LB/MMBTU | 0.0075 |
| OK-0173 | 01/19/2016  ACT | Heaters (Gas-Fired) | 13.31 | Natural Gas | 0 | | Nitrogen Oxides (NOx) | Natural Gas Fuel | 0.1 | LB/MMBTU | 0.1000 |
| OR-0050 | 03/05/2014  ACT | Auxiliary boiler | 13.31 | natural gas | 39.8 | MMBTU/H | Nitrogen Oxides (NOx) | Utilize Low-NOx burners and FGR. | 0.035 | LB/MMBTU | 0.0350 |
| PA-0291 | 04/23/2013  ACT | AUXILIARY BOILER | 13.31 | Natural Gas | 40 | MMBTU/H | Nitrogen Oxides (NOx) | | 0.011 | LB/MMBTU | 0.0110 |
| PA-0296 | 12/17/2013  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 40 | MMBTU/H | Nitrogen Oxides (NOx) | | 1.01 | T/YR | |
| PA-0307 | 06/15/2015  ACT | Auxilary Boiler | 13.31 | Natural Gas | 62.04 | MCF/hr | Nitrogen Oxides (NOx) | Good combustion practices, Ultra-Low NOx burners, FGR | 0.0086 | LB/MMBTU | 0.0086 |
| PA-0309 | 12/23/2015  ACT | Auxillary Boiler | 13.31 | Natural gas | 13.31 | MMBtu/hr | Nitrogen Oxides (NOx) | SCR and ultra low NOx burners, Fired only on natural gas supplied by a public utility. | 0.006 | LB/MMBTU | 0.0060 |
| PA-0310 | 09/02/2016  ACT | Auxilary boiler | 13.31 | Natural Gas | 92.4 | MMBtu/hr | Nitrogen Oxides (NOx) | Ultra low NOx burners, FGR, good combustion practices | 0.011 | LB/MMBTU | 0.0110 |
| PA-0311 | 09/01/2015  ACT | Auxilary Boiler | 13.31 | Natural Gas | 55.4 | MMBtu/hr | Nitrogen Oxides (NOx) | | 0.006 | LB/MMBTU | 0.0060 |
| *PA-0316 | 01/26/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 118800 | MMBtu/12 month period | Nitrogen Oxides (NOx) | ‘‘ultra-low NOx burners and flue gas re-circulation‘‘ operated in accordance with the manufacturerâ€™s specifications and good operating practices | 0.011 | LB | 0.0110 |
| *PA-0319 | 08/27/2018  ACT | NATURAL GAS FIRED AUXILIARY BOILER | 13.31 | Natural Gas | 88 | MMBtu/hr | Nitrogen Oxides (NOx) | Lo-NOx burners, Flue Gas Recirculation, good combustion practices, proper operation and maintainance. | 0.02 | LB/MMBTU | 0.0200 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - $NO_X$ (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SC-0113 | 02/08/2012  ACT | BOILERS | 13.31 | NATURAL GAS | 5 | MMBTU/H | Nitrogen Oxides (NOx) | GOOD DESIGN AND COMBUSTION PRACTICES, LOW NOX BURNERS, COMBUSTION OF NATURAL GAS/PROPANE. | 0 | | |
| SC-0149 | 01/03/2013  ACT | NATURAL GAS BOILER EU004 | 13.31 | NATURAL GAS | 46 | MMBTU/H | Nitrogen Oxides (NOx) | | 0.036 | LB/MMBTU | 0.0360 |
| SC-0149 | 01/03/2013  ACT | NATURAL GAS BOILER EU005 | 13.31 | NATURAL GAS | 46 | MMBTU/H | Nitrogen Oxides (NOx) | | 0.036 | LB/MMBTU | 0.0360 |
| SC-0149 | 01/03/2013  ACT | NATURAL GAS BOILER EU006 | 13.31 | NATURAL GAS | 46 | MMBTU/H | Nitrogen Oxides (NOx) | | 0.036 | LB/MMBTU | 0.0360 |
| TX-0656 | 05/16/2014  ACT | Heaters | 13.31 | natural gas | 45 | MMBTU/H | Nitrogen Oxides (NOx) | ultra low NOx burners | 0.036 | LB/MMBTU | 0.0360 |
| TX-0656 | 05/16/2014  ACT | heaters (5) | 13.31 | natural gas | 24.3 | MMBTU/H | Nitrogen Oxides (NOx) | ultra low NOx burners | 0.036 | LB/MMBTU | 0.0360 |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 17 | MMBTU/H | Nitrogen Oxides (NOx) | | 0 | | |
| TX-0663 | 05/25/2012  ACT | 8 Inlet Compressors | 13.31 | Natural Gas or electricity | 4.5 | MMBTU/H | Nitrogen Oxides (NOx) | Ultra lean burn and Dual Drive (electric/gas) technology | 0.5 | G/HP | |
| TX-0663 | 05/25/2012  ACT | Residue Compressors | 13.31 | Natural Gas | 4735 | hp | Nitrogen Oxides (NOx) | SCR | 0.05 | G/BHP | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 48 | MMBTU/H | Nitrogen Oxides (NOx) | Flue Gas Recirculation | 7.62 | TON | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 10 | MMBTU/H | Nitrogen Oxides (NOx) | Flue Gas Recirculation | 0 | | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 3 | MMBTU/H | Nitrogen Oxides (NOx) | Flue Gas recirculation | 0 | | |
| TX-0680 | 06/14/2013  ACT | Heater | 13.31 | natural gas | 10 | MMBTU/H | Nitrogen Oxides (NOx) | low-NOx burners | 0.01 | LB/MMBTU | 0.0100 |
| TX-0680 | 06/14/2013  ACT | 2 Heaters | 13.31 | natural gas | 5 | MMBTU/H | Nitrogen Oxides (NOx) | | 0.1 | LB/MMBTU | 0.1000 |
| TX-0691 | 05/20/2014  ACT | fuel gas heater | 13.31 | natural gas | 18 | MMBTU/H | Nitrogen Oxides (NOx) | | 0.1 | LB/MMBTU | 0.1000 |
| TX-0693 | 04/22/2014  ACT | heater | 13.31 | natural gas | 5.5 | MMBTU/H | Nitrogen Oxides (NOx) | | 0.036 | LB/MMBTU | 0.0360 |
| TX-0694 | 02/02/2015  ACT | heater | 13.31 | natural gas | 3 | MMBTU/H | Nitrogen Oxides (NOx) | | 0.1 | LB/MMBTU | 0.1000 |
| TX-0713 | 04/29/2014  ACT | boiler | 13.31 | natural gas | 90 | MMBTU/H | Nitrogen Oxides (NOx) | ultra low-NOx burners, limited use | 9 | PPMVD | 0.0332 |
| TX-0714 | 12/19/2014  ACT | boiler | 13.31 | natural gas | 80 | MMBTU/H | Nitrogen Oxides (NOx) | low-NOx burners | 0.036 | LB/MMBTU | 0.0360 |
| TX-0751 | 06/18/2015  ACT | Commercial/Institutional Size Boilers (<100 MMBtu) â€“ natural gas | 13.31 | natural gas | 73.3 | MMBTU/H | Nitrogen Dioxide (NO2) | | 0.01 | MMBTU/H | |
| TX-0755 | 05/21/2015  ACT | Hot Oil Heaters and Regeneration Heaters | 13.31 | Residue gas equivalent to natural gas | 60 | MMBTU/H | Nitrogen Oxides (NOx) | low NOx burners | 0.045 | LB/MMBTU | 0.0450 |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 40 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burners | 0.036 | LB/MMBTU | 0.0360 |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 95.7 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burners and flue gas recirculation | 0.011 | LB/MMBTU | 0.0110 |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 13.2 | MMBTU/H | Nitrogen Oxides (NOx) | | 0.1 | LB/MMBTU | 0.1000 |
| TX-0845 | 08/24/2018  ACT | HEATERS | 13.31 | NATL GAS | 31 | BTU/HR | Nitrogen Oxides (NOx) | LOW NOX BURNERS, CLEAN FUEL | 0.04 | LB/MMBTU | 0.0400 |
| TX-0851 | 12/17/2018  ACT | Thermal Oxidizer | 13.31 | NATL GAS | 71.3 | MMBTU/HR | Nitrogen Oxides (NOx) | Low NOx burners and good combustion practices. | 0.162 | LB/MMBTU | 0.1620 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - $NO_X$ (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0888 | 04/23/2020  ACT | Heaters | 13.31 | natural gas | 100 | MMBtu | Nitrogen Oxides (NOx) | Low NOx burners and good combustion practice. | 0.04 | LB/MMBTU | 0.0400 |
| VA-0321 | 03/12/2013  ACT | AUXILIARY BOILER | 13.31 | Natural Gas | 66.7 | MMBTU/H | Nitrogen Oxides (NOx) | Dry Low NOx burner. | 9 | PPMVD | 0.0109 |
| *WI-0283 | 04/24/2018  ACT | B01-B12, Boilers | 13.31 | Natural Gas | 28 | mmBTU/hr | Nitrogen Oxides (NOx) | Ultra-low NOx Burners, Flue Gas Recirculation and Good Combustion Practices | 0.0105 | LB/MMBTU | 0.0105 |
| *WI-0284 | 04/24/2018  ACT | B13-B24 & B25-B36 Natural Gas-Fired Boilers | 13.31 | Natural Gas | 28 | mmBTU | Nitrogen Oxides (NOx) | Ultra-Low NOx Burners, Flue Gas Recirculation, and Good Combustion Practices. | 0.0105 | LB/MMBTU | 0.0105 |
| *WI-0291 | 01/28/2019  ACT | P05 Natural Gas Fired Line Heater | 13.31 | Natural Gas | 1.5 | mmBTU/hr | Nitrogen Oxides (NOx) | Good Combustion Practices | 0.1 | LB/MMBTU | 0.1000 |
| *WV-0029 | 03/27/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 77.8 | mmBtu/hr | Nitrogen Oxides (NOx) | LNB, FGR, Good Combustion Practices | 0.86 | LB/HR | 0.0011 |
| *WV-0032 | 09/18/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas/Ethane | 111.9 | mmBtu/hr | Nitrogen Oxides (NOx) | LNB, Good Combustion Practices | 1.23 | LB/HR | 0.0110 |
| WY-0070 | 08/28/2012  ACT | Inlet Air Heater (EP06) | 13.31 | Natural Gas | 16.1 | MMBTU/H | Nitrogen Oxides (NOx) | Ultra Low-NOx Burners | 0.012 | LB/MMBTU | 0.0120 |
| WY-0070 | 08/28/2012  ACT | Inlet Air Heater (EP07) | 13.31 | Natural Gas | 16.1 | MMBTU/H | Nitrogen Oxides (NOx) | Ultra Low NOx Burners | 0.012 | LB/MMBTU | 0.0120 |
| WY-0070 | 08/28/2012  ACT | Inlet Air Heater (EP08) | 13.31 | Natural Gas | 16.1 | MMBTU/H | Nitrogen Oxides (NOx) | Ultra Low NOx Burners | 0.012 | LB/MMBTU | 0.0120 |
| WY-0070 | 08/28/2012  ACT | Inlet Air Heater (EP09) | 13.31 | Natural Gas | 16.1 | MMBTU/H | Nitrogen Oxides (NOx) | Ultra Low NOx Burners | 0.012 | LB/MMBTU | 0.0120 |
| WY-0070 | 08/28/2012  ACT | Inlet Air Heater (EP10) | 13.31 | Natural Gas | 16.1 | MMBTU/H | Nitrogen Oxides (NOx) | Ultra Low NOx Burners | 0.012 | LB/MMBTU | 0.0120 |
| WY-0070 | 08/28/2012  ACT | Inlet Air Heater (EP11) | 13.31 | Natural Gas | 16.1 | MMBTU/H | Nitrogen Oxides (NOx) | Ultra Low NOx Burners | 0.012 | LB/MMBTU | 0.0120 |
| WY-0075 | 07/16/2014  ACT | Auxiliary Boiler | 13.31 | natual gas | 25.06 | MMBtu/h | Nitrogen Oxides (NOx) | Ultra low NOx burners and flue gas recirculation | 0.0175 | LB/MMBTU | 0.0175 |

## BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - PM (Gas-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0083 | 01/06/2015  ACT | Five (5) Waste Heat Boilers | 13.31 | Natural Gas | 50 | MMBTU/H | Particulate matter, total (TPM) | | 0.0074 | LB/MMBTU | 0.0074 |
| *AK-0085 | 08/13/2020  ACT | Two (2) Buyback Gas Bath Heaters and Three (3) Operations Camp Heaters | 13.31 | Natural Gas | 32 | MMBtu/hr | Particulate matter, total (TPM) | Good Combustion Practices, Clean Fuels, and Limited Operation of 500 hours per year per heater. | 0.0079 | LB/MMBTU | 0.0079 |
| AL-0280 | 12/06/2011  ACT | Natural Gas Fired Broiler #3 | 13.31 | Natural Gas | 100 | MMBTU/Hr | Particulate matter, filterable (FPM) | Good Combustion Practices | 7.6 | LB/MMSCF | 0.0075 |
| AL-0282 | 01/22/2014  ACT | Natural Gas Fired Boilers (3) | 13.31 | Natural Gas | 100 | mm btu/hr | Particulate matter, filterable (FPM) | Good combustion Practices. | 0.0075 | | |
| *AL-0329 | 09/21/2021  ACT | Three Gas Heaters | 13.31 | Natural Gas | 10 | MMBtu/hr | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.008 | LB/MMBTU | 0.0080 |
| AR-0140 | 09/18/2013  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 67 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 5.2 X10^-4 | LB/MMBTU | 0.0005 |
| AR-0140 | 09/18/2013  ACT | BOILERS SN-26 AND 27, GALVANIZING LINE | 13.31 | NATURAL GAS | 24.5 | MMBTU/H | Particulate matter, filterable (FPM) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 5.2 X10^-4 | GR/DSCF | |
| AR-0140 | 09/18/2013  ACT | FURNACES SN-40 AND SN-42, DECARBURIZING LINE | 13.31 | NATURAL GAS | 22 | MMBTU/H | Particulate matter, filterable (FPM) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 5.2 X10^-4 | LB/MMBTU | 0.0005 |
| AR-0155 | 11/07/2018  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 53.7 | MMBTU/HR | Particulate matter, filterable (FPM) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0019 | LB/MMBTU | 0.0019 |
| AR-0155 | 11/07/2018  ACT | BOILER SN-26, GALVANIZING LINE | 13.31 | NATURAL GAS | 53.7 | MMBTU/HR | Particulate matter, filterable (FPM) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 6.8 X10^-4 | LB/MMBTU | 0.0007 |
| AR-0155 | 11/07/2018  ACT | PREHEATER, GALVANIZING LINE SN-28 | 13.31 | NATURAL GAS | 78.2 | MMBTU/HR | Particulate matter, filterable (FPM) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0012 | LB/MMBTU | 0.0012 |
| AR-0159 | 04/05/2019  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 0 | | Particulate matter, filterable (FPM) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0019 | LB/MMBTU | 0.0019 |
| AR-0159 | 04/05/2019  ACT | PREHEATERS, GALVANIZING LINE SN-28 and SN-29 | 13.31 | NATURAL GAS | 0 | | Particulate matter, filterable (FPM) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0012 | LB/MMBTU | 0.0012 |
| AR-0159 | 04/05/2019  ACT | BOILER, ANNEALING PICKLE LINE | 13.31 | NATURAL GAS | 0 | | Particulate matter, filterable (FPM) | Combustion of Natural gas and Good Combustion Practice | 0.0019 | LB/MMBTU | 0.0019 |
| AR-0159 | 04/05/2019  ACT | BOILERS SN-26 AND SN-27, GALVANIZING LINE | 13.31 | NATURAL GAS | 0 | | Particulate matter, filterable (FPM) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0007 | LB/MMBTU | 0.0007 |
| AR-0168 | 03/17/2021  ACT | Galvanizing Line #2 Furnace | 13.31 | Natural Gas | 150.5 | MMBtu/hr | Particulate matter, total (TPM) | Combustion of Natural gas and Good Combustion Practice | 0.0012 | LB/MMBTU | 0.0012 |
| AR-0168 | 03/17/2021  ACT | Decarburizing Line Furnace Section | 13.31 | Natural Gas | 58 | MMBtu/hr | Particulate matter, total (TPM) | Combustion of Natural gas and Good Combustion Practice | 0.013 | LB/MMBTU | 0.0130 |

## BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - PM (Gas-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *AR-0172 | 09/01/2021  ACT | SN-202, 203, 204 Pickle Line Boilers | 13.31 | Natural Gas | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Good Combustion Practice | 0.0076 | GR/DSCF | |
| CA-1192 | 06/21/2011  ACT | AUXILIARY BOILER | 13.31 | NATURAL GAS | 37.4 | MMBTU/H | Particulate matter, total (TPM) | USE PUC QUALITY NATURAL GAS, OPERATIONAL LIMIT OF 46,675 MMBTU/YR | 0.0034 | GR/DSCF | |
| FL-0335 | 09/05/2012  ACT | Four(4) Natural Gas Boilers - 46 MMBtu/hour | 13.31 | Natural Gas | 46 | MMBTU/H | Particulate matter, total (TPM) | Good Combustion Practice | 2 | GR OF S/100 SCF | |
| FL-0356 | 03/09/2016  ACT | Auxiliary Boiler, 99.8 MMBtu/hr | 13.31 | Natural gas | 99.8 | MMBtu/hr | Particulate matter, total (TPM) | Use of clean fuels | 10 | % OPACITY | |
| *FL-0363 | 12/04/2017  ACT | 99.8 MMBtu/hr auxiliary boiler | 13.31 | Natural gas | 99.8 | MMBtu/hr | Particulate matter, filterable (FPM) | Clean fuels | 0 | | |
| *FL-0367 | 07/27/2018  ACT | 60 MMBtu/hour Auxiliary Boiler | 13.31 | Natural Gas | 60 | MMBtu/hour | Particulate matter, filterable (FPM) | Clean fuels | 0 | | |
| IA-0106 | 07/12/2013  ACT | Startup Heater | 13.31 | natural gas | 58.8 | MMBTU/H | Particulate matter, total (TPM) | good operating practices and use of natural gas | 0.0024 | LB/MMBTU | 0.0024 |
| IA-0107 | 04/14/2014  ACT | dew point heater | 13.31 | natural gas | 13.32 | mmBtu/hr | Particulate matter, total (TPM) | | 0.008 | LB/MMBTU | 0.0080 |
| IA-0107 | 04/14/2014  ACT | auxiliary boiler | 13.31 | natural gas | 60.1 | mmBtu/hr | Particulate matter, total (TPM) | | 0.008 | LB/MMBTU | 0.0080 |
| *IA-0117 | 03/17/2021  ACT | Natural Gas Boiler A | 13.31 | natural gas | 82 | MMBtu/hr | Particulate matter, total (TPM) | Low NOx Burner and Flue Gas Recirculation | 0.026 | LB/HR | 0.0003 |
| *IA-0117 | 03/17/2021  ACT | Natural Gas Boiler B | 13.31 | natural gas | 82 | MMBtu/hr | Particulate matter, total (TPM) | Low NOx Burner and Flue Gas Recirculation | 0.26 | LB/HR | 0.0032 |
| IL-0129 | 07/30/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 96 | mmBtu/hr | Particulate matter, total (TPM) | Good combustion practices | 0.0075 | | |
| IL-0130 | 12/31/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 96 | mmBtu/hr | Particulate matter, total (TPM) | Good combustion practice | 0.0075 | LB/MMBTU | 0.0075 |
| IN-0158 | 12/03/2012  ACT | TWO (2) NATURAL GAS AUXILIARY BOILERS | 13.31 | NATURAL GAS | 80 | MMBTU/H | Particulate matter, filterable (FPM) | GOOD COMBUSTION PRACTICES AND FUEL SPECIFICATIONS | 0.0075 | LB/MMBTU | 0.0075 |
| IN-0263 | 03/23/2017  ACT | STARTUP HEATER EU-002 | 13.31 | NATURAL GAS | 70 | MMBTU/HR | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES | 0.522 | LB/H | 0.0075 |
| IN-0285 | 08/02/2017  ACT | Space Heaters | 13.31 | | 0 | | Particulate matter, total (TPM) | | 0.0072 | LB/MMBTU | 0.0072 |
| KS-0029 | 07/14/2015  ACT | Auxiliary boiler | 13.31 | Natural gas | 18.6 | MMBTU/HR | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0.005 | LB PER MMBTU | 0.0050 |
| *KS-0030 | 03/31/2016  ACT | Indirect fuel-gas heater | 13.31 | | 2 | mmBTU/hr | Particulate matter, total (TPM) | | 0.015 | LB/H | 0.0075 |
| KY-0110 | 07/23/2020  ACT | EP 15-01 - Natural Gas Direct-Fired Space Heaters, Process Water Heaters, & Air Makeup Heaters | 13.31 | Natural Gas | 40 | MMBtu/hr, combined | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 7.6 | LB/MMSCF | 0.0075 |

## BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - PM (Gas-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| KY-0110 | 07/23/2020  ACT | EP 05-01 - Group 1 Car Bottom Furnaces #1 - #3 | 13.31 | Natural Gas | 28 | MMBtu/hr, each | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 7.6 | LB/MMSCF | 0.0075 |
| KY-0110 | 07/23/2020  ACT | EP 04-02 - Austenitizing Furnace | 13.31 | Natural Gas | 54 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 7.6 | LB/MMSCF | 0.0075 |
| KY-0110 | 07/23/2020  ACT | EP 05-02 - Group 2 Car Bottom Furnaces A & B | 13.31 | Natural Gas | 60 | MMBtu/hr, combined | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 7.6 | LB/MMSCF | 0.0075 |
| KY-0110 | 07/23/2020  ACT | EP 03-02 - Ingot Car Bottom Furnaces #1-#4 | 13.31 | Natural Gas | 37 | MMBtu/hr, each | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 7.6 | LB/MMSCF | 0.0075 |
| KY-0110 | 07/23/2020  ACT | EP 03-05 - Steckel Mill Coiling Furnaces #1 & #2 | 13.31 | Natural Gas | 17.5 | MMBtu/hr, each | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 7.6 | LB/MMSCF | 0.0075 |
| KY-0110 | 07/23/2020  ACT | EP 04-03 - Tempering Furnace | 13.31 | Natural Gas | 48 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 7.6 | LB/MMSCF | 0.0075 |
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Makeup Air Units (EP 21-19) | 13.31 | Natural Gas | 40 | MMBtu/hr, total | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 7.6 | LB/MMSCF | 0.0075 |
| KY-0115 | 04/19/2021  ACT | Vacuum Degasser Boiler (EP 20-13) | 13.31 | Natural Gas | 50.4 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 7.6 | LB/MMSCF | 0.0075 |
| KY-0115 | 04/19/2021  ACT | Pickle Line #2 â€“ Boiler #1 & #2 (EP 21-04 & EP 21-05) | 13.31 | Natural Gas | 18 | MMBtu/hr, each | Particulate matter, total < 2.5 Âµ (TPM2.5) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 7.6 | LB/MMSCF | 0.0075 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Alkali Cleaning Section Heater (EP 21-07B) | 13.31 | Natural Gas | 23 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 7.6 | LB/MMSCF | 0.0075 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Radiant Tube Furnace (EP 21-08B) | 13.31 | Natural Gas | 36 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 7.6 | LB/MMSCF | 0.0075 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Annealing Furnaces (15) (EP 21-15) | 13.31 | Natural Gas | 4.8 | MMBtu/hr, each | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 7.6 | LB/MMSCF | 0.0075 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Preheat Furnace (EP 21-08A) | 13.31 | Natural Gas | 94 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 7.6 | LB/MMSCF | 0.0075 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Zinc Pot Preheater (EP 21-09) | 13.31 | Natural Gas | 3 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 7.6 | LB/MMSCF | 0.0075 |
| KY-0115 | 04/19/2021  ACT | Heated Transfer Table Furnace (EP 02-03) | 13.31 | Natural Gas | 65.5 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 7.6 | LB/MMSCF | 0.0075 |
| LA-0305 | 06/30/2016  ACT | Gasifier Start-up Preheat Burners | 13.31 | Natural gas | 23 | MM BTU/hr (each) | Particulate matter, total < 10 Âµ (TPM10) | good engineering practices, good combustion technology, and use of clean fuels | 0 | | |
| LA-0305 | 06/30/2016  ACT | WSA Preheat Burners | 13.31 | Natural Gas | 0 | | Particulate matter, total < 10 Âµ (TPM10) | good engineering design and practices and use of clean fuels | 0 | | |
| LA-0307 | 03/21/2016  ACT | Regenerative Heaters | 13.31 | natural gas | 7.37 | mm btu/hr | Particulate matter, total < 10 Âµ (TPM10) | good combustion practices | 0 | | |
| *LA-0315 | 05/23/2014  ACT | Reactor Charge Heater - 53B001 | 13.31 | Natural Gas | 10.1 | MMBTU/HR | Particulate matter, total < 10 Âµ (TPM10) | Combustion controls (proper burner design and operation using natural gas) | 0.08 | LB/H | 0.0075 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - PM (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *LA-0315 | 05/23/2014  ACT | Regeneraton Heater - 51B001 | 13.31 | Natural Gas | 61 | MMBTU/HR | Particulate matter, total < 10 Âµ (TPM10) | Combustion controls (proper burner design and operation using natural gas) | 0.45 | LB/H | 0.0075 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002A | 13.31 | Natural Gas | 33 | MMBTU/HR | Particulate matter, total < 10 Âµ (TPM10) | Combustion controls (proper burner design and operation using natural gas) | 0.24 | LB/H | 0.0075 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002B | 13.31 | Natural Gas | 33 | MMBTU/HR | Particulate matter, total < 10 Âµ (TPM10) | Combustion controls (proper burner design and operation using natural gas) | 0.24 | LB/H | 0.0075 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002C | 13.31 | Natural Gas | 33 | MMBTU/HR | Particulate matter, total < 10 Âµ (TPM10) | Combustion controls (proper burner design and operation using natural gas) | 0.24 | LB/H | 0.0075 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002D | 13.31 | Natural Gas | 33 | MMBTU/HR | Particulate matter, total < 10 Âµ (TPM10) | Combustion controls (proper burner design and operation using natural gas) | 0.24 | LB/H | 0.0075 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002E | 13.31 | Natural Gas | 33 | MMBTU/HR | Particulate matter, total < 10 Âµ (TPM10) | Combustion controls (proper burner design and operation using natural gas) | 0.24 | LB/H | 0.0075 |
| *LA-0349 | 07/10/2018  ACT | Hot Oil Heaters (5) | 13.31 | natural gas | 16.13 | mm btu/hr | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good Combustion Practices and Use of low sulfur facility fuel gas | 0.0075 | LB/MM BTU | 0.0075 |
| *LA-0364 | 01/06/2020  ACT | Hot Oil Heaters 1 and 2 | 13.31 | Natural Gas | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Use of pipeline quality natural gas or fuel gas and good combustion practices. | 0.03 | LB/H | |
| *LA-0364 | 01/06/2020  ACT | PR Waste Heat Boiler | 13.31 | Natural Gas | 94 | mm btu/h | Particulate matter, total < 10 Âµ (TPM10) | Use of pipeline quality natural gas or fuel gas and good combustion practices. | 0.61 | LB/H | 0.0065 |
| MA-0039 | 01/30/2014  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 80 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | | 0.005 | LB/MMBTU | 0.0050 |
| MD-0041 | 04/23/2014  ACT | AUXILLARY BOILER | 13.31 | NATURAL GAS | 93 | MMBTU/H | Particulate matter, filterable (FPM) | USE OF PIPELINE QUALITY NATURAL GAS AND GOOD COMBUSTION PRACTICES | 0.005 | LB/MMBTU | 0.0050 |
| MD-0042 | 04/08/2014  ACT | AUXILLARY BOILER | 13.31 | NATURAL GAS | 45 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF PIPELINE QUALITY NATURAL GAS AND GOOD COMBUSTION PRACTICES | 0.0075 | LB/MMBTU | 0.0075 |
| MD-0045 | 11/13/2015  ACT | AUXILIARY BOILER | 13.31 | NATURAL GAS | 42 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | USE OF PIPELINE QUALITY NATURAL GAS AND GOOD COMBUSTION PRACTICES | 0.0075 | LB/MMBTU | 0.0075 |
| MD-0046 | 10/31/2014  ACT | AUXILIARY BOILER | 13.31 | PIPELINE QUALITY NATURAL GAS | 93 | MMBTU/H | Particulate matter, filterable (FPM) | EFFICIENT BOILER DESIGN, EXCLUSIVE USE OF PIPELINE QUALITY NATURAL GAS, AND APPLICATION OF GOOD COMBUSTION PRACTICES | 0.0075 | LB/MMBTU | 0.0075 |
| MI-0406 | 11/01/2013  ACT | FG-AUXBOILER1-2; Two (2) natural gas-fired auxiliary boilers. | 13.31 | natural gas | 40 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices. | 0.005 | LB/MMBTU | 0.0050 |
| MI-0410 | 07/25/2013  ACT | FGAUXBOILERS: Two auxiliary boilers < 100 MMBTU/H heat input each | 13.31 | natural gas | 100 | MMBTU/H heat input each | Particulate matter, total < 10 Âµ (TPM10) | Efficient combustion; natural gas fuel. | 0.007 | LB/MMBTU | 0.0070 |
| MI-0412 | 12/04/2013  ACT | Fuel pre-heater (EUFUELHTR) | 13.31 | natural gas | 3.7 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 0.0075 | LB/MMBTU | 0.0075 |
| MI-0412 | 12/04/2013  ACT | Auxiliary Boiler B (EUAUXBOILERB) | 13.31 | natural gas | 95 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 0.007 | LB/MMBTU | 0.0070 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - PM (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0412 | 12/04/2013  ACT | Auxiliary Boiler A (EUAUXBOILERA) | 13.31 | natural gas | 55 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 0.007 | LB/MMBTU | 0.0070 |
| MI-0420 | 06/03/2016  ACT | FGAUXBOILERS | 13.31 | Natural gas | 6 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices and low sulfur fuel (pipeline quality natural gas). | 0.0075 | LB/MMBTU | 0.0075 |
| MI-0421 | 08/26/2016  ACT | EUFLTOS1 in FGTOH (Thermal Oil System for Thermally Fused Lamination Lines) | 13.31 | Natural gas | 34 | MMBTU/H | Particulate matter, filterable (FPM) | Good combustion practices. | 0.0075 | LB/MMBTU | 0.0075 |
| MI-0421 | 08/26/2016  ACT | EUTOH (In FGTOH)--Thermal Oil Heater | 13.31 | Natural gas | 34 | MMBTU/H | Particulate matter, filterable (FPM) | Good combustion practices | 0.0075 | LB/MMBTU | 0.0075 |
| MI-0423 | 01/04/2017  ACT | FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2) | 13.31 | Natural gas | 27 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices. | 0.2 | LB/H | 0.0074 |
| MI-0424 | 12/05/2016  ACT | EUFUELHTR (Fuel pre-heater) | 13.31 | Natural gas | 3.7 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices. | 0.0075 | LB/MMBTU | 0.0075 |
| MI-0424 | 12/05/2016  ACT | EUAUXBOILER (Auxiliary boiler) | 13.31 | natural gas | 83.5 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices. | 0.007 | LB/MMBTU | 0.0070 |
| MI-0425 | 05/09/2017  ACT | EUTOH in FGTOH | 13.31 | Natural gas | 38 | MMBTU/H | Particulate matter, filterable (FPM) | Good combustion practices | 0.0075 | LB/MMBTU | 0.0075 |
| MI-0425 | 05/09/2017  ACT | EUFLTOS1 in FGTOH | 13.31 | Natural gas | 10.2 | MMBTU/H | Particulate matter, filterable (FPM) | Good combustion practices | 0.0075 | LB/MMBTU | 0.0075 |
| MI-0426 | 03/24/2017  ACT | FGAUXBOILERS (6 auxiliary boilers EUAUXBOIL2A, EUAUXBOIL3A, EUAUXBOIL2B, EUAUXBOIL3B, EUAUXBOIL2C, EUAUXBOIL3C) | 13.31 | Natural gas | 3 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices and low sulfur fuel (pipeline quality natural gas). | 0.52 | LB/MMSCF | 0.0005 |
| MI-0433 | 06/29/2018  ACT | EUAUXBOILER (North Plant): Auxiliary Boilder | 13.31 | Natural gas | 61.5 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 0.46 | LB/H | 0.0075 |
| MI-0433 | 06/29/2018  ACT | EUAUXBOILER (South Plant): Auxiliary Boiler | 13.31 | Natural gas | 61.5 | MMBTU/h | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices. | 0.46 | LB/H | 0.0075 |
| MI-0435 | 07/16/2018  ACT | EUAUXBOILER: Auxiliary Boiler | 13.31 | Natural gas | 99.9 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices, low sulfur fuel | 0.007 | LB/MMBTU | 0.0070 |
| MI-0435 | 07/16/2018  ACT | EUFUELHTR1: Natural gas fired fuel heater | 13.31 | Natural gas | 20.8 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Low sulfur fuel | 0.15 | LB/H | 0.0072 |
| MI-0435 | 07/16/2018  ACT | EUFUELHTR2: Natural gas fired fuel heater | 13.31 | Natural gas | 3.8 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Low sulfur fuel | 0.03 | LB/H | 0.0079 |
| *MI-0440 | 05/22/2019  ACT | FGFUELHEATERS | 13.31 | natural gas | 25 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 0.008 | LB/MMBTU | 0.0080 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - PM (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *MI-0441 | 12/21/2018  ACT | EUAUXBOILER--natural gas fired auxiliary boiler rated at <= 99MMBTU/H | 13.31 | Natural gas | 99 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 0.74 | LB/H | 0.0075 |
| *MI-0442 | 08/21/2019  ACT | FGAUXBOILER | 13.31 | Natural gas | 80 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Low sulfur fuel (natural gas) and good combustion practices (efficient combustion). | 7.6 | LB/MMSCF | 0.0075 |
| *MI-0442 | 08/21/2019  ACT | FGPREHEAT | 13.31 | natural gas | 7 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Low sulfur fuel (natural gas) and good combustion practices (efficient combustion) | 7.6 | LB/MMSCF | 0.0075 |
| *MI-0445 | 11/26/2019  ACT | FGFUELHTR (2 fuel pre-heaters) | 13.31 | Natural gas | 27 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 0.1 | LB/H | 0.0037 |
| MS-0092 | 05/08/2014  ACT | Regeneration Heater, methanol to gasoline | 13.31 | NATURAL GAS | 13 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | | 0 | | |
| MS-0092 | 05/08/2014  ACT | Reactor Heater, 5 | 13.31 | NATURAL GAS | 12 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | | 0 | | |
| NJ-0079 | 07/25/2012  ACT | Commercial/Institutional size boilers less than 100 MMBtu/hr | 13.31 | natural gas | 2000 | hours/year | Particulate matter, total < 10 Âµ (TPM10) | | 0.46 | LB/H | 0.0050 |
| NJ-0080 | 11/01/2012  ACT | Boiler less than 100 MMBtu/hr | 13.31 | Natural Gas | 51.9 | mmcubic ft/year | Particulate matter, filterable < 10 Âµ (FPM10) | use of natural gas a clean fuel | 0.33 | LB/H | |
| NJ-0084 | 03/10/2016  ACT | Auxiliary Boiler firing natural gas | 13.31 | natural gas | 687 | MMCFT/YR | Particulate matter, total < 10 Âµ (TPM10) | use of natural gas a clean burning fuel | 0.4 | LB/H | 0.0050 |
| NJ-0085 | 07/19/2016  ACT | AUXILIARY BOILER | 13.31 | Natural GAS | 4000 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | USE OF NATURAL GAS A CLEAN BURNING FUEL | 0.488 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Auxiliary boiler | 13.31 | natural gas | 60 | MMBTU/H | Particulate matter, filterable (FPM) | good combustion practiced and pipeline quality natural gas | 0.005 | LB/MMBTU | 0.0050 |
| NY-0104 | 08/01/2013  ACT | Auxiliary boiler | 13.31 | natural gas | 0 | | Particulate matter, filterable (FPM) | Natural gas. | 0.0063 | LB/MMBTU | 0.0063 |
| OH-0350 | 07/18/2012  ACT | Steam Boiler | 13.31 | Natural Gas | 65 | MMBtu/H | Particulate matter, total < 10 Âµ (TPM10) | | 0.48 | LB/H | 0.0074 |
| OH-0352 | 06/18/2013  ACT | Auxillary Boiler | 13.31 | Natural Gas | 99 | MMBtu/H | Particulate matter, total < 10 Âµ (TPM10) | Clean burning fuel, only burning natural gas | 0.79 | LB/H | 0.0080 |
| OH-0355 | 05/07/2013  ACT | 4 Indirect-Fired Air Preheaters | 13.31 | Natural gas | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.007 | LB/MMBTU | 0.0070 |
| OH-0360 | 11/05/2013  ACT | Auxiliary Boiler (B001) | 13.31 | Natural Gas | 99 | MMBtu/H | Particulate matter, total < 10 Âµ (TPM10) | natural gas only | 0.79 | LB/H | 0.0080 |
| OH-0366 | 08/25/2015  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 34 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Low sulfur fuel | 0.27 | LB/H | 0.0080 |
| OH-0367 | 09/23/2016  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 99 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | natural gas/ultra low sulfur diesel | 5.94 | LB/H | 0.0080 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - PM (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0368 | 04/19/2017  ACT | Startup Heater (B001) | 13.31 | Natural gas | 100 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion control (i.e., high temperatures, sufficient excess air, sufficient residence times, and god air/fuel mixing). | 0.75 | LB/H | 0.0075 |
| OH-0370 | 09/07/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 37.8 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Low sulfur fuel | 0.3 | LB/H | 0.0080 |
| OH-0372 | 09/27/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 37.8 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | low sulfur fuel | 0.3 | LB/H | 0.0080 |
| OH-0374 | 10/23/2017  ACT | Fuel Gas Heaters (2 identical, P007 and P008) | 13.31 | Natural gas | 15 | MMBTU/H | Particulate matter, total (TPM) | Combustion control | 0.075 | LB/H | 0.0050 |
| OH-0375 | 11/07/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 26.8 | MMBTU/H | Particulate matter, total (TPM) | Low sulfur fuel | 0.27 | LB/H | 0.0100 |
| OH-0377 | 04/19/2018  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 44.55 | MMBTU/H | Particulate matter, total (TPM) | Pipeline quality natural gas | 0.33 | LB/H | 0.0075 |
| OH-0377 | 04/19/2018  ACT | Auxiliary Boiler (B002) | 13.31 | Natural gas | 80 | MMBTU/H | Particulate matter, total (TPM) | Pipeline quality natural gas | 0.48 | LB/H | 0.0060 |
| OH-0379 | 02/06/2019  ACT | Startup boiler (B001) | 13.31 | Natural gas | 15.17 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices and the use of natural gas | 0.113 | LB/H | 0.0074 |
| OH-0379 | 02/06/2019  ACT | Ladle Preheaters (P002, P003 and P004) | 13.31 | Natural gas | 15 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices and the use of natural gas | 0.112 | LB/H | 0.0075 |
| *OH-0381 | 09/27/2019  ACT | Tunnel Furnace #2 (P018) | 13.31 | Natural Gas | 88 | MMBTU/H | Particulate matter, total (TPM) | Use of natural gas, good combustion practices and design | 0.88 | LB/H | 0.0100 |
| OK-0148 | 09/12/2012  ACT | Commercial/Institutional Boilers (<100 MMBTUH) | 13.31 | Natural Gas | 11.04 | MMBTUH | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0.0075 | LB/MMBTU | 0.0075 |
| OK-0156 | 07/31/2013  ACT | Gas-fired Boiler | 13.31 | Natural Gas | 95 | MMBTUH | Particulate matter, total < 10 Âµ (TPM10) | Good Combustion | 0.013 | LB/MMBTU | 0.0130 |
| OK-0173 | 01/19/2016  ACT | Heaters (Gas-Fired) | 13.31 | Natural Gas | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Natural Gas Fuel. | 0.0076 | LB/MMBTU | 0.0076 |
| OR-0050 | 03/05/2014  ACT | Auxiliary boiler | 13.31 | natural gas | 39.8 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices; Utilize only natural gas. | 0 | | |
| PA-0291 | 04/23/2013  ACT | AUXILIARY BOILER | 13.31 | Natural Gas | 40 | MMBTU/H | Particulate matter, total (TPM) | | 0.005 | LB/MMBTU | 0.0050 |
| PA-0296 | 12/17/2013  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 40 | MMBTU/H | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.46 | T/YR | |
| PA-0307 | 06/15/2015  ACT | Auxilary Boiler | 13.31 | Natural Gas | 62.04 | MCF/hr | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices and low sulfur fuels | 0.005 | LB/MMBTU | 0.0050 |
| PA-0309 | 12/23/2015  ACT | Auxillary Boiler | 13.31 | Natural gas | 13.31 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | | 0.007 | LB/MMBTU | 0.0070 |
| PA-0310 | 09/02/2016  ACT | Auxilary boiler | 13.31 | Natural Gas | 92.4 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | ULSD and good combustion practices | 0.007 | LB/MMBTU | 0.0070 |

## BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - PM (Gas-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PA-0311 | 09/01/2015  ACT | Auxilary Boiler | 13.31 | Natural Gas | 55.4 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | | 0.007 | LB/MMBTU | 0.0070 |
| *PA-0316 | 01/26/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 118800 | MMBtu/12 month period | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.0019 | LB | 0.0019 |
| SC-0149 | 01/03/2013  ACT | NATURAL GAS BOILER EU004 | 13.31 | NATURAL GAS | 46 | MMBTU/H | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.005 | LB/MMBTU | 0.0050 |
| SC-0149 | 01/03/2013  ACT | NATURAL GAS BOILER EU005 | 13.31 | NATURAL GAS | 46 | MMBTU/H | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.005 | LB/MMBTU | 0.0050 |
| SC-0149 | 01/03/2013  ACT | NATURAL GAS BOILER EU006 | 13.31 | NATURAL GAS | 46 | MMBTU/H | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.005 | LB/MMBTU | 0.0050 |
| SC-0179 | 03/18/2015  ACT | THERMAL OIL HEATER #2 | 13.31 | NATURAL GAS | 1.83 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES | 0.01 | LB/H | 0.0055 |
| *SC-0193 | 04/15/2016  ACT | Energy Center Boilers | 13.31 | Natural Gas | 14.27 | MMBTU/hr | Particulate matter, total (TPM) | Annual tune ups per 40 CFR 63.7540(a)(10) are required. | 7.6 | LB/MMSCF | 0.0075 |
| TX-0656 | 05/16/2014  ACT | Heaters | 13.31 | natural gas | 45 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | clean fuel and good combustion practices | 0.81 | T/YR | |
| TX-0656 | 05/16/2014  ACT | heaters (5) | 13.31 | natural gas | 24.3 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | clean fuel and good combustion practices | 3.38 | T/YR | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 17 | MMBTU/H | Particulate matter, filterable (FPM) | Good combustion practices and fuel selection | 0 | | |
| TX-0663 | 05/25/2012  ACT | 8 Inlet Compressors | 13.31 | Natural Gas or electricity | 4.5 | MMBTU/H | Particulate matter, filterable (FPM) | Good combustion practices and Dual Drive (electric/gas) technology | 0.57 | TON | |
| TX-0663 | 05/25/2012  ACT | Residue Compressors | 13.31 | Natural Gas | 4735 | hp | Particulate matter, filterable (FPM) | Good combustion practices and fuel selection | 1.53 | TON | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 48 | MMBTU/H | Particulate matter, filterable (FPM) | Best Combustion Practices | 0 | | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 10 | MMBTU/H | Particulate matter, filterable (FPM) | Good combustion practices and fuel selection | 0 | | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 3 | MMBTU/H | Particulate matter, filterable (FPM) | Good combustion practices and fuel selection | 0 | | |
| TX-0691 | 05/20/2014  ACT | fuel gas heater | 13.31 | natural gas | 18 | MMBTU/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0 | | |
| TX-0694 | 02/02/2015  ACT | heater | 13.31 | natural gas | 3 | MMBTU/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0 | | |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 40 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practice to ensure complete combustion. gaseous fuel | 1.31 | T/YR | |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - PM (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 95.7 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Use of gaseous fuel with efficient combustion. | 7.49 | T/YR | |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 13.2 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practice to ensure complete combustion. | 0.4 | T/YR | |
| TX-0851 | 12/17/2018  ACT | Thermal Oxidizer | 13.31 | NATL GAS | 71.3 | MMBTU/HR | Particulate matter, total < 10 Âµ (TPM10) | Natural Gas / Clean Fuel, good combustion practices. | 0.0075 | LB/MMBTU | 0.0075 |
| TX-0888 | 04/23/2020  ACT | Heaters | 13.31 | natural gas | 100 | MMBtu | Particulate matter, filterable < 10 Âµ (FPM10) | Good combustion practice, clean fuel, and proper design | 0.0075 | LB/MMBTU | 0.0075 |
| VA-0321 | 03/12/2013  ACT | AUXILIARY BOILER | 13.31 | Natural Gas | 66.7 | MMBTU/H | Particulate matter, filterable < 10 Âµ (FPM10) | Low sulfur/carbon fuel and good combustion practices | 0.007 | LB/MMBTU | 0.0070 |
| *VA-0333 | 12/09/2020  ACT | Three (3) boilers | 13.31 | Natural Gas | 76.6 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | | 0.0078 | LB | 0.0078 |
| *WI-0283 | 04/24/2018  ACT | B01-B12, Boilers | 13.31 | Natural Gas | 28 | mmBTU/hr | Particulate matter, total (TPM) | Good Combustion Practices | 0.0075 | LB/MMBTU | 0.0075 |
| *WI-0284 | 04/24/2018  ACT | B13-B24 & B25-B36 Natural Gas-Fired Boilers | 13.31 | Natural Gas | 28 | mmBTU | Particulate matter, total (TPM) | Good Combustion Practices and The Use of Pipeline Quality Natural Gas | 0.0075 | LB/MMBTU | 0.0075 |
| *WV-0029 | 03/27/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 77.8 | mmBtu/hr | Particulate matter, total (TPM) | Use of Natural Gas, Good Combustion Practices | 0.6 | LB/HR | 0.0080 |
| *WV-0031 | 06/14/2018  ACT | WH-1 - Boiler | 13.31 | Natural Gas | 8.72 | mmBtu/hr | Particulate matter, total (TPM) | Limited to natural gas. | 0 | | |
| *WV-0032 | 09/18/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas/Ethane | 111.9 | mmBtu/hr | Particulate matter, total (TPM) | Use of Natural Gas, Good Combustion Practices | 0.87 | LB/HR | 0.0080 |
| WY-0075 | 07/16/2014  ACT | Auxiliary Boiler | 13.31 | natual gas | 25.06 | MMBtu/h | Particulate matter, total (TPM) | good combustion practices | 0.0175 | LB/MMBTU | 0.0175 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - VOC (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0083 | 01/06/2015  ACT | Five (5) Waste Heat Boilers | 13.31 | Natural Gas | 50 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0.0054 | LB/MMBTU | 0.0054 |
| *AK-0085 | 08/13/2020  ACT | Two (2) Buyback Gas Bath Heaters and Three (3) Operations Camp Heaters | 13.31 | Natural Gas | 32 | MMBtu/hr | Volatile Organic Compounds (VOC) | Good Combustion Practices, Clean Fuels, and Limited Operation of 500 hours per year per heater. | 0.0057 | LB/MMBTU | 0.0057 |
| AL-0280 | 12/06/2011  ACT | Natural Gas Fired Broiler #3 | 13.31 | Natural Gas | 100 | MMBTU/Hr | Volatile Organic Compounds (VOC) | Good combustion practices | 5.5 | LB/MMSCF | 0.0054 |
| AL-0282 | 01/22/2014  ACT | Natural Gas Fired Boilers (3) | 13.31 | Natural Gas | 100 | mm btu/hr | Volatile Organic Compounds (VOC) | Good combustion Practices. | 0.0054 | LB/MMBTU | 0.0054 |
| AL-0307 | 10/09/2015  ACT | PACKAGE BOILER | 13.31 | NATURAL GAS | 17.5 | MMBTU/H | Volatile Organic Compounds (VOC) | GCP | 0.006 | LB/MMBTU | 0.0060 |
| AL-0307 | 10/09/2015  ACT | 2 CALP LINE BOILERS | 13.31 | NATURAL GAS | 24.59 | MMBTU/H | Volatile Organic Compounds (VOC) | GCP | 0.006 | LB/MMBTU | 0.0060 |
| AL-0312 | 05/26/2016  ACT | 60 MMBTU/HR NATURAL GAS-FIRED BOILER (ES-008) | 13.31 | NATURAL GAS | 60 | MMBTU/H | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.0054 | LB/MMBTU INPUT | 0.0054 |
| AR-0140 | 09/18/2013  ACT | BOILERS SN-26 AND 27, GALVANIZING LINE | 13.31 | NATURAL GAS | 24.5 | MMBTU/H | Volatile Organic Compounds (VOC) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0054 | LB/MMBTU | 0.0054 |
| AR-0140 | 09/18/2013  ACT | FURNACES SN-40 AND SN-42, DECARBURIZING LINE | 13.31 | NATURAL GAS | 22 | MMBTU/H | Volatile Organic Compounds (VOC) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0054 | LB/MMBTU | 0.0054 |
| AR-0155 | 11/07/2018  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 53.7 | MMBTU/HR | Volatile Organic Compounds (VOC) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0054 | LB/MMBTU | 0.0054 |
| AR-0155 | 11/07/2018  ACT | BOILER SN-26, GALVANIZING LINE | 13.31 | NATURAL GAS | 53.7 | MMBTU/HR | Volatile Organic Compounds (VOC) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.054 | LB/MMBTU | 0.0540 |
| AR-0155 | 11/07/2018  ACT | PREHEATER, GALVANIZING LINE SN-28 | 13.31 | NATURAL GAS | 78.2 | MMBTU/HR | Volatile Organic Compounds (VOC) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0054 | LB/MMBTU | 0.0054 |
| AR-0159 | 04/05/2019  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 0 | | Volatile Organic Compounds (VOC) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0054 | LB/MMBTU | 0.0054 |
| AR-0159 | 04/05/2019  ACT | PREHEATERS, GALVANIZING LINE SN-28 and SN-29 | 13.31 | NATURAL GAS | 0 | | Volatile Organic Compounds (VOC) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0054 | LB/MMBTU | 0.0054 |
| AR-0159 | 04/05/2019  ACT | BOILER, ANNEALING PICKLE LINE | 13.31 | NATURAL GAS | 0 | | Volatile Organic Compounds (VOC) | Combustion of Natural gas and Good Combustion Practice | 0.0054 | LB/MMBTU | 0.0054 |
| AR-0159 | 04/05/2019  ACT | BOILERS SN-26 AND SN-27, GALVANIZING LINE | 13.31 | NATURAL GAS | 0 | | Volatile Organic Compounds (VOC) | COMBUSTION OF NATURAL GAS AND GOOD COMBUSTION PRACTICE | 0.0054 | LB/MMBTU | 0.0054 |
| AR-0168 | 03/17/2021  ACT | Galvanizing Line #2 Furnace | 13.31 | Natural Gas | 150.5 | MMBtu/hr | Volatile Organic Compounds (VOC) | Combustion of Natural gas and Good Combustion Practice | 0.0054 | LB/MMBTU | 0.0054 |
| AR-0168 | 03/17/2021  ACT | Decarburizing Line Furnace Section | 13.31 | Natural Gas | 58 | MMBtu/hr | Volatile Organic Compounds (VOC) | Combustion of Natural gas and Good Combustion Practice | 0.0054 | LB/MMBTU | 0.0054 |
| *AR-0172 | 09/01/2021  ACT | SN-202, 203, 204 Pickle Line Boilers | 13.31 | Natural Gas | 0 | | Volatile Organic Compounds (VOC) | Good Combustion Practice | 0.0055 | LB/MMBTU | 0.0055 |
| FL-0335 | 09/05/2012  ACT | Four(4) Natural Gas Boilers - 46 MMBtu/hour | 13.31 | Natural Gas | 46 | MMBTU/H | Volatile Organic Compounds (VOC) | Good Combustion Practice | 0.003 | LB/MMBTU | 0.0030 |
| FL-0364 | 03/21/2018  ACT | Two natural gas heaters (< 10 MMBtu/hr each) | 13.31 | Natural gas | 9.9 | MMBtu/hr | Volatile Organic Compounds (VOC) | | 0.005 | LB/MMBTU | 0.0050 |
| IA-0102 | 02/01/2012  ACT | Pusher Preheat Furnace | 13.31 | natural gas | 60 | MMBTU/h | Volatile Organic Compounds (VOC) | The company is required to limit the amount of oils & coolants used in earlier processes and apply good combustion practices to the furnace. There are no numerical limits for VOCs. | 0 | | |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - VOC (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IA-0102 | 02/01/2012  ACT | Annealing Furnace | 13.31 | natural gas | 12 | MMBTU/h | Volatile Organic Compounds (VOC) | The company is required to limit the amount of oils & coolants used in earlier processes and apply good combustion practices to the furnace. There are no numerical limits for VOCs. | 0 | | |
| IA-0102 | 02/01/2012  ACT | 88" Continuous Heat Treat Line | 13.31 | natural gas | 20.4 | MMBTU/h | Volatile Organic Compounds (VOC) | The company is required to limit the amount of oils & coolants used in earlier processes and apply good combustion practices to the furnace. There are no numerical limits for VOCs. | 0 | | |
| IA-0106 | 07/12/2013  ACT | Startup Heater | 13.31 | natural gas | 58.8 | MMBTU/H | Volatile Organic Compounds (VOC) | good operating practices & use of natural gas | 0.0014 | LB/MMBTU | 0.0014 |
| IA-0107 | 04/14/2014  ACT | auxiliary boiler | 13.31 | natural gas | 60.1 | mmBtu/hr | Volatile Organic Compounds (VOC) | | 0.005 | LB/MMBTU | 0.0050 |
| IL-0127 | 10/05/2018  ACT | Heating Units | 13.31 | natural gas | 1 | mmBtu/hr | Volatile Organic Compounds (VOC) | Units shall be operated in accordance with good combustion practices. | 0 | | |
| IN-0158 | 12/03/2012  ACT | TWO (2) NATURAL GAS AUXILIARY BOILERS | 13.31 | NATURAL GAS | 80 | MMBTU/H | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.005 | LB/MMBTU | 0.0050 |
| IN-0263 | 03/23/2017  ACT | STARTUP HEATER EU-002 | 13.31 | NATURAL GAS | 70 | MMBTU/HR | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.378 | LB/H | 0.0054 |
| IN-0285 | 08/02/2017  ACT | Space Heaters | 13.31 | | 0 | | Volatile Organic Compounds (VOC) | | 0.0053 | LB/MMBTU | 0.0053 |
| *KS-0030 | 03/31/2016  ACT | Indirect fuel-gas heater | 13.31 | | 2 | mmBTU/hr | Volatile Organic Compounds (VOC) | | 0.011 | LB/H | 0.0055 |
| KY-0110 | 07/23/2020  ACT | EP 15-01 - Natural Gas Direct-Fired Space Heaters, Process Water Heaters, & Air Makeup Heaters | 13.31 | Natural Gas | 40 | MMBtu/hr, combined | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 5.5 | LB/MMSCF | 0.0054 |
| KY-0110 | 07/23/2020  ACT | EP 05-01 - Group 1 Car Bottom Furnaces #1 - #3 | 13.31 | Natural Gas | 28 | MMBtu/hr, each | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 5.5 | LB/MMSCF | 0.0054 |
| KY-0110 | 07/23/2020  ACT | EP 04-02 - Austenitizing Furnace | 13.31 | Natural Gas | 54 | MMBtu/hr | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 5.5 | LB/MMSCF | 0.0054 |
| KY-0110 | 07/23/2020  ACT | EP 05-02 - Group 2 Car Bottom Furnaces A & B | 13.31 | Natural Gas | 60 | MMBtu/hr, combined | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 5.5 | LB/MMSCF | 0.0054 |
| KY-0110 | 07/23/2020  ACT | EP 03-02 - Ingot Car Bottom Furnaces #1-#4 | 13.31 | Natural Gas | 37 | MMBtu/hr, each | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 5.5 | LB/MMSCF | 0.0054 |
| KY-0110 | 07/23/2020  ACT | EP 03-05 - Steckel Mill Coiling Furnaces #1 & #2 | 13.31 | Natural Gas | 17.5 | MMBtu/hr, each | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 5.5 | LB/MMSCF | 0.0054 |
| KY-0110 | 07/23/2020  ACT | EP 04-03 - Tempering Furnace | 13.31 | Natural Gas | 48 | MMBtu/hr | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 5.5 | LB/MMSCF | 0.0054 |
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Makeup Air Units (EP 21-19) | 13.31 | Natural Gas | 40 | MMBtu/hr, total | Volatile Organic Compounds (VOC) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 5.5 | LB/MMSCF | 0.0054 |
| KY-0115 | 04/19/2021  ACT | Vacuum Degasser Boiler (EP 20-13) | 13.31 | Natural Gas | 50.4 | MMBtu/hr | Volatile Organic Compounds (VOC) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 5.5 | LB/MMSCF | 0.0054 |
| KY-0115 | 04/19/2021  ACT | Pickle Line #2 â€“ Boiler #1 & #2 (EP 21-04 & EP 21-05) | 13.31 | Natural Gas | 18 | MMBtu/hr, each | Volatile Organic Compounds (VOC) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 5.5 | LB/MMSCF | 0.0054 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Alkali Cleaning Section Heater (EP 21-07B) | 13.31 | Natural Gas | 23 | MMBtu/hr | Volatile Organic Compounds (VOC) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 5.5 | LB/MMSCF | 0.0054 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - VOC (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Radiant Tube Furnace (EP 21-08B) | 13.31 | Natural Gas | 36 | MMBtu/hr | Volatile Organic Compounds (VOC) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 5.5 | LB/MMSCF | 0.0054 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Annealing Furnaces (15) (EP 21-15) | 13.31 | Natural Gas | 4.8 | MMBtu/hr, each | Volatile Organic Compounds (VOC) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 5.5 | LB/MMSCF | 0.0054 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Preheat Furnace (EP 21-08A) | 13.31 | Natural Gas | 94 | MMBtu/hr | Volatile Organic Compounds (VOC) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 5.5 | LB/MMSCF | 0.0054 |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Zinc Pot Preheater (EP 21-09) | 13.31 | Natural Gas | 3 | MMBtu/hr | Volatile Organic Compounds (VOC) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 5.5 | LB/MMSCF | 0.0054 |
| KY-0115 | 04/19/2021  ACT | Heated Transfer Table Furnace (EP 02-03) | 13.31 | Natural Gas | 65.5 | MMBtu/hr | Volatile Organic Compounds (VOC) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 5.5 | LB/MMSCF | 0.0054 |
| LA-0307 | 03/21/2016  ACT | Regenerative Heaters | 13.31 | natural gas | 7.37 | mm btu/hr | Volatile Organic Compounds (VOC) | good combustion practices | 0 | | |
| *LA-0315 | 05/23/2014  ACT | Reactor Charge Heater - 53B001 | 13.31 | Natural Gas | 10.1 | MMBTU/HR | Volatile Organic Compounds (VOC) | Combustion controls (proper burner design and operation using natural gas) | 0.05 | LB/H | 0.0050 |
| *LA-0315 | 05/23/2014  ACT | Regeneraton Heater - 51B001 | 13.31 | Natural Gas | 61 | MMBTU/HR | Volatile Organic Compounds (VOC) | Combustion controls (proper burner design and operation using natural gas) | 0.33 | LB/H | 0.0054 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002A | 13.31 | Natural Gas | 33 | MMBTU/HR | Volatile Organic Compounds (VOC) | Combustion controls (proper burner design and operation using natural gas) | 0.18 | LB/H | 0.0055 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002B | 13.31 | Natural Gas | 33 | MMBTU/HR | Volatile Organic Compounds (VOC) | Combustion controls (proper burner design and operation using natural gas) | 0.18 | LB/H | 0.0055 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002C | 13.31 | Natural Gas | 33 | MMBTU/HR | Volatile Organic Compounds (VOC) | Combustion controls (proper burner design and operation using natural gas) | 0.18 | LB/H | 0.0055 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002D | 13.31 | Natural Gas | 33 | MMBTU/HR | Volatile Organic Compounds (VOC) | Combustion controls (proper burner design and operation using natural gas) | 0.18 | LB/H | 0.0055 |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002E | 13.31 | Natural Gas | 33 | MMBTU/HR | Volatile Organic Compounds (VOC) | Combustion controls (proper burner design and operation using natural gas) | 0.18 | LB/H | 0.0055 |
| *LA-0349 | 07/10/2018  ACT | Hot Oil Heaters (5) | 13.31 | natural gas | 16.13 | mm btu/hr | Volatile Organic Compounds (VOC) | Good Combustion Practices and Use of low sulfur facility fuel gas | 0.0054 | LB/MM BTU | 0.0054 |
| *LA-0364 | 01/06/2020  ACT | Hot Oil Heaters 1 and 2 | 13.31 | Natural Gas | 0 | | Volatile Organic Compounds (VOC) | Good combustion practices and compliance with the applicable provisions of 40 CFR 63 Subpart DDDDD. | 4.02 | LB/H | |
| *LA-0364 | 01/06/2020  ACT | PR Waste Heat Boiler | 13.31 | Natural Gas | 94 | mm btu/h | Volatile Organic Compounds (VOC) | Good combustion practices and oxidation catalyst | 13.37 | LB/H | 0.1422 |
| MA-0039 | 01/30/2014  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 80 | MMBTU/H | Volatile Organic Compounds (VOC) | oxidation catalyst | 11.8 | PPMVD@3% O2 | 0.0050 |
| MD-0041 | 04/23/2014  ACT | AUXILLARY BOILER | 13.31 | NATURAL GAS | 93 | MMBTU/H | Volatile Organic Compounds (VOC) | EXCLUSIVE USE OF NATURAL GAS, AND GOOD COMBUSTION PRACTICES | 0.002 | LB/MMBTU | 0.0020 |
| MD-0042 | 04/08/2014  ACT | AUXILLARY BOILER | 13.31 | NATURAL GAS | 45 | MMBTU/H | Volatile Organic Compounds (VOC) | THE EXCLUSIVE USE OF PIPELINE QUALITY NATURAL GAS, LIMITED HOURS OF OPERATION, AND GOOD COMBUSTION PRACTICES | 0.0033 | LB/MMBTU | 0.0033 |
| MD-0045 | 11/13/2015  ACT | AUXILIARY BOILER | 13.31 | NATURAL GAS | 42 | MMBTU/H | Volatile Organic Compounds (VOC) | EXCLUSIVE USE OF NATURAL GAS, AND GOOD COMBUSTION PRACTICES | 0.003 | LB/MMBTU | 0.0030 |
| MD-0046 | 10/31/2014  ACT | AUXILIARY BOILER | 13.31 | PIPELINE QUALITY NATURAL GAS | 93 | MMBTU/H | Volatile Organic Compounds (VOC) | EFFICIENT BOILER DESIGN, EXCLUSIVE USE OF PIPELINE QUALITY NATURAL GAS, THE USE OF ULTRA-LOW NOX BURNERS, AND GOOD COMBUSTION PRACTICES | 0.002 | LB/MMBTU | 0.0020 |
| MI-0406 | 11/01/2013  ACT | FG-AUXBOILER1-2; Two (2) natural gas-fired auxiliary boilers. | 13.31 | natural gas | 40 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices. | 0.005 | LB/MMBTU | 0.0050 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - VOC (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0410 | 07/25/2013  ACT | FGAUXBOILERS: Two auxiliary boilers < 100 MMBTU/H heat input each | 13.31 | natural gas | 100 | MMBTU/H heat input each | Volatile Organic Compounds (VOC) | Efficient combustion; natural gas fuel. | 0.008 | LB/MMBTU | 0.0080 |
| MI-0412 | 12/04/2013  ACT | Fuel pre-heater (EUFUELHTR) | 13.31 | natural gas | 3.7 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0.03 | LB/H | 0.0081 |
| MI-0412 | 12/04/2013  ACT | Auxiliary Boiler B (EUAUXBOILERB) | 13.31 | natural gas | 95 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0.008 | LB/MMBTU | 0.0080 |
| MI-0412 | 12/04/2013  ACT | Auxiliary Boiler A (EUAUXBOILERA) | 13.31 | natural gas | 55 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion control | 0.008 | LB/MMBTU | 0.0080 |
| MI-0421 | 08/26/2016  ACT | EUFLTOS1 in FGTOH (Thermal Oil System for Thermally Fused Lamination Lines) | 13.31 | Natural gas | 34 | MMBTU/H | Volatile Organic Compounds (VOC) | Good design and operating/combustion practices. | 0.0054 | LB/MMBTU | 0.0054 |
| MI-0421 | 08/26/2016  ACT | EUTOH (In FGTOH)--Thermal Oil Heater | 13.31 | Natural gas | 34 | MMBTU/H | Volatile Organic Compounds (VOC) | Good design and operating/combustion practices. | 0.0054 | LB/MMBTU | 0.0054 |
| MI-0423 | 01/04/2017  ACT | FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2) | 13.31 | Natural gas | 27 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices. | 0.15 | LB/H | 0.0056 |
| MI-0424 | 12/05/2016  ACT | EUFUELHTR (Fuel pre-heater) | 13.31 | Natural gas | 3.7 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices. | 0.03 | LB/H | 0.0081 |
| MI-0424 | 12/05/2016  ACT | EUAUXBOILER (Auxiliary boiler) | 13.31 | natural gas | 83.5 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices. | 0.008 | LB/MMBTU | 0.0080 |
| MI-0425 | 05/09/2017  ACT | EUTOH in FGTOH | 13.31 | Natural gas | 38 | MMBTU/H | Volatile Organic Compounds (VOC) | Good design and operating/combustion practices. | 0.0054 | LB/MMBTU | 0.0054 |
| MI-0425 | 05/09/2017  ACT | EUFLTOS1 in FGTOH | 13.31 | Natural gas | 10.2 | MMBTU/H | Volatile Organic Compounds (VOC) | Good design and operating/combustion practices. | 0.0054 | LB/MMBTU | 0.0054 |
| MI-0433 | 06/29/2018  ACT | EUAUXBOILER (North Plant): Auxiliary Boilder | 13.31 | Natural gas | 61.5 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices. | 0.004 | LB/MMBTU | 0.0040 |
| MI-0433 | 06/29/2018  ACT | EUAUXBOILER (South Plant): Auxiliary Boiler | 13.31 | Natural gas | 61.5 | MMBTU/h | Volatile Organic Compounds (VOC) | Good combustion practices. | 0.004 | LB/MMBTU | 0.0040 |
| MI-0435 | 07/16/2018  ACT | EUAUXBOILER: Auxiliary Boiler | 13.31 | Natural gas | 99.9 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0.008 | LB/MMBTU | 0.0080 |
| MI-0435 | 07/16/2018  ACT | EUFUELHTR1: Natural gas fired fuel heater | 13.31 | Natural gas | 20.8 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion controls | 0.17 | LB/H | 0.0082 |
| MI-0435 | 07/16/2018  ACT | EUFUELHTR2: Natural gas fired fuel heater | 13.31 | Natural gas | 3.8 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion controls. | 0.03 | LB/H | 0.0079 |
| *MI-0440 | 05/22/2019  ACT | FGFUELHEATERS | 13.31 | natural gas | 25 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0.005 | LB/MMBTU | 0.0050 |
| *MI-0441 | 12/21/2018  ACT | EUAUXBOILER--natural gas fired auxiliary boiler rated at <= 99MMBTU/H | 13.31 | Natural gas | 99 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices. | 0.5 | LB/H | 0.0051 |
| *MI-0442 | 08/21/2019  ACT | FGAUXBOILER | 13.31 | Natural gas | 80 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices. | 0.0054 | LB/MMBTU | 0.0054 |
| *MI-0442 | 08/21/2019  ACT | FGPREHEAT | 13.31 | natural gas | 7 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0.025 | LB/MMBTU | 0.0250 |
| *MI-0445 | 11/26/2019  ACT | FGFUELHTR (2 fuel pre-heaters) | 13.31 | Natural gas | 27 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0.07 | LB/H | 0.0026 |
| MS-0092 | 05/08/2014  ACT | Regeneration Heater, methanol to gasoline | 13.31 | NATURAL GAS | 13 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0 | | |
| MS-0092 | 05/08/2014  ACT | Reactor Heater, 5 | 13.31 | NATURAL GAS | 12 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0 | | |
| NJ-0079 | 07/25/2012  ACT | Commercial/Institutional size boilers less than 100 MMBtu/hr | 13.31 | natural gas | 2000 | hours/year | Volatile Organic Compounds (VOC) | Use of Natural Gas | 0.14 | LB/H | 0.0015 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - VOC (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NJ-0080 | 11/01/2012  ACT | Boiler less than 100 MMBtu/hr | 13.31 | Natural Gas | 51.9 | mmcubic ft/year | Volatile Organic Compounds (VOC) | use of natural gas a clean fuel | 0.27 | LB/H | |
| NJ-0084 | 03/10/2016  ACT | Auxiliary Boiler firing natural gas | 13.31 | natural gas | 687 | MMCFT/YR | Volatile Organic Compounds (VOC) | Use of good combustion practices and use of natural gas a clean burning fuel | 0.32 | LB/H | 0.0040 |
| NJ-0085 | 07/19/2016  ACT | AUXILIARY BOILER | 13.31 | Natural GAS | 4000 | H/YR | Volatile Organic Compounds (VOC) | USE OF NATURAL GAS A CLEAN BURNING FUEL AND GOOD COMBUSTION PRACTICES | 0.488 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Auxiliary boiler | 13.31 | natural gas | 60 | MMBTU/H | Volatile Organic Compounds (VOC) | good combustion practice | 0.0015 | LB/MMBTU | 0.0015 |
| NY-0104 | 08/01/2013  ACT | Auxiliary boiler | 13.31 | natural gas | 0 | | Volatile Organic Compounds (VOC) | Good combustion practice. | 0.0038 | LB/MMBTU | 0.0038 |
| OH-0350 | 07/18/2012  ACT | Steam Boiler | 13.31 | Natural Gas | 65 | MMBtu/H | Volatile Organic Compounds (VOC) | Proper burner design and good combustion practices | 0.35 | LB/H | 0.0054 |
| OH-0352 | 06/18/2013  ACT | Auxillary Boiler | 13.31 | Natural Gas | 99 | MMBtu/H | Volatile Organic Compounds (VOC) | Good combustion practices and using combustion optimization technologies | 0.59 | LB/H | 0.0060 |
| OH-0355 | 05/07/2013  ACT | 4 Indirect-Fired Air Preheaters | 13.31 | Natural gas | 0 | | Volatile Organic Compounds (VOC) | | 0.005 | LB/MMBTU | 0.0050 |
| OH-0360 | 11/05/2013  ACT | Auxiliary Boiler (B001) | 13.31 | Natural Gas | 99 | MMBtu/H | Volatile Organic Compounds (VOC) | Good combustion practices and using combustion optimization technologies. | 0.59 | LB/H | 0.0060 |
| OH-0366 | 08/25/2015  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 34 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion controls | 0.2 | LB/H | 0.0060 |
| OH-0367 | 09/23/2016  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 99 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion controls and natural gas/ultra low sulfur diesel | 0.59 | LB/H | 0.0060 |
| OH-0368 | 04/19/2017  ACT | Startup Heater (B001) | 13.31 | Natural gas | 100 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion control (i.e., high temperatures, sufficient excess air, sufficient residence times, and god air/fuel mixing). | 0.54 | LB/H | 0.0054 |
| OH-0370 | 09/07/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 37.8 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion controls | 0.23 | LB/H | 0.0060 |
| OH-0372 | 09/27/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 37.8 | MMBTU/H | Volatile Organic Compounds (VOC) | good combustion controls | 0.23 | LB/H | 0.0060 |
| OH-0374 | 10/23/2017  ACT | Fuel Gas Heaters (2 identical, P007 and P008) | 13.31 | Natural gas | 15 | MMBTU/H | Volatile Organic Compounds (VOC) | Combustion control | 0.075 | LB/H | 0.0050 |
| OH-0375 | 11/07/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 26.8 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion controls | 0.13 | LB/H | 0.0050 |
| OH-0377 | 04/19/2018  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 44.55 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0.16 | LB/H | 0.0036 |
| OH-0377 | 04/19/2018  ACT | Auxiliary Boiler (B002) | 13.31 | Natural gas | 80 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0.248 | LB/H | 0.0031 |
| *OH-0381 | 09/27/2019  ACT | Tunnel Furnace #2 (P018) | 13.31 | Natural Gas | 88 | MMBTU/H | Volatile Organic Compounds (VOC) | Use of natural gas, good combustion practices and design | 0.48 | LB/H | 0.0055 |
| OK-0148 | 09/12/2012  ACT | Commercial/Institutional Boilers (<100 MMBTUH) | 13.31 | Natural Gas | 11.04 | MMBTUH | Volatile Organic Compounds (VOC) | | 0.0054 | LB/MMBTU | 0.0054 |
| OK-0156 | 07/31/2013  ACT | Gas-fired Boiler | 13.31 | Natural Gas | 95 | MMBTUH | Volatile Organic Compounds (VOC) | Good Combustion | 0.006 | LB/MMBTU | 0.0060 |
| OK-0156 | 07/31/2013  ACT | Refinery Boiler | 13.31 | Natural Gas | 5 | MMBTUH | Volatile Organic Compounds (VOC) | Good Combustion | 0.0054 | LB/MMBTU | 0.0054 |
| OK-0164 | 01/08/2015  ACT | Heaters/Boilers | 13.31 | Natural Gas | 0 | MMBTUH | Volatile Organic Compounds (VOC) | 1. Use pipeline-quality natural gas. 2. Good Combustion Practices w/emission rate limit of 0.005 lb/MMBTU based on AP-42 (7/1998). | 7.1 | TONS PER YEAR | |
| OK-0173 | 01/19/2016  ACT | Heaters (Gas-Fired) | 13.31 | Natural Gas | 0 | | Volatile Organic Compounds (VOC) | Natural Gas Fuel. | 0.0055 | LB/MMBTU | 0.0055 |
| OR-0050 | 03/05/2014  ACT | Auxiliary boiler | 13.31 | natural gas | 39.8 | MMBTU/H | Volatile Organic Compounds (VOC) | Utilize Low-NOx burners and FGR. | 0.005 | LB/MMBTU | 0.0050 |
| PA-0291 | 04/23/2013  ACT | AUXILIARY BOILER | 13.31 | Natural Gas | 40 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0.0015 | LB/MMBTU | 0.0015 |
| PA-0296 | 12/17/2013  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 40 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0.14 | T/YR | |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - VOC (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PA-0307 | 06/15/2015  ACT | Auxilary Boiler | 13.31 | Natural Gas | 62.04 | MCF/hr | Volatile Organic Compounds (VOC) | Good combustion practices and FGR | 0.004 | LB/MMBTU | 0.0040 |
| PA-0309 | 12/23/2015  ACT | Auxillary Boiler | 13.31 | Natural gas | 13.31 | MMBtu/hr | Volatile Organic Compounds (VOC) | | 0.005 | LB/MMBTU | 0.0050 |
| PA-0310 | 09/02/2016  ACT | Auxilary boiler | 13.31 | Natural Gas | 92.4 | MMBtu/hr | Volatile Organic Compounds (VOC) | ULSD and good combustion practices | 0.004 | LB/MMBTU | 0.0040 |
| PA-0311 | 09/01/2015  ACT | Auxilary Boiler | 13.31 | Natural Gas | 55.4 | MMBtu/hr | Volatile Organic Compounds (VOC) | | 0.005 | LB/MMBTU | 0.0050 |
| *PA-0316 | 01/26/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 118800 | MMBtu/12 month period | Volatile Organic Compounds (VOC) | | 0.005 | LB | 0.0050 |
| SC-0113 | 02/08/2012  ACT | BOILERS | 13.31 | NATURAL GAS | 5 | MMBTU/H | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES. CONSUMPTION OF NATURAL GAS AND PROPANE AS FUEL. | 0 | | |
| SC-0149 | 01/03/2013  ACT | NATURAL GAS BOILER EU004 | 13.31 | NATURAL GAS | 46 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0.003 | LB/MMBTU | 0.0030 |
| SC-0149 | 01/03/2013  ACT | NATURAL GAS BOILER EU005 | 13.31 | NATURAL GAS | 46 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0.003 | LB/MMBTU | 0.0030 |
| SC-0149 | 01/03/2013  ACT | NATURAL GAS BOILER EU006 | 13.31 | NATURAL GAS | 46 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0.003 | LB/MMBTU | 0.0030 |
| SC-0160 | 12/13/2012  ACT | BOILERS (BL01) & (BL02) | 13.31 | NATURAL GAS | 33.6 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0.18 | LB/H | 0.0054 |
| SC-0179 | 03/18/2015  ACT | THERMAL OIL HEATER #2 | 13.31 | NATURAL GAS | 1.83 | MMBTU/H | Volatile Organic Compounds (VOC) | NATURAL GAS USAGE AND GOOD COMBUSTION PRACTICES. | 0.01 | LB/H | 0.0055 |
| SC-0192 | 05/21/2019  ACT | Boiler No. 2 | 13.31 | Natural Gas | 0 | | Volatile Organic Compounds (VOC) | Work Practice Standards | 0.0054 | LB/MMBTU | 0.0054 |
| *SC-0193 | 04/15/2016  ACT | Energy Center Boilers | 13.31 | Natural Gas | 14.27 | MMBTU/hr | Volatile Organic Compounds (VOC) | Annual tune ups per 40 CFR 63.7540(a)(10) are required. | 5.5 | LB/MMSCF | 0.0054 |
| TX-0656 | 05/16/2014  ACT | Heaters | 13.31 | natural gas | 45 | MMBTU/H | Volatile Organic Compounds (VOC) | clean fuel and good combustion practices | 0.59 | T/YR | |
| TX-0656 | 05/16/2014  ACT | heaters (5) | 13.31 | natural gas | 24.3 | MMBTU/H | Volatile Organic Compounds (VOC) | clean fuel and good combustion practices | 2.44 | T/YR | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 17 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0 | | |
| TX-0663 | 05/25/2012  ACT | 8 Inlet Compressors | 13.31 | Natural Gas or electricity | 4.5 | MMBTU/H | Volatile Organic Compounds (VOC) | Oxidation catalyst and Dual Drive (electric/gas) technology | 0.27 | G/HP | |
| TX-0663 | 05/25/2012  ACT | Residue Compressors | 13.31 | Natural Gas | 4735 | hp | Volatile Organic Compounds (VOC) | Oxidation Catalyst | 0.27 | G/BHP | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 48 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0 | | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 10 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0 | | |
| TX-0663 | 05/25/2012  ACT | Heaters | 13.31 | Natural Gas | 3 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practice | 0 | | |
| TX-0663 | 05/25/2012  ACT | Amine Units | 13.31 | Natural Gas | 9 | MMscfd | Volatile Organic Compounds (VOC) | Thermal Oxidizer | 0 | | |
| TX-0663 | 05/25/2012  ACT | Glycol Dehy Units | 13.31 | Natural Gas | 3700 | T/YR | Volatile Organic Compounds (VOC) | Thermal Oxidizer | 0 | | |
| TX-0751 | 06/18/2015  ACT | Commercial/Institutional Size Boilers (<100 MMBtu) â€“ natural gas | 13.31 | natural gas | 73.3 | MMBTU/H | Volatile Organic Compounds (VOC) | | 4 | PPM | |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 40 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practice to ensure complete combustion. | 0.94 | T/YR | |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 95.7 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practice to ensure complete combustion. | 5.42 | T/YR | |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 13.2 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practice to ensure complete combustion. | 0.3 | T/YR | |
| TX-0813 | 11/22/2016  ACT | small Boiler | 13.31 | natural gas | 39.9 | MMBtu/hr | Volatile Organic Compounds (VOC) | best combustion practices | 0.0005 | MMBTU/HR | |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - VOC (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0851 | 12/17/2018  ACT | Thermal Oxidizer | 13.31 | NATL GAS | 71.3 | MMBTU/HR | Volatile Organic Compounds (VOC) | Natural Gas / Clean Fuel, good combustion practices. | 0.0054 | LB/MMBTU | 0.0054 |
| TX-0877 | 01/08/2020  ACT | Isostripper Reboiler (heater) | 13.31 | natural gas | 0 | | Volatile Organic Compounds (VOC) | Good combustion practices, use of natural gas fuel for the project heater | 0.0054 | LB/MMBTU | 0.0054 |
| TX-0888 | 04/23/2020  ACT | Heaters | 13.31 | natural gas | 100 | MMBtu | Volatile Organic Compounds (VOC) | Good combustion practice and proper design. | 0.0054 | LB/MMBTU | 0.0054 |
| VA-0321 | 03/12/2013  ACT | AUXILIARY BOILER | 13.31 | Natural Gas | 66.7 | MMBTU/H | Volatile Organic Compounds (VOC) | Clean fuel and good combustion practices | 0.005 | LB/MMBTU | 0.0050 |
| VA-0327 | 07/12/2017  ACT | (4) 27 MMBtu/hr boilers, Natural gas and No. 2 fuel oi | 13.31 | Natural Gas | 0 | | Volatile Organic Compounds (VOC) | | 0.1 | LB/HR | |
| WI-0266 | 09/06/2018  ACT | Natural gas-fied boiler (Boiler B01) | 13.31 | Natural Gas | 35 | mmBtu/hr | Volatile Organic Compounds (VOC) | Good combustion practices, use only natural gas, equip boiler with Low NOx burners and flue gas recirculation | 0.0055 | LB/MMBTU | 0.0055 |
| *WI-0283 | 04/24/2018  ACT | B01-B12, Boilers | 13.31 | Natural Gas | 28 | mmBTU/hr | Volatile Organic Compounds (VOC) | Ultra-low NOx Burners, Flue Gas Recirculation and Good Combustion Practices | 0.0036 | LB/MMBTU | 0.0036 |
| *WI-0284 | 04/24/2018  ACT | B13-B24 & B25-B36 Natural Gas-Fired Boilers | 13.31 | Natural Gas | 28 | mmBTU | Volatile Organic Compounds (VOC) | Ultra-Low NOx Burners, Flue Gas Recirculation, and Good Combustion Practices. | 0.0036 | LB/MMBTU | 0.0036 |
| *WI-0289 | 04/01/2019  ACT | B98 & B99 Natural Gas Fired Temporary Boilers | 13.31 | Natural Gas | 95 | mmBTU/hr | Volatile Organic Compounds (VOC) | Good Combustion Practices | 0.0055 | LB/MMBTU | 0.0055 |
| *WI-0292 | 04/01/2019  ACT | P44 Space Heaters | 13.31 | Natural Gas | 20 | mmBTU/hr | Volatile Organic Compounds (VOC) | Good Combustion Practices, the Use of Low-NOx Burners | 0.0055 | LB/MMBTU | 0.0055 |
| *WV-0029 | 03/27/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 77.8 | mmBtu/hr | Volatile Organic Compounds (VOC) | Use of Natural Gas, Good Combustion Practices | 0.62 | LB/HR | 0.0080 |
| *WV-0032 | 09/18/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas/Ethane | 111.9 | mmBtu/hr | Volatile Organic Compounds (VOC) | Use of Natural Gas, Good Combustion Practices | 0.9 | LB/HR | 0.0080 |
| WY-0075 | 07/16/2014  ACT | Auxiliary Boiler | 13.31 | natual gas | 25.06 | MMBtu/h | Volatile Organic Compounds (VOC) | good combustion practices | 0.0017 | LB/MMBTU | 0.0017 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - GHG (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| AK-0083 | 01/06/2015  ACT | Five (5) Waste Heat Boilers | 13.31 | Natural Gas | 50 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 59.61 | TONS/MMCF |
| *AK-0085 | 08/13/2020  ACT | Two (2) Buyback Gas Bath Heaters and Three (3) Operations Camp Heaters | 13.31 | Natural Gas | 32 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices, Clean Fuels, and Limited Operation of 500 hours per year per heater. | 117.1 | LB/MMBTU |
| AL-0282 | 01/22/2014  ACT | Natural Gas Fired Boilers (3) | 13.31 | Natural Gas | 100 | mm btu/hr | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 112508 | TPY |
| AL-0307 | 10/09/2015  ACT | PACKAGE BOILER | 13.31 | NATURAL GAS | 17.5 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 34189 | T/YR |
| AL-0307 | 10/09/2015  ACT | 2 CALP LINE BOILERS | 13.31 | NATURAL GAS | 24.59 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 34189 | T/YR |
| *AL-0329 | 09/21/2021  ACT | Three Gas Heaters | 13.31 | Natural Gas | 10 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | | 117.1 | LB/MMBTU |
| AR-0140 | 09/18/2013  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 67 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | GOOD OPERATING PRACTICES<br><br>MINIMUM BOILER EFFICIENCY 75% | 117 | LB/MMBTU |
| AR-0140 | 09/18/2013  ACT | BOILERS SN-26 AND 27, GALVANIZING LINE | 13.31 | NATURAL GAS | 24.5 | MMBTU/H | Carbon Dioxide | GOOD OPERATING PRACTICES<br><br>MINIMUM BOILER EFFICIENCY 75% | 117 | LB/MMBTU |
| AR-0140 | 09/18/2013  ACT | FURNACES SN-40 AND SN-42, DECARBURIZING LINE | 13.31 | NATURAL GAS | 22 | MMBTU/H | Carbon Dioxide | GOOD OPERATING PRACTICES | 117 | LB/MMBTU |
| AR-0155 | 11/07/2018  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 53.7 | MMBTU/HR | Carbon Dioxide | GOOD OPERATING PRACTICES MINIMUM BOILER EFFICIENCY 75% | 117 | LB/MMBTU |
| AR-0155 | 11/07/2018  ACT | BOILER SN-26, GALVANIZING LINE | 13.31 | NATURAL GAS | 53.7 | MMBTU/HR | Carbon Dioxide | GOOD OPERATING PRACTICES MINIMUM BOILER EFFICIENCY 75% | 117 | LB/MMBTU |
| AR-0155 | 11/07/2018  ACT | PREHEATER, GALVANIZING LINE SN-28 | 13.31 | NATURAL GAS | 78.2 | MMBTU/HR | Carbon Dioxide | GOOD OPERATING PRACTICES | 117 | LB/MMBTU |
| AR-0159 | 04/05/2019  ACT | BOILER, PICKLE LINE | 13.31 | NATURAL GAS | 0 | | Carbon Dioxide | GOOD OPERATING PRACTICES MINIMUM BOILER EFFICIENCY 75% | 117 | LB/MMBTU |
| AR-0159 | 04/05/2019  ACT | PREHEATERS, GALVANIZING LINE SN-28 and SN-29 | 13.31 | NATURAL GAS | 0 | | Carbon Dioxide | GOOD OPERATING PRACTICES | 117 | LB/MMBTU |
| AR-0159 | 04/05/2019  ACT | BOILER, ANNEALING PICKLE LINE | 13.31 | NATURAL GAS | 0 | | Carbon Dioxide | GOOD OPERATING PRACTICES MINIMUM BOILER EFFICIENCY 75% | 117 | LB/MMBTU |
| AR-0159 | 04/05/2019  ACT | BOILERS SN-26 AND SN-27, GALVANIZING LINE | 13.31 | NATURAL GAS | 0 | | Carbon Dioxide | GOOD OPERATING PRACTICES MINIMUM BOILER EFFICIENCY 75% | 117 | LB/MMBTU |
| AR-0168 | 03/17/2021  ACT | Galvanizing Line #2 Furnace | 13.31 | Natural Gas | 150.5 | MMBtu/hr | Carbon Dioxide | Good operating practices | 117 | LB/MMBTU |
| *AR-0172 | 09/01/2021  ACT | SN-202, 203, 204 Pickle Line Boilers | 13.31 | Natural Gas | 0 | | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practice | 121 | LB/MMBTU |
| FL-0356 | 03/09/2016  ACT | Auxiliary Boiler, 99.8 MMBtu/hr | 13.31 | Natural gas | 99.8 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | Use of natural gas only | 0 | |
| IA-0106 | 07/12/2013  ACT | Startup Heater | 13.31 | natural gas | 58.8 | MMBTU/H | Carbon Dioxide | good operating practices & use of natural gas | 117 | LB/MMBTU |
| IA-0106 | 07/12/2013  ACT | Startup Heater | 13.31 | natural gas | 58.8 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | good operating practices & use of natural gas | 345 | TONS/YR |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - GHG (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| IA-0107 | 04/14/2014  ACT | dew point heater | 13.31 | natural gas | 13.32 | mmBtu/hr | Carbon Dioxide Equivalent (CO2e) | | 6860 | TONS |
| IA-0107 | 04/14/2014  ACT | dew point heater | 13.31 | natural gas | 13.32 | mmBtu/hr | Carbon Dioxide Equivalent (CO2e) | | 6860 | TONS |
| IA-0107 | 04/14/2014  ACT | auxiliary boiler | 13.31 | natural gas | 60.1 | mmBtu/hr | Carbon Dioxide Equivalent (CO2e) | | 17313 | TON/YR |
| IA-0107 | 04/14/2014  ACT | auxiliary boiler | 13.31 | natural gas | 60.1 | mmBtu/hr | Carbon Dioxide Equivalent (CO2e) | | 17313 | TON/YR |
| IL-0129 | 07/30/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 96 | mmBtu/hr | Carbon Dioxide Equivalent (CO2e) | Good combustion practice | 22500 | TON/YR |
| IL-0130 | 12/31/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 96 | mmBtu/hr | Carbon Dioxide Equivalent (CO2e) | Good combustion practice | 11250 | TONS/YEAR |
| IN-0158 | 12/03/2012  ACT | TWO (2) NATURAL GAS AUXILIARY BOILERS | 13.31 | NATURAL GAS | 80 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | OPERATION AND MAINTENANCE PRACTICES; COMBUSTION TURNING; OXYGEN TRIM CONTROLS & ANALYZERS; ECONOMIZER; ENERGY EFFICIENT REFRACTORY; CONDENSATE RETURN SYSTEM, INSULATE STEAM AND HOT LINES. | 81996 | TONS |
| IN-0263 | 03/23/2017  ACT | STARTUP HEATER EU-002 | 13.31 | NATURAL GAS | 70 | MMBTU/HR | Carbon Dioxide | GOOD COMBUSTION PRACTICES AND THE USE OF INLET AIR CONTROL SENSORS THAT LIMIT EXCESS AIR | 8184 | LB/H |
| KS-0029 | 07/14/2015  ACT | Auxiliary boiler | 13.31 | Natural gas | 18.6 | MMBTU/HR | Carbon Dioxide Equivalent (CO2e) | | 9521.5 | TONS PER YEAR |
| KY-0110 | 07/23/2020  ACT | EP 15-01 - Natural Gas Direct-Fired Space Heaters, Process Water Heaters, & Air Makeup Heaters | 13.31 | Natural Gas | 40 | MMBtu/hr, combined | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan and meet design requirements. | 20734 | TON/YR |
| KY-0110 | 07/23/2020  ACT | EP 05-01 - Group 1 Car Bottom Furnaces #1 - #3 | 13.31 | Natural Gas | 28 | MMBtu/hr, each | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan and meet design requirements. | 43542 | TON/YR |
| KY-0110 | 07/23/2020  ACT | EP 04-02 - Austenitizing Furnace | 13.31 | Natural Gas | 54 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan and implement design standards. | 27991 | TON/YR |
| KY-0110 | 07/23/2020  ACT | EP 05-02 - Group 2 Car Bottom Furnaces A & B | 13.31 | Natural Gas | 60 | MMBtu/hr, combined | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan and meet design requirements. | 31101 | TON/YR |
| KY-0110 | 07/23/2020  ACT | EP 03-02 - Ingot Car Bottom Furnaces #1-#4 | 13.31 | Natural Gas | 37 | MMBtu/hr, each | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan and meet design standards. | 76717 | TON/YR |
| KY-0110 | 07/23/2020  ACT | EP 03-05 - Steckel Mill Coiling Furnaces #1 & #2 | 13.31 | Natural Gas | 17.5 | MMBtu/hr, each | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 18142 | TON/YR |
| KY-0110 | 07/23/2020  ACT | EP 04-03 - Tempering Furnace | 13.31 | Natural Gas | 48 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan and meet design requirements. | 24881 | TON/YR |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - GHG (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Makeup Air Units (EP 21-19) | 13.31 | Natural Gas | 40 | MMBtu/hr, total | Carbon Dioxide Equivalent (CO2e) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan and implement various design and operational efficiency requirements. | 20734 | TONS/YR |
| KY-0115 | 04/19/2021  ACT | Vacuum Degasser Boiler (EP 20-13) | 13.31 | Natural Gas | 50.4 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan and implement various design and operational efficiency requirements. | 26125 | TONS/YR |
| KY-0115 | 04/19/2021  ACT | Pickle Line #2 â€“ Boiler #1 & #2 (EP 21-04 & EP 21-05) | 13.31 | Natural Gas | 18 | MMBtu/hr, each | Carbon Dioxide Equivalent (CO2e) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan and implement various design and operational efficiency requirements. | 12675 | TONS/YR |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Alkali Cleaning Section Heater (EP 21-07B) | 13.31 | Natural Gas | 23 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan and implement various design and operational efficiency requirements. | 11922 | TONS/YR |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Radiant Tube Furnace (EP 21-08B) | 13.31 | Natural Gas | 36 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan and implement various design and operational efficiency requirements. | 18660 | TONS/YR |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Annealing Furnaces (15) (EP 21-15) | 13.31 | Natural Gas | 4.8 | MMBtu/hr, each | Carbon Dioxide Equivalent (CO2e) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan and implement various design and operational efficiency requirements. | 37581 | TONS/YR |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Preheat Furnace (EP 21-08A) | 13.31 | Natural Gas | 94 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan and implement various design and operational efficiency requirements. | 48725 | TONS/YR |
| KY-0115 | 04/19/2021  ACT | Galvanizing Line #2 Zinc Pot Preheater (EP 21-09) | 13.31 | Natural Gas | 3 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan and implement various design and operational efficiency requirements. | 30 | TONS/YR |
| KY-0115 | 04/19/2021  ACT | Heated Transfer Table Furnace (EP 02-03) | 13.31 | Natural Gas | 65.5 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan and implement various design and operational efficiency requirements. | 33952 | TONS/YR |
| LA-0268 | 09/25/2013  ACT | Cracking Furnace E (2M-17) (EQT 0233) | 13.31 | Natural gas | 90 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Improved combustion measures (i.e., combustion tuning, optimization, and installation of instrumentation and controls); insulation; and operational monitoring and proper maintenance to minimize air infiltration. | 46123 | TPY |
| LA-0269 | 09/25/2013  ACT | Cracking Furnace E (M-17) (EQT 0242) | 13.31 | Natural Gas | 90 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Improved combustion measures (i.e., combustion tuning, optimization, and installation of instrumentation and controls); insulation; and operational monitoring and proper maintenance to minimize air infiltration. | 46123 | TPY |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - GHG (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| LA-0271 | 05/24/2013  ACT | Mol Sieve Dehy Regen Heater (H-01) | 13.31 | Natural gas | 30 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Improved combustion measures: heater tuning, optimization, and installation of instrumentation and controls; insulation installed according to the heater manufacturerâ€™s specifications; operational monitoring as well as proper maintenance in order to minimize air infiltration. | 0 | |
| LA-0305 | 06/30/2016  ACT | Gasifier Start-up Preheat Burners | 13.31 | Natural gas | 23 | MM BTU/hr (each) | Carbon Dioxide Equivalent (CO2e) | good equipment design and good combustion practices | 0 | |
| LA-0305 | 06/30/2016  ACT | WSA Preheat Burners | 13.31 | Natural Gas | 0 | | Carbon Dioxide Equivalent (CO2e) | good equipment design and good combustion practices | 0 | |
| LA-0307 | 03/21/2016  ACT | Regenerative Heaters | 13.31 | natural gas | 7.37 | mm btu/hr | Carbon Dioxide Equivalent (CO2e) | good combustion/operating/maintenance practices and fueled by natural gas | 0 | |
| LA-0311 | 07/15/2013  ACT | No. 6 Ammonia Plant Start-up Heater (4-13, EQT 158) | 13.31 | Natural Gas | 94.5 | MM Btu/hr | Carbon Dioxide Equivalent (CO2e) | Use of natural gas as fuel, good combustion practices, and good heater design with appropriate instrumentation. | 117 | LB/MM BTU |
| LA-0311 | 07/15/2013  ACT | No. 6 Ammonia Plant Start-up Heater (4-13, EQT 158) | 13.31 | Natural Gas | 94.5 | MM Btu/hr | Carbon Dioxide | Use of natural gas as fuel, good combustion practices, and good heater design with appropriate instrumentation. | 116.89 | LB/MM BTU |
| *LA-0315 | 05/23/2014  ACT | Reactor Charge Heater - 53B001 | 13.31 | Natural Gas | 10.1 | MMBTU/HR | Carbon Dioxide Equivalent (CO2e) | Energy Efficiency Measures | 0 | |
| *LA-0315 | 05/23/2014  ACT | Regeneraton Heater - 51B001 | 13.31 | Natural Gas | 61 | MMBTU/HR | Carbon Dioxide Equivalent (CO2e) | Energy Efficiency Measures | 0 | |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002A | 13.31 | Natural Gas | 33 | MMBTU/HR | Carbon Dioxide Equivalent (CO2e) | Energy Efficiency Measures | 0 | |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002B | 13.31 | Natural Gas | 33 | MMBTU/HR | Carbon Dioxide Equivalent (CO2e) | Energy Efficiency Measures | 0 | |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002C | 13.31 | Natural Gas | 33 | MMBTU/HR | Carbon Dioxide Equivalent (CO2e) | Energy Efficiency Measures | 0 | |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002D | 13.31 | Natural Gas | 33 | MMBTU/HR | Carbon Dioxide Equivalent (CO2e) | Energy Efficiency Measures | 0 | |
| *LA-0315 | 05/23/2014  ACT | Recycle Gas Heater - 51B002E | 13.31 | Natural Gas | 33 | MMBTU/HR | Carbon Dioxide Equivalent (CO2e) | Energy Efficiency Measures | 0 | |
| *LA-0349 | 07/10/2018  ACT | Hot Oil Heaters (5) | 13.31 | natural gas | 16.13 | mm btu/hr | Carbon Dioxide Equivalent (CO2e) | Use Low Carbon Fuel, Energy Efficiency Measures, and Good Combustion Practices | 0 | |
| *LA-0364 | 01/06/2020  ACT | Hot Oil Heaters 1 and 2 | 13.31 | Natural Gas | 0 | | Carbon Dioxide Equivalent (CO2e) | Use of fuel gas as fuel, energy-efficient design options, and operational/maintenance practices. | 5858 | TONS/YR |
| *LA-0364 | 01/06/2020  ACT | PR Waste Heat Boiler | 13.31 | Natural Gas | 94 | mm btu/h | Carbon Dioxide Equivalent (CO2e) | Use of natural gas or fuel gas as fuel, energy efficient design options, and operational/maintenance practices. | 455475 | T/YR |
| MA-0039 | 01/30/2014  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 80 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 119 | LB/MMBTU |
| MI-0406 | 11/01/2013  ACT | FG-AUXBOILER1-2; Two (2) natural gas-fired auxiliary boilers. | 13.31 | natural gas | 40 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices. | 11503.7 | T/YR |
| MI-0410 | 07/25/2013  ACT | FGAUXBOILERS: Two auxiliary boilers < 100 MMBTU/H heat input each | 13.31 | natural gas | 100 | MMBTU/H heat input each | Carbon Dioxide Equivalent (CO2e) | Efficient combustion; energy efficiency. | 24304 | T/YR |
| MI-0412 | 12/04/2013  ACT | Fuel pre-heater (EUFUELHTR) | 13.31 | natural gas | 3.7 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 1934 | T/YR |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - GHG (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| MI-0412 | 12/04/2013  ACT | Auxiliary Boiler B (EUAUXBOILERB) | 13.31 | natural gas | 95 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 49251 | T/YR |
| MI-0412 | 12/04/2013  ACT | Auxiliary Boiler A (EUAUXBOILERA) | 13.31 | natural gas | 55 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 28514 | T/YR |
| MI-0420 | 06/03/2016  ACT | FGAUXBOILERS | 13.31 | Natural gas | 6 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Use of pipeline quality natural gas and energy efficiency measures. | 6155 | T/YR |
| MI-0421 | 08/26/2016  ACT | EUFLTOS1 in FGTOH (Thermal Oil System for Thermally Fused Lamination Lines) | 13.31 | Natural gas | 34 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion and maintenance practices. Natural gas only. | 5254 | T/YR |
| MI-0421 | 08/26/2016  ACT | EUTOH (In FGTOH)--Thermal Oil Heater | 13.31 | Natural gas | 34 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion and maintenance practices, natural gas only. | 17438 | T/YR |
| MI-0423 | 01/04/2017  ACT | FGFUELHTR (Two fuel pre-heaters identified as EUFUELHTR1 & EUFUELHTR2) | 13.31 | Natural gas | 27 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Energy efficiency measures and the use of a low carbon fuel (pipeline quality natural gas). | 13848 | T/YR |
| MI-0424 | 12/05/2016  ACT | EUFUELHTR (Fuel pre-heater) | 13.31 | Natural gas | 3.7 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices. | 1934 | T/YR |
| MI-0424 | 12/05/2016  ACT | EUAUXBOILER (Auxiliary boiler) | 13.31 | natural gas | 83.5 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices. | 43283 | T/YR |
| MI-0425 | 05/09/2017  ACT | EUTOH in FGTOH | 13.31 | Natural gas | 38 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion and maintenance practices, natural gas only. | 19490 | T/YR |
| MI-0425 | 05/09/2017  ACT | EUFLTOS1 in FGTOH | 13.31 | Natural gas | 10.2 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion and maintenance practices, natural gas only. | 5254 | T/YR |
| MI-0426 | 03/24/2017  ACT | FGAUXBOILERS (6 auxiliary boilers EUAUXBOIL2A, EUAUXBOIL3A, EUAUXBOIL2B, EUAUXBOIL3B, EUAUXBOIL2C, EUAUXBOIL3C) | 13.31 | Natural gas | 3 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Use of pipeline quality natural gas and energy efficiency measures. | 7324 | T/YR |
| MI-0433 | 06/29/2018  ACT | EUAUXBOILER (North Plant): Auxiliary Boilder | 13.31 | Natural gas | 61.5 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Energy efficiency measures and the use of a low carbon fuel (pipeline quality natural gas). | 31540 | T/YR |
| MI-0433 | 06/29/2018  ACT | EUAUXBOILER (South Plant): Auxiliary Boiler | 13.31 | Natural gas | 61.5 | MMBTU/h | Carbon Dioxide Equivalent (CO2e) | Energy efficiency measures and the use of a low carbon fuel (pipeline quality natural gas). | 31540 | T/YR |
| MI-0435 | 07/16/2018  ACT | EUAUXBOILER: Auxiliary Boiler | 13.31 | Natural gas | 99.9 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Energy efficiency measures, use of natural gas. | 25623 | T/YR |
| MI-0435 | 07/16/2018  ACT | EUFUELHTR1: Natural gas fired fuel heater | 13.31 | Natural gas | 20.8 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Natural gas fuel | 6310 | T/YR |
| MI-0435 | 07/16/2018  ACT | EUFUELHTR2: Natural gas fired fuel heater | 13.31 | Natural gas | 3.8 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Natural gas fuel | 6310 | T/YR |
| *MI-0440 | 05/22/2019  ACT | FGFUELHEATERS | 13.31 | natural gas | 25 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Utilize low-carbon fuels and implement energy efficiency measures and preventative maintenance pursuant to manufacturer recommendations. | 12822 | T/YR |
| *MI-0441 | 12/21/2018  ACT | EUAUXBOILER--natural gas fired auxiliary boiler rated at <= 99MMBTU/H | 13.31 | Natural gas | 99 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Low carbon fuel (pipeline quality natural gas), good combustion practices and energy efficiency measures. | 50776 | T/YR |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - GHG (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| *MI-0442 | 08/21/2019  ACT | FGAUXBOILER | 13.31 | Natural gas | 80 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Energy efficiency | 41031 | T/YR |
| *MI-0442 | 08/21/2019  ACT | FGPREHEAT | 13.31 | natural gas | 7 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Energy efficiency | 3590 | T/YR |
| *MI-0445 | 11/26/2019  ACT | FGFUELHTR (2 fuel pre-heaters) | 13.31 | Natural gas | 27 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Energy Efficiency Measures and the use of a low carbon fuel (pipeline quality natural gas) | 13848 | T/YR |
| MS-0092 | 05/08/2014  ACT | Regeneration Heater, methanol to gasoline | 13.31 | NATURAL GAS | 13 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 0 | |
| MS-0092 | 05/08/2014  ACT | Reactor Heater, 5 | 13.31 | NATURAL GAS | 12 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 0 | |
| NY-0103 | 02/03/2016  ACT | Auxiliary boiler | 13.31 | natural gas | 60 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | good combustion practiced and pipeline quality natural gas | 119 | LB/MMBTU |
| NY-0114 | 09/11/2014  ACT | Package boilers | 13.31 | natural gas | 0 | | Carbon Dioxide Equivalent (CO2e) | BACT Requirements:<br><br>1) Firing natural gas only.<br>2) Refractory and external insulation.<br>3) High efficiency low NOx burners.<br>4) Economizer.<br>5) Digital Control instrumentation.<br>6) Minimize air infiltration.<br>7) Combustion tuning.<br>8) Condensate return.<br>9) Steam line maintenance.<br>10) Operation and Maintenance Practices. | 0 | |
| NY-0116 | 03/29/2013  ACT | Boilers - NG | 13.31 | natural gas | 0 | | Carbon Dioxide | Natural gas fired boilers required to achieve a minimum of 85% fuel to water heat transfer efficiency. | 118 | LB/MMBTU |
| OH-0352 | 06/18/2013  ACT | Auxillary Boiler | 13.31 | Natural Gas | 99 | MMBtu/H | Carbon Dioxide Equivalent (CO2e) | | 11671 | T/YR |
| OH-0355 | 05/07/2013  ACT | 4 Indirect-Fired Air Preheaters | 13.31 | Natural gas | 0 | | Carbon Dioxide Equivalent (CO2e) | | 74000 | T/YR |
| OH-0359 | 03/31/2014  ACT | Backup Boilers (B001, B002) | 13.31 | natural gas | 96.5 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Efficient burner design (natural gas, economizer) | 49494 | T/YR |
| OH-0360 | 11/05/2013  ACT | Auxiliary Boiler (B001) | 13.31 | Natural Gas | 99 | MMBtu/H | Carbon Dioxide Equivalent (CO2e) | | 26259.76 | T/YR |
| OH-0366 | 08/25/2015  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 34 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion controls/natural gas combustion | 4008 | T/YR |
| OH-0367 | 09/23/2016  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 99 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion controls, natural gas combustion, and ultra low sulfur diesel | 32171 | T/YR |
| OH-0368 | 04/19/2017  ACT | Startup Heater (B001) | 13.31 | Natural gas | 100 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion control (i.e., high temperatures, sufficient excess air, sufficient residence times, and god air/fuel mixing). | 2840 | T/YR |
| OH-0370 | 09/07/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 37.8 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion controls/natural gas combustion | 4456 | T/YR |
| OH-0372 | 09/27/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 37.8 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | use of natural gas, good combustion controls | 4502 | T/YR |
| OH-0374 | 10/23/2017  ACT | Fuel Gas Heaters (2 identical, P007 and P008) | 13.31 | Natural gas | 15 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Natural gas, low-emitting fuel | 7695 | T/YR |
| OH-0375 | 11/07/2017  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 26.8 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Natural gas as the sole fuel | 7845 | T/YR |
| OH-0377 | 04/19/2018  ACT | Auxiliary Boiler (B001) | 13.31 | Natural gas | 44.55 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices and pipeline quality natural gas | 2817.6 | T/YR |
| OH-0377 | 04/19/2018  ACT | Auxiliary Boiler (B002) | 13.31 | Natural gas | 80 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices and pipeline quality natural gas | 5009.1 | T/YR |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - GHG (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| OH-0379 | 02/06/2019  ACT | Startup boiler (B001) | 13.31 | Natural gas | 15.17 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices and the use of natural gas | 1784 | LB/H |
| OH-0379 | 02/06/2019  ACT | Ladle Preheaters (P002, P003 and P004) | 13.31 | Natural gas | 15 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices and the use of natural gas | 1764 | LB/H |
| *OH-0381 | 09/27/2019  ACT | Tunnel Furnace #2 (P018) | 13.31 | Natural Gas | 88 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Use of natural gas and energy efficient design | 10283.06 | LB/H |
| OK-0148 | 09/12/2012  ACT | Commercial/Institutional Boilers (<100 MMBTUH) | 13.31 | Natural Gas | 11.04 | MMBTUH | Carbon Dioxide Equivalent (CO2e) | | 117 | LB/MMBTU |
| OK-0156 | 07/31/2013  ACT | Refinery Boiler | 13.31 | Natural Gas | 5 | MMBTUH | Carbon Dioxide | Good Combustion | 0 | |
| OK-0164 | 01/08/2015  ACT | Heaters/Boilers | 13.31 | Natural Gas | 0 | MMBTUH | Carbon Dioxide Equivalent (CO2e) | 1. Use pipeline-quality natural gas.<br>2. Good Combustion Practices.<br>3. Tune-ups for applicable boilers/heaters per 40CFR63, Subpart DDDDD. | 153716 | TONS PER YEAR |
| OK-0173 | 01/19/2016  ACT | Heaters (Gas-Fired) | 13.31 | Natural Gas | 0 | | Carbon Dioxide Equivalent (CO2e) | Natural Gas Fuel | 120 | LB/MMBTU |
| OR-0050 | 03/05/2014  ACT | Auxiliary boiler | 13.31 | natural gas | 39.8 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Clean fuels | 117 | LB CO2/MMBTU |
| OR-0050 | 03/05/2014  ACT | Auxiliary boiler | 13.31 | natural gas | 39.8 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Clean fuels | 117 | LB CO2/MMBTU |
| PA-0291 | 04/23/2013  ACT | AUXILIARY BOILER | 13.31 | Natural Gas | 40 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 13696 | TPY |
| PA-0296 | 12/17/2013  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 40 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 12346 | T/YR |
| PA-0309 | 12/23/2015  ACT | Auxillary Boiler | 13.31 | Natural gas | 13.31 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | | 44107 | TON |
| PA-0311 | 09/01/2015  ACT | Auxilary Boiler | 13.31 | Natural Gas | 55.4 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | | 13561 | TPY |
| SC-0113 | 02/08/2012  ACT | BOILERS | 13.31 | NATURAL GAS | 5 | MMBTU/H | Carbon Dioxide | CONTROL METHOD FOR CO2E: GOOD DESIGN AND COMBUSTION PRACTICES. | 0 | |
| TX-0634 | 10/12/2012  ACT | Thermal Oxidizers | 13.31 | Natural Gas | 0 | | Carbon Dioxide Equivalent (CO2e) | | 36406 | T/YR |
| TX-0634 | 10/12/2012  ACT | Thermal Oxidizers | 13.31 | Natural Gas | 0 | | Carbon Dioxide | | 36406 | T/YR |
| TX-0635 | 01/17/2013  ACT | Vapor Destruction Unit | 13.31 | Natural Gas | 28.8 | MM BTU/H | Carbon Dioxide | | 2400 | T/YR |
| TX-0746 | 11/18/2014  ACT | Regeneration Heater | 13.31 | Natural Gas | 36 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 168.3 | LB CO2/MMSCF |
| TX-0746 | 11/18/2014  ACT | Hot Oil Heater | 13.31 | Natural Gas | 60 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 280.5 | LB CO2/MMSCFD PROCES |
| TX-0757 | 05/12/2014  ACT | Pipeline Heater | 13.31 | Natural Gas | 3 | MMBtu/hr (HHV) | Carbon Dioxide Equivalent (CO2e) | | 624.78 | TPY CO2E |
| TX-0758 | 08/01/2014  ACT | Dew-Point Heater | 13.31 | Natural Gas | 9 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 2631 | TPY CO2E |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 40 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practice to ensure complete combustion. | 20758 | T/YR |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 95.7 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices and use of low carbon fuel | 119195 | T/YR |
| TX-0772 | 11/06/2015  ACT | Commercial/Institutional-Size Boilers/Furnaces | 13.31 | natural gas | 13.2 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practice to ensure complete combustion. | 6850 | T/YR |
| TX-0845 | 08/24/2018  ACT | HEATERS | 13.31 | NATL GAS | 31 | BTU/HR | Carbon Dioxide Equivalent (CO2e) | low carbon fuel selection, and good combustion practices | 0 | |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - GHG (Gas-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| TX-0851 | 12/17/2018  ACT | Thermal Oxidizer | 13.31 | NATL GAS | 71.3 | MMBTU/HR | Carbon Dioxide Equivalent (CO2e) | Natural Gas / Clean Fuel, good combustion practices. | 0 | |
| TX-0888 | 04/23/2020  ACT | Heaters | 13.31 | natural gas | 100 | MMBtu | Carbon Dioxide Equivalent (CO2e) | Good combustion practice, clean fuel, and proper design | 0 | |
| VA-0321 | 03/12/2013  ACT | AUXILIARY BOILER | 13.31 | Natural Gas | 66.7 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Pipeline quality natural gas and fuel-efficient design and operation | 117 | LB/MMBTU |
| *VA-0333 | 12/09/2020  ACT | Three (3) boilers | 13.31 | Natural Gas | 76.6 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | | 117.1 | LB |
| WI-0266 | 09/06/2018  ACT | Natural gas-fied boiler (Boiler B01) | 13.31 | Natural Gas | 35 | mmBtu/hr | Carbon Dioxide Equivalent (CO2e) | Good combustion practices, use only natural gas, equip with Low NOx burners and flue gas recirculation | 160 | LBCO2E/1000 LB STEAM |
| *WI-0283 | 04/24/2018  ACT | B01-B12, Boilers | 13.31 | Natural Gas | 28 | mmBTU/hr | Carbon Dioxide Equivalent (CO2e) | Ultra-low NOx Burners, Flue Gas Recirculation, Good Combustion Practices and the Use of Pipeline Quality Natural Gas | 160 | LB/1000 LB CO2E |
| *WI-0284 | 04/24/2018  ACT | B13-B24 & B25-B36 Natural Gas-Fired Boilers | 13.31 | Natural Gas | 28 | mmBTU | Carbon Dioxide Equivalent (CO2e) | Ultra-Low NOx Burners, Flue Gas Recirculation, and Good Combustion Practices and the Use of Pipeline Quality Natural Gas. | 160 | LB CO2E/1000LB STEAM |
| *WI-0292 | 04/01/2019  ACT | P44 Space Heaters | 13.31 | Natural Gas | 20 | mmBTU/hr | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices, the Use of Low-NOx Burners | 0 | |
| *WV-0029 | 03/27/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas | 77.8 | mmBtu/hr | Carbon Dioxide Equivalent (CO2e) | Use of Natural Gas | 9107 | LB/HR |
| *WV-0031 | 06/14/2018  ACT | CT-1 & CT-2 - Solar Titan 130 Combustion Turbine/compressor | 13.31 | Natural Gas | 20500 | hp | Carbon Dioxide Equivalent (CO2e) | Limited to natural gas. | 1.01 | LB CO2E/HP |
| *WV-0031 | 06/14/2018  ACT | WH-1 - Boiler | 13.31 | Natural Gas | 8.72 | mmBtu/hr | Carbon Dioxide Equivalent (CO2e) | Limited to natural gas; and tune-up the boiler once every five years. | 0 | |
| *WV-0032 | 09/18/2018  ACT | Auxiliary Boiler | 13.31 | Natural Gas/Ethane | 111.9 | mmBtu/hr | Carbon Dioxide Equivalent (CO2e) | Use of Natural Gas | 14768 | LB/HR |
| WY-0075 | 07/16/2014  ACT | Auxiliary Boiler | 13.31 | natual gas | 25.06 | MMBtu/h | Carbon Dioxide Equivalent (CO2e) | good combustion practices and energy efficiency | 12855 | TONS |
| WY-0076 | 07/01/2014  ACT | Startup Heater | 13.31 | Natural Gas | 16 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | limited to 200 hours of operation per year | 187 | T/YR |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Boilers and Heaters | 13.22 | Ultra Low Sulfur Diesel | 7 | MMBTU/H | Carbon Monoxide | | 5 | LB/1,000 GAL | 0.0357 |
| FL-0328 | 10/27/2011  ACT | Boiler | 13.22 | Diesel | 9.6 | MMBTU/H | Carbon Monoxide | Use of good combustion and maintenance practices, based on the current manufacturerâ€™s specifications for this boiler. | 0.12 | TONS PER YEAR | |
| MI-0400 | 06/29/2011  ACT | Auxiliary Boiler | 13.22 | Diesel | 72.4 | MMBTU/H | Carbon Monoxide | Good combustion control | 6.11 | LB/H | 0.0844 |
| *SC-0194 | 11/14/2008  ACT | K and L Area Boilers - Fuel Oil | 13.22 | No. 2 Fuel Oil | 14.9 | MMBTU/hr | Carbon Monoxide | Good Combustion Practices | 0.036 | LB/MMBTU | 0.0360 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - $NO_X$ (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Boilers and Heaters | 13.22 | Ultra Low Sulfur Diesel | 7 | MMBTU/H | Nitrogen Oxides (NOx) | | 20 | LB/1,000 GAL | 0.1429 |
| FL-0328 | 10/27/2011  ACT | Boiler | 13.22 | Diesel | 9.6 | MMBTU/H | Nitrogen Oxides (NOx) | Use of good combustion and maintenance practices, based on the current manufacturerâ€™s specifications for this boiler. | 0.49 | TONS PER YEAR | |
| FL-0347 | 09/16/2014  ACT | Flowback Boiler | 13.22 | Diesel | 8 | MMBTU/H | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturer's specifications issued for this boiler | 0 | | |
| MI-0400 | 06/29/2011  ACT | Auxiliary Boiler | 13.22 | Diesel | 72.4 | MMBTU/H | Nitrogen Oxides (NOx) | Low NOx burner | 1.67 | LB/H | 0.0231 |
| *WA-0349 | 04/04/2013  ACT | steam generating boiler | 13.22 | diesel | 0 | | Nitrogen Oxides (NOx) | Low NOx burners | 0.09 | LB/MMBTU | 0.0900 |
| *WI-0270 | 06/13/2016  ACT | B27 - Auxilary Steam Boiler | 13.22 | Distillate fuel oil | 83.8 | mmBTU/hr | Nitrogen Oxides (NOx) | Limit nitrogen oxides emissions to 0.21 pounds per MMBTU | 0.21 | LB/MMBTU | 0.2100 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0081 | 06/12/2013  ACT | Combustion | 13.22 | ULSD | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good combustion and operation practices | 0.25 | LB/GAL | 1.7857 |
| AK-0082 | 01/23/2015  ACT | Boilers and Heaters | 13.22 | Ultra Low Sulfur Diesel | 7 | MMBTU/H | Particulate matter, filterable < 10 Âµ (FPM10) | | 2.3 | LB/1,000 GAL | 0.0164 |
| FL-0328 | 10/27/2011  ACT | Boiler | 13.22 | Diesel | 9.6 | MMBTU/H | Particulate matter, total (TPM) | Use of good combustion and maintenance practices, based on the current manufacturerâ€™s specifications for this boiler. | 0.05 | TONS PER YEAR | |
| FL-0347 | 09/16/2014  ACT | Flowback Boiler | 13.22 | Diesel | 8 | MMBTU/H | Particulate matter, total (TPM) | Use of good combustion practices based on the most recent manufacturer's specifications issued for this boiler | 0 | | |
| MI-0400 | 06/29/2011  ACT | Auxiliary Boiler | 13.22 | Diesel | 72.4 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | | 2.17 | LB/H | 0.0300 |
| *WA-0349 | 04/04/2013  ACT | steam generating boiler | 13.22 | diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 13400000 | GAL/YR | 0.0200 |
| *WI-0270 | 06/13/2016  ACT | B27 - Auxilary Steam Boiler | 13.22 | Distillate fuel oil | 83.8 | mmBTU/hr | Particulate matter, total (TPM) | Switch to ultra-low sulfur fuel oil (sulfur content no greater than 15 ppm, by weight) | 0.015 | LB/MMBTU | 0.0150 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Boilers and Heaters | 13.22 | Ultra Low Sulfur Diesel | 7 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0.252 | LB/1,000 GAL | 0.0018 |
| FL-0328 | 10/27/2011  ACT | Boiler | 13.22 | Diesel | 9.6 | MMBTU/H | Volatile Organic Compounds (VOC) | Use of good combustion and maintenance practices, based on the current manufacturerâ€™s specifications for this boiler. | 0.005 | TONS PER YEAR | |
| FL-0347 | 09/16/2014  ACT | Flowback Boiler | 13.22 | Diesel | 8 | MMBTU/H | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the most recent manufacturer's specifications issued for this boiler | 0 | | |
| MI-0400 | 06/29/2011  ACT | Auxiliary Boiler | 13.22 | Diesel | 72.4 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0.3 | LB/H | 0.0041 |

**BACT Determinations for Commercial/Institutional-Size Boilers/Furnaces (< 100 MMBtu/hr) - GHG (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit lb/mmbtu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Boilers and Heaters | 13.22 | Ultra Low Sulfur Diesel | 7 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 45537 | TONS/YEAR | |
| FL-0347 | 09/16/2014  ACT | Flowback Boiler | 13.22 | Diesel | 8 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the most recent manufacturer's specifications issued for this boiler | 0 | | |
| TX-0612 | 11/10/2011  ACT | EMGEN1-STK - DIESEL FIRED EMERGENCY GENERATOR | 13.22 | DIESEL | 93.8 | | Carbon Dioxide Equivalent (CO2e) | | 15314 | LB/H | 163.2623 |
| *WI-0270 | 06/13/2016  ACT | B27 - Auxilary Steam Boiler | 13.22 | Distillate fuel oil | 83.8 | mmBTU/hr | Carbon Dioxide Equivalent (CO2e) | Limit GHG emissions to 203.8 pounds of carbon dioxide equivalents (CO2-e) per 1000 pounds of steam produced, averaged over any 12 consecutive month period (computed monthly). | 0 | | |

**BACT Determinations for Emergency Diesel Engines - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Emergency Camp Generators | 17.11 | Ultra Low Sulfur Diesel | 2695 | hp | Carbon Monoxide | | 2.6 | GRAMS/HP-H | - |
| AK-0084 | 06/30/2017  ACT | Black Start and Emergency Internal Cumbustion Engines | 17.11 | Diesel | 1500 | kWe | Carbon Monoxide | Good Combustion Practices | 4.38 | G/KW-HR | - |
| AK-0084 | 06/30/2017  ACT | Fire Pump Diesel Internal Combustion Engines | 17.21 | Diesel | 252 | hp | Carbon Monoxide | Good Combustion Practices | 3.3 | G/KW-HR | - |
| *AK-0085 | 08/13/2020  ACT | Three (3) Firewater Pump Engines and two (2) Emergency Diesel Generators | 17.21 | ULSD | 19.4 | gph | Carbon Monoxide | Good combustion practices, limit operation to 500 hours per year per engine | 3.3 | G/HP-HR | - |
| AL-0301 | 07/22/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | DIESEL | 800 | HP | Carbon Monoxide | | 0.0055 | LB/HP-H | - |
| *AL-0318 | 12/18/2017  ACT | 250 Hp Emergency CI, Diesel-fired RICE | 17.11 | Diesel | 0 | | Carbon Monoxide | | 0 | | |
| AR-0161 | 09/23/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Carbon Monoxide | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 3.5 | G/KW-H | - |
| AR-0163 | 06/09/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Carbon Monoxide | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 3.5 | G/KW-HR | - |
| AR-0168 | 03/17/2021  ACT | Emergency Engines | 17.21 | Diesel | 0 | | Carbon Monoxide | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 3.5 | G/KW-HR | - |
| AR-0171 | 02/14/2019  ACT | SN-106 Cold Mill 1 Diesel Fired Emergency Generator | 17.21 | Diesel | 1073 | bhp | Carbon Monoxide | Good operating practices. | 4 | G/KW-HR | - |
| CA-1192 | 06/21/2011  ACT | EMERGENCY FIREWATER PUMP ENGINE | 17.21 | DIESEL | 288 | HP | Carbon Monoxide | EQUIPPED W/ A TURBOCHARGER AND AN INTERCOOLER/AFTERCOOLER | 0.447 | G/HP-H | - |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.11 | DIESEL | 2683 | HP | Carbon Monoxide | | 3.5 | G/KW-H | - |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.21 | DIESEL | 182 | HP | Carbon Monoxide | | 3.5 | G/KW-H | - |
| FL-0328 | 10/27/2011  ACT | Emergency Engine | 17.11 | Diesel | 0 | | Carbon Monoxide | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.09 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Emergency Fire Pump Engine | 17.11 | Diesel | 0 | | Carbon Monoxide | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.005 | TONS PER YEAR | |
| FL-0332 | 09/23/2011  ACT | 600 HP Emergency Equipment | 17.11 | Ultra-Low Sulfur Oil | 0 | | Carbon Monoxide | See Pollutant Notes. | 2.6 | G/HP-H | - |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - Development Driller 1 | 17.11 | Diesel | 2229 | hp | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 0.37 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - C.R. Luigs | 17.11 | diesel | 2064 | hp | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 0.34 | T/12MO ROLLING TOTAL | |
| FL-0346 | 04/22/2014  ACT | Four 3100 kW black start emergency generators | 17.11 | ULSD | 2.32 | MMBtu/hr (HHV) per engine | Carbon Monoxide | Good combustion practice | 3.5 | GRAMS PER KW-HR | - |
| FL-0346 | 04/22/2014  ACT | Emergency fire pump engine (300 HP) | 17.21 | USLD | 29 | MMBTU/H | Carbon Monoxide | Good combustion practice. | 3.5 | GRAM PER KW-HR | - |

## BACT Determinations for Emergency Diesel Engines - CO (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0347 | 09/16/2014  ACT | Emergency Diesel Engine | 17.11 | Diesel | 3300 | hp | Carbon Monoxide | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0347 | 09/16/2014  ACT | Remotely Operated Vehicle Emergency Generator | 17.21 | Diesel | 427 | hp | Carbon Monoxide | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0354 | 08/25/2015  ACT | Emergency fire pump engine, 300 HP | 17.21 | Diesel | 29 | MMBTU/H | Carbon Monoxide | Low-emitting fuel and certified engine | 3.5 | G / KWH | - |
| FL-0356 | 03/09/2016  ACT | Three 3300-kW ULSD emergency generators | 17.11 | ULSD | 0 | | Carbon Monoxide | Use of clean engine | 3.5 | G / KW-HR | - |
| FL-0356 | 03/09/2016  ACT | One 422-hp emergency fire pump engine | 17.21 | ULSD | 0 | | Carbon Monoxide | Use of clean engine technology | 3.5 | G / KW-HR | - |
| *FL-0363 | 12/04/2017  ACT | Two 3300 kW emergency generators | 17.11 | ULSD | 0 | | Carbon Monoxide | Certified engine | 3.5 | GRAMS PER KWH | - |
| *FL-0363 | 12/04/2017  ACT | Emergency Fire Pump Engine (422 hp) | 17.21 | ULSD | 0 | | Carbon Monoxide | Certified engine | 3.5 | G / KWH | - |
| *FL-0367 | 07/27/2018  ACT | 1,500 kW Emergency Diesel Generator | 17.11 | ULSD | 14.82 | MMBtu/hour | Carbon Monoxide | Operate and maintain the engine according to the manufacturer's written instructions | 3.5 | G/KW-HOUR | - |
| *FL-0367 | 07/27/2018  ACT | Emergency Fire Pump Engine (347 HP) | 17.21 | ULSD | 8700 | gal/year | Carbon Monoxide | Operate and maintain the engine according to the manufacturer's written instructions | 3.5 | G/KW-HOUR | - |
| IA-0105 | 10/26/2012  ACT | Emergency Generator | 17.11 | diesel fuel | 142 | GAL/H | Carbon Monoxide | good combustion practices | 3.5 | G/KW-H | - |
| IA-0105 | 10/26/2012  ACT | Fire Pump | 17.21 | diesel fuel | 14 | GAL/H | Carbon Monoxide | good combustion practices | 3.5 | G/KW-H | - |
| IA-0106 | 07/12/2013  ACT | Emergency Generators | 17.11 | diesel fuel | 180 | GAL/H | Carbon Monoxide | good combustion practices | 3.5 | G/KW-H | - |
| IL-0114 | 09/05/2014  ACT | Emergency Generator | 17.11 | distillate fuel oil | 3755 | HP | Carbon Monoxide | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 3.5 | G/KW-H | - |
| IL-0129 | 07/30/2018  ACT | Emergency Engines | 17.11 | Ultra-low sulfur diesel | 0 | | Carbon Monoxide | | 0 | | |
| IL-0130 | 12/31/2018  ACT | Emergency Engine | 17.11 | Ultra-Low Sulfur Diesel | 1500 | kW | Carbon Monoxide | | 3.5 | G/KW-HR | - |
| IN-0158 | 12/03/2012  ACT | TWO (2) EMERGENCY DIESEL GENERATORS | 17.11 | DIESEL | 1006 | HP EACH | Carbon Monoxide | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 2.6 | G/HP-H | - |
| IN-0158 | 12/03/2012  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 2012 | HP | Carbon Monoxide | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 2.6 | G/HP-H | - |
| IN-0166 | 06/27/2012  ACT | TWO (2) EMERGENCY GENERATORS | 17.11 | DIESEL | 1341 | HORSEPOWER, EACH | Carbon Monoxide | GOOD COMBUSTION PRACTICES AND LIMITED HOURS OF NON-EMERGENCY OPERATION | 0 | | |
| IN-0173 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.61 | G/BHP-H | - |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR | 17.11 | NO. 2 FUEL OIL | 4690 | B-HP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.61 | G/B-HP-H | - |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY WATER PUMP | 17.21 | NO. 2 FUEL OIL | 481 | BHP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.6 | G/B-HP-H | - |
| IN-0180 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.61 | G/B-HP-H | - |
| IN-0234 | 12/08/2015  ACT | EMERGENCY FIRE PUMP ENGINE | 17.21 | DISTILLATE OIL | 0 | | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.01 | G/HP-H | - |
| IN-0263 | 03/23/2017  ACT | EMERGENCY GENERATORS (EU014A AND EU-014B) | 17.11 | DISTILLATE OIL | 3600 | HP EACH | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.61 | G/HP-H EACH | - |

**BACT Determinations for Emergency Diesel Engines - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Deisel | 150 | hp | Carbon Monoxide | | 3.08 | G/KW-HR | - |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Diesel | 250 | hp | Carbon Monoxide | | 3.08 | G/HP-HR | - |
| IN-0317 | 06/11/2019  ACT | Emergency generator EU-6006 | 17.11 | Diesel | 2800 | HP | Carbon Monoxide | Tier II diesel engine | 3.5 | G/KWH | - |
| IN-0317 | 06/11/2019  ACT | Emergency fire pump EU-6008 | 17.11 | Diesel | 750 | HP | Carbon Monoxide | Engine that complies with Table 4 to Subpart IIII of Part 60 | 3.5 | G/KWH | - |
| *KS-0036 | 03/18/2013  ACT | Cummins 6BTA 5.9F-1 Diesel Engine Fire Pump | 17.21 | No. 2 Fuel Oil | 182 | BHP | Carbon Monoxide | utilize efficient combustion/design technology | 0.53 | LB/HR | - |
| KY-0109 | 10/24/2016  ACT | Emergency Generators #1, #2, & #3 (EU72, EU73, & EU74) | 17.11 | Diesel | 53.6 | gal/hr | Carbon Monoxide | The permittee shall prepare and maintain for EU72, EU73, and EU74, within 90 days of startup, a good combustion and operation practices plan (GCOP) that defines, measures and verifies the use of operational and design practices determined as BACT for minimizing CO, VOC, PM, PM10, and PM2.5 emissions. Any revisions requested by the<br>Division shall be made and the plan shall be maintained on site. The permittee shall operate according to the provisions of this plan at all times, including periods of startup, shutdown, and malfunction. The plan shall be incorporated into the plant standard operating procedures (SOP) and shall be made available for the Divisionâ€™s inspection. The plan shall include, but not be limited to:<br>i. A list of combustion optimization practices and a means of verifying the practices have occurred.<br>ii. A list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred.<br>iii. A list of the design choices determined to be BACT and verification that designs were implemented in the final construction. | 2.6 | G/HP-HR (EU72 &EU73) | - |
| KY-0110 | 07/23/2020  ACT | EP 10-02 - North Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 10-03 - South Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 10-04 - Emergency Fire Water Pump | 17.11 | Diesel | 920 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 11-01 - Melt Shop Emergency Generator | 17.21 | Diesel | 260 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 11-02 - Reheat Furnace Emergency Generator | 17.21 | Diesel | 190 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 10-07 - Air Separation Plant Emergency Generator | 17.11 | Diesel | 700 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 10-01 - Caster Emergency Generator | 17.11 | Diesel | 2922 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | - |

## BACT Determinations for Emergency Diesel Engines - CO (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| KY-0110 | 07/23/2020  ACT | EP 11-03 - Rolling Mill Emergency Generator | 17.21 | Diesel | 440 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 11-04 - IT Emergency Generator | 17.21 | Diesel | 190 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 11-05 - Radio Tower Emergency Generator | 17.21 | Diesel | 61 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 3.73 | G/HP-HR | - |
| KY-0115 | 04/19/2021  ACT | New Pumphouse (XB13) Emergency Generator #1 (EP 08-05) | 17.11 | Diesel | 2922 | HP | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | - |
| KY-0115 | 04/19/2021  ACT | Tunnel Furnace Emergency Generator (EP 08-06) | 17.11 | Diesel | 2937 | HP | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | - |
| KY-0115 | 04/19/2021  ACT | Caster B Emergency Generator (EP 08-07) | 17.11 | Diesel | 2937 | HP | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | - |
| KY-0115 | 04/19/2021  ACT | Air Separation Unit Emergency Generator (EP 08-08) | 17.11 | Diesel | 700 | HP | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | - |
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Emergency Generator (EP 09-05) | 17.21 | Diesel | 350 | HP | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | - |
| LA-0251 | 04/26/2011  ACT | Fire Pump Engines - 2 units | 17.21 | diesel | 444 | hp | Carbon Monoxide | good equipment design and proper combustion practices | 0.65 | LB/H | - |
| LA-0254 | 08/16/2011  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 1250 | HP | Carbon Monoxide | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 2.6 | G/HP-H | - |
| LA-0254 | 08/16/2011  ACT | EMERGENCY FIRE PUMP | 17.21 | DIESEL | 350 | HP | Carbon Monoxide | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 2.6 | G/HP-H | - |
| LA-0296 | 05/23/2014  ACT | Emergency Diesel Generators (EQTs 622, 671, 773, 850, 994, 995, 996, 1033, 1077, 1105, & 1202) | 17.11 | Diesel | 2682 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII; operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage. | 15.43 | LB/HR | - |
| LA-0305 | 06/30/2016  ACT | Diesel Engines (Emergency) | 17.11 | Diesel | 4023 | hp | Carbon Monoxide | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0309 | 06/04/2015  ACT | Emergency Generator Engines | 17.11 | Diesel | 2922 | hp (each) | Carbon Monoxide | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| *LA-0312 | 06/30/2017  ACT | DFP1-13 - Diesel Fire Pump Engine (EQT0013) | 17.11 | Diesel | 650 | horsepower | Carbon Monoxide | Compliance with NSPS Subpart IIII | 0.9 | LB/HR | - |
| *LA-0312 | 06/30/2017  ACT | DEG1-13 - Diesel Fired Emergency Generator Engine (EQT0012) | 17.11 | Diesel | 1474 | horsepower | Carbon Monoxide | Compliance with NSPS Subpart IIII | 0.51 | LB/HR | - |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Generator 1 | 17.11 | Diesel | 2584 | HP | Carbon Monoxide | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel). | 14.81 | LB/H | - |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Firewater Pump 1 | 17.21 | Diesel | 282 | HP | Carbon Monoxide | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel). | 1.62 | LB/H | - |
| LA-0314 | 08/03/2016  ACT | Diesel emergency generator engine - EGEN | 17.21 | diesel | 350 | hp | Carbon Monoxide | complying with 40 CFR 63 subpart ZZZZ | 0 | | |

**BACT Determinations for Emergency Diesel Engines - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 1 | 17.11 | Diesel | 5364 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 30.86 | LB/H | - |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 2 | 17.11 | Diesel | 5364 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 30.86 | LB/H | - |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 1 | 17.11 | Diesel | 751 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 4.32 | LB/H | - |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 2 | 17.11 | Diesel | 751 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 4.32 | LB/H | - |
| LA-0316 | 02/17/2017  ACT | emergency generator engines (6 units) | 17.11 | diesel | 3353 | hp | Carbon Monoxide | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0317 | 12/22/2016  ACT | Emergency Generator Engines (4 units) | 17.11 | Diesel | 0 | | Carbon Monoxide | complying with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0 | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 3 Engine | 17.11 | Diesel Fuel | 600 | hp | Carbon Monoxide | Proper operation and limits on hours operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 4 Engine | 17.11 | Diesel Fuel | 600 | hp | Carbon Monoxide | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0323 | 01/09/2017  ACT | Standby Generator No. 9 Engine | 17.21 | Diesel Fuel | 400 | hp | Carbon Monoxide | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39A | 17.21 | Diesel Fuel | 375 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII | 3.5 | | |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39B | 17.21 | Diesel Fuel | 300 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII | 3.5 | | |
| LA-0331 | 09/21/2018  ACT | Large Emergency Engines (>50kW) | 17.11 | Diesel Fuel | 5364 | HP | Carbon Monoxide | Good Combustion and Operating Practices. | 3.5 | G/KW-H | - |
| LA-0364 | 01/06/2020  ACT | Emergency Generator Diesel Engines | 17.11 | Diesel Fuel | 550 | hp | Carbon Monoxide | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| LA-0364 | 01/06/2020  ACT | Emergency Fire Water Pumps | 17.11 | Diesel Fuel | 550 | hp | Carbon Monoxide | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| *LA-0370 | 04/27/2020  ACT | Emergency Fire Pump Engine (EQT0021, ENG-1) | 17.21 | Diesel | 1.1 | MM BTU/hr | Carbon Monoxide | The use of low sulfur fuels and compliance with 40 CFR 60 Subpart IIII | 0.4 | LB/HR | |
| MA-0039 | 01/30/2014  ACT | Emergency Engine/Generator | 17.11 | ULSD | 7.4 | MMBTU/H | Carbon Monoxide | | 2.6 | GM/BHP-H | - |
| MA-0039 | 01/30/2014  ACT | Fire Pump Engine | 17.21 | ULSD | 2.7 | MMBTU/H | Carbon Monoxide | | 2.6 | GM/BHP-H | - |
| MD-0041 | 04/23/2014  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Carbon Monoxide | USE OF ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 2.6 | G/HP-H | - |
| MD-0041 | 04/23/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Carbon Monoxide | USE OF ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 2.6 | G/HP-H | - |
| MD-0042 | 04/08/2014  ACT | EMERGENCY GENERATOR 1 | 17.11 | ULTRA LOW SULFU DIESEL | 2250 | KW | Carbon Monoxide | USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES AND HOURS OF OPERATION LIMITED TO 100 HOURS PER YEAR | 2.6 | G/HP-H | - |
| MD-0042 | 04/08/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA LOW SULFUR DIESEL | 477 | HP | Carbon Monoxide | USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES AND HOURS OF OPERATION LIMITED TO 100 HOURS PER YEAR | 2.6 | G/HP-H | - |
| MD-0044 | 06/09/2014  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 1550 | HP | Carbon Monoxide | GOOD COMBUSTION PRACTICES AND DESIGNED TO MEET EMISSION LIMIT | 2.6 | G/HP-H | - |

**BACT Determinations for Emergency Diesel Engines - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MD-0044 | 06/09/2014  ACT | 5 EMERGENCY FIRE WATER PUMP ENGINES | 17.21 | ULTRA LOW SULFUR DIESEL | 350 | HP | Carbon Monoxide | GOOD COMBUSTION PRACTICES AND DESIGNED TO MEET EMISSION LIMIT | 3 | G/HP-H | - |
| MD-0045 | 11/13/2015  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1490 | HP | Carbon Monoxide | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 3.5 | G/KW-H | - |
| MD-0045 | 11/13/2015  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 305 | HP | Carbon Monoxide | USE OF ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 3.5 | G/KW-H | - |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED AUXILIARY (EMERGENCY) ENGINES (TWO) | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Carbon Monoxide | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 3.5 | G/KW-H | - |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED FIRE PUMP ENGINE | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Carbon Monoxide | EXCLUSIVE USE OF ULTRA LOW SULFUR DIESEL FUEL AND GOOD COMBUSTION PRACTICES | 3.5 | G/KW-H | - |
| MI-0406 | 11/01/2013  ACT | FG-EMGEN7-8; Two (2) 1,000kW diesel-fueled emergency reciprocating internal combustion engines | 17.11 | Diesel | 1000 | kW | Carbon Monoxide | Good combustion practices. | 2.6 | G/B-HP-H | - |
| MI-0410 | 07/25/2013  ACT | EU-FPENGINE: Diesel fuel fired emergency backup fire pump | 17.21 | diesel fuel | 315 | hp nameplate | Carbon Monoxide | Proper combustion design and ultra low sulfur diesel fuel. | 2.6 | G/HP-H | - |
| MI-0412 | 12/04/2013  ACT | Emergency Engine -- Diesel Fire Pump (EUFPENGINE) | 17.21 | Diesel | 165 | HP | Carbon Monoxide | Good combustion practices | 3.7 | G/HP-H | - |
| MI-0421 | 08/26/2016  ACT | Emergency Diesel Generator Engine (EUEMRGRICE in FGRICE) | 17.11 | Diesel | 500 | H/YR | Carbon Monoxide | Good design and combustion practices. | 3.5 | G/KW-H | - |
| MI-0421 | 08/26/2016  ACT | Dieself fire pump engine (EUFIREPUMP in FGRICE) | 17.11 | Diesel | 500 | H/YR | Carbon Monoxide | Good design and combustion practices. | 3.5 | G/KW-H | - |
| MI-0423 | 01/04/2017  ACT | EUEMENGINE (Diesel fuel emergency engine) | 17.11 | Diesel Fuel | 22.68 | MMBTU/H | Carbon Monoxide | Good combustion practices and meeting NSPS Subpart IIII requirements. | 3.5 | G/KW-H | - |
| MI-0423 | 01/04/2017  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | Diesel | 1.66 | MMBTU/H | Carbon Monoxide | Good combustion practices and meeting NSPS Subpart IIII requirements. | 2.6 | G/BHP-H | - |
| MI-0424 | 12/05/2016  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | diesel | 500 | H/YR | Carbon Monoxide | Good combustion practices. | 3.7 | G/HP-H | - |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE1 in FGRICE (Emergency diesel generator engine) | 17.11 | Diesel | 500 | H/YR | Carbon Monoxide | Good design and combustion practices. | 3.5 | G/KW-H | - |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE2 in FGRICE (Emergency Diesel Generator Engine) | 17.11 | Diesel | 500 | H/YR | Carbon Monoxide | Good design and combustion practices. | 3.5 | G/KW-H | - |
| MI-0425 | 05/09/2017  ACT | EUFIREPUMP in FGRICE (Diesel fire pump engine) | 17.11 | Diesel | 500 | H/YR | Carbon Monoxide | Good design and combustion practices. | 3.5 | G/KW-H | - |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (South Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Carbon Monoxide | Good combustion practices and meeting NSPS Subpart IIII requirements. | 2.6 | G/BPH-H | - |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (North Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Carbon Monoxide | Good combustion practices and meeting NSPS Subpart IIII requirements. | 3.5 | G/KW-H | - |

**BACT Determinations for Emergency Diesel Engines - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (North Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Carbon Monoxide | Good combustion practices and meeting NSPS Subpart IIII requirements. | 2.6 | G/BHP-H | - |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (South Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Carbon Monoxide | Good combustion practices and meeting NSPS IIII requirements. | 3.5 | G/KW-H | - |
| MI-0435 | 07/16/2018  ACT | EUEMENGINE: Emergency engine | 17.11 | Diesel | 2 | MW | Carbon Monoxide | State of the art combustion design. | 3.5 | G/KW-H | - |
| MI-0435 | 07/16/2018  ACT | EUFPENGINE: Fire pump engine | 17.21 | Diesel | 399 | BHP | Carbon Monoxide | State of the art combustion design. | 3.5 | G/KW-H | - |
| MI-0441 | 12/21/2018  ACT | EUEMGD1--A 1500 HP diesel fueled emergency engine | 17.11 | Diesel | 1500 | HP | Carbon Monoxide | Good combustion practices and will be NSPS compliant. | 3.5 | G/KW-H | - |
| MI-0441 | 12/21/2018  ACT | EUEMGD2--A 6000 HP diesel fuel fired emergency engine | 17.11 | Diesel | 6000 | HP | Carbon Monoxide | Good combustion practices and will be NSPS compliant. | 3.5 | G/KW-H | - |
| MI-0441 | 12/21/2018  ACT | EUFPRICE--A 315 HP diesel fueled emergency engine | 17.21 | Diesel | 2.5 | MMBTU/H | Carbon Monoxide | Good combustion practices. | 2.6 | G/HP-H | - |
| *MI-0445 | 11/26/2019  ACT | EUFPENGINE (Emergency engine-diesel fire pump | 17.21 | diesel fuel | 1.66 | MMBTU/H | Carbon Monoxide | Good Combustion Practices and meeting NSPS Subpart IIII requirements | 2.6 | G/BHP-H | - |
| *MI-0445 | 11/26/2019  ACT | EUEMENGINE (diesel fuel emergency engine) | 17.11 | diesel fuel | 22.68 | MMBTU/H | Carbon Monoxide | Good Combustion Practices and meeting NSPS Subpart IIII requirements | 3.5 | G/KW-H | - |
| MI-0447 | 01/07/2021  ACT | EUEMGD--emergency engine | 17.11 | diesel fuel | 4474.2 | KW | Carbon Monoxide | Good combustion practices and will be NSPS compliant. | 3.5 | G/KW-H | - |
| MI-0447 | 01/07/2021  ACT | EUFPRICE--A 315 HP diesel fueled emergency engine | 17.21 | Diesel | 2.5 | MMBTU/H | Carbon Monoxide | Good combustion practices | 2.6 | G/HP-H | - |
| NJ-0079 | 07/25/2012  ACT | Emergency Generator | 17.11 | Ultra Low Sulfur distillate Diesel | 100 | H/YR | Carbon Monoxide | Use of ULSD oil | 1.99 | LB/H | |
| NJ-0080 | 11/01/2012  ACT | Emergency Generator | 17.11 | ULSD | 200 | H/YR | Carbon Monoxide | | 11.56 | LB/H | |
| NJ-0081 | 03/07/2014  ACT | Emergency diesel fire pump | 17.21 | Ultra Low Sulfur Distillate oil | 0 | | Carbon Monoxide | | 0.079 | LB/H | - |
| NJ-0084 | 03/10/2016  ACT | Diesel Fired Emergency Generator | 17.11 | ULSD | 44 | H/YR | Carbon Monoxide | use of ultra low sulfur diesel oil a clean burning fuel | 3.5 | LB/H | |
| NJ-0084 | 03/10/2016  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD | 100 | H/YR | Carbon Monoxide | use of ULSD a clean burning fuel, and limited hours of operation | 1.1 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY GENERATOR DIESEL | 17.21 | DIESEL OIL | 0 | 100 H/YR | Carbon Monoxide | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation (<= 100 H/YR) | 11.6 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY DIESEL FIRE PUMP | 17.21 | ULSD | 100 | H/YR | Carbon Monoxide | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 1.87 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Emergency fire pump | 17.21 | ultra low sulfur diesel | 460 | hp | Carbon Monoxide | Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations. | 0.53 | G/BHP-H | - |
| NY-0104 | 08/01/2013  ACT | Emergency generator | 17.11 | ultra low sulfur diesel | 0 | | Carbon Monoxide | Good combustion practice. | 0.45 | G/BHP-H | - |
| NY-0104 | 08/01/2013  ACT | Fire pump | 17.21 | ultra low sulfur diesel | 0 | | Carbon Monoxide | Good combustion practice. | 0.75 | LB/MMBTU | |
| OH-0352 | 06/18/2013  ACT | Emergency fire pump engine | 17.21 | diesel | 300 | HP | Carbon Monoxide | Purchased certified to the standards in NSPS Subpart IIII | 1.7 | LB/H | - |
| OH-0352 | 06/18/2013  ACT | Emergency generator | 17.11 | diesel | 2250 | KW | Carbon Monoxide | Purchased certified to the standards in NSPS Subpart IIII | 17.35 | LB/H | - |
| OH-0360 | 11/05/2013  ACT | Emergency generator (P003) | 17.11 | diesel | 1112 | KW | Carbon Monoxide | Purchased certified to the standards in NSPS Subpart IIII | 8.57 | LB/H | - |

## BACT Determinations for Emergency Diesel Engines - CO (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0360 | 11/05/2013  ACT | Emergency fire pump engine (P004) | 17.21 | diesel | 400 | HP | Carbon Monoxide | Purchased certified to the standards in NSPS Subpart IIII | 2.3 | LB/H | - |
| OH-0363 | 11/05/2014  ACT | Emergency generator (P002) | 17.11 | Diesel fuel | 1100 | KW | Carbon Monoxide | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 8.49 | LB/H | - |
| OH-0363 | 11/05/2014  ACT | Emergency Fire Pump Engine (P003) | 17.21 | Diesel fuel | 260 | HP | Carbon Monoxide | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 0.69 | LB/H | - |
| OH-0366 | 08/25/2015  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 140 | HP | Carbon Monoxide | State-of-the-art combustion design | 1.15 | LB/H | - |
| OH-0366 | 08/25/2015  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2346 | HP | Carbon Monoxide | State-of-the-art combustion design | 13.5 | LB/H | - |
| OH-0367 | 09/23/2016  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 311 | HP | Carbon Monoxide | State-of-the-art combustion design | 1.79 | LB/H | - |
| OH-0367 | 09/23/2016  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2947 | HP | Carbon Monoxide | State-of-the-art combustion design | 16.96 | LB/H | - |
| OH-0368 | 04/19/2017  ACT | Emergency Fire Pump Diesel Engine (P008) | 17.21 | Diesel fuel | 460 | HP | Carbon Monoxide | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 2.6 | LB/H | - |
| OH-0368 | 04/19/2017  ACT | Emergency Generator (P009) | 17.11 | Diesel fuel | 5000 | HP | Carbon Monoxide | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 28.8 | LB/H | - |
| OH-0370 | 09/07/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Carbon Monoxide | State-of-the-art combustion design | 8.8 | LB/H | - |
| OH-0370 | 09/07/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Carbon Monoxide | State-of-the-art combustion design | 1.73 | LB/H | - |
| OH-0372 | 09/27/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Carbon Monoxide | State-of-the-art combustion design | 8.8 | LB/H | - |
| OH-0372 | 09/27/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Carbon Monoxide | state of the art combustion design | 1.73 | LB/H | - |
| OH-0374 | 10/23/2017  ACT | Emergency Generators (2 identical, P004 and P005) | 17.11 | Diesel fuel | 2206 | HP | Carbon Monoxide | Certified to the meet the emissions standards in 40 CFR 89.112 and 89.113 pursuant to 40 CFR 60.4205(b) and 60.4202(a)(2).<br>Good combustion practices per the manufacturerâ€™s operating manual. | 12.69 | LB/H | - |
| OH-0374 | 10/23/2017  ACT | Emergency Fire Pump (P006) | 17.21 | Diesel fuel | 410 | HP | Carbon Monoxide | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII. Good combustion practices per the manufacturerâ€™s operating manual. | 2.36 | LB/H | - |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Generator Engine (P001) | 17.11 | Diesel fuel | 2206 | HP | Carbon Monoxide | Good combustion design | 12.64 | LB/H | - |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Fire Pump Engine (P002) | 17.11 | Diesel fuel | 700 | HP | Carbon Monoxide | Good combustion design | 4.01 | LB/H | - |
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fueled fire pump (P006) | 17.21 | Diesel fuel | 250 | HP | Carbon Monoxide | Comply with NSPS 40 CFR 60 Subpart IIII | 1.4 | LB/H | - |
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fired generator (P007) | 17.11 | Diesel fuel | 2682 | HP | Carbon Monoxide | Comply with NSPS 40 CFR 60 Subpart IIII | 15.4 | LB/H | - |
| OH-0377 | 04/19/2018  ACT | Emergency Fire Pump (P004) | 17.21 | Diesel fuel | 320 | HP | Carbon Monoxide | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 1.83 | LB/H | - |
| OH-0378 | 12/21/2018  ACT | Emergency Diesel-fired Generator Engine (P007) | 17.11 | Diesel fuel | 3353 | HP | Carbon Monoxide | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 19.25 | LB/H | - |
| OH-0378 | 12/21/2018  ACT | 1,000 kW Emergency Generators (P008 - P010) | 17.11 | Diesel fuel | 1341 | HP | Carbon Monoxide | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 7.7 | LB/H | - |

**BACT Determinations for Emergency Diesel Engines - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OK-0154 | 07/02/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR ENGINE | 17.11 | DIESEL | 1341 | HP | Carbon Monoxide | COMBUSTION CONTROL. | 0.001 | LB/HR | |
| PA-0275 | 10/24/2011  ACT | Fire Water Pump | 17.29 | Diesel | 0 | | Carbon Monoxide | | 1.43 | LB/H | |
| PA-0278 | 10/10/2012  ACT | Emergency Generator | 17.11 | Diesel | 0 | | Carbon Monoxide | | 0.13 | G/B-HP-H | - |
| PA-0278 | 10/10/2012  ACT | Fire Pump | 17.21 | Diesel | 0 | | Carbon Monoxide | | 0.5 | G/B-HP-H | - |
| PA-0286 | 01/31/2013  ACT | Fire Pump Engine - 460 BHP | 17.21 | Diesel | 0 | | Carbon Monoxide | | 0.5 | G/HP-H | - |
| PA-0286 | 01/31/2013  ACT | EMERGENCY GENERATOR-ENGINE | 17.13 | Diesel | 0 | | Carbon Monoxide | | 0.13 | GM/B-HP-H | - |
| PA-0291 | 04/23/2013  ACT | EMERGENCY FIREWATER PUMP | 17.21 | ULTRA LOW SULFUR DISTILLATE | 3.25 | MMBTU/H | Carbon Monoxide | | 2.58 | LB/H | |
| PA-0291 | 04/23/2013  ACT | EMERGENCY GENERATOR | 17.11 | Ultra Low sulfur Distillate | 7.8 | MMBTU/H | Carbon Monoxide | | 5.79 | LB/H | |
| PA-0296 | 12/17/2013  ACT | Emergency Firewater Pump | 17.21 | Diesel | 16 | Gal/hr | Carbon Monoxide | | 0.09 | T/YR | |
| PA-0309 | 12/23/2015  ACT | Fire pump engine | 17.21 | Ultra-low sulfur diesel | 15 | gal/hr | Carbon Monoxide | | 0.5 | GM/HP-HR | - |
| PA-0309 | 12/23/2015  ACT | 2000 kW Emergency Generator | 17.11 | Ultra-low sulfur Diesel | 0 | | Carbon Monoxide | | 0.6 | GM/HP-HR | - |
| PA-0310 | 09/02/2016  ACT | Emergency Generator Engines | 17.11 | ULSD | 0 | | Carbon Monoxide | | 2.61 | G/BHP-HR | - |
| PA-0310 | 09/02/2016  ACT | Emergency Fire Pump Engine | 17.21 | ULSD | 0 | | Carbon Monoxide | | 2.61 | G/BHP-HR | - |
| PA-0311 | 09/01/2015  ACT | Fire Pump Engine | 17.11 | diesel | 0 | | Carbon Monoxide | | 1 | G/HP-HR | - |
| *PA-0313 | 07/27/2017  ACT | Emergency Generator | 17.11 | Diesel | 2500 | bhp | Carbon Monoxide | | 3.5 | G | - |
| *PA-0326 | 02/18/2021  ACT | Emergency Generator Parking Garage | 17.21 | Diesel | 0 | | Carbon Monoxide | The use of certified engines, design of engines to include turbocharger and an intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards | 0.5 | G | - |
| *PA-0326 | 02/18/2021  ACT | Emergency GeneratorTelecom Hut & Tower | 17.21 | diesel | 0 | | Carbon Monoxide | The use of certified engines, design of engines to include turbocharger and an intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards | 0.5 | G | - |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD Fuel Oil #2 | 0 | | Carbon Monoxide | | 2.6 | G/B-HP-H | - |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Generator | 17.11 | ULSD Fuel oil # 2 | 0 | | Carbon Monoxide | | 2.6 | G/BHP-H | - |
| SC-0113 | 02/08/2012  ACT | EMERGENCY ENGINE 1 THRU 8 | 17.21 | DIESEL | 29 | HP | Carbon Monoxide | PURCHASE OF CERTIFIED ENGINE. HOURS OF OPERATION LIMITED TO 100 HOURS FOR MAINTENANCE AND TESTING. | 5.5 | GR/KW-H | - |
| SC-0113 | 02/08/2012  ACT | FIRE PUMP | 17.21 | DIESEL | 500 | HP | Carbon Monoxide | ENGINES CERTIFIED TO MEET NSPS, SUBPART IIII. HOURS OF OPERATION LIMITED TO 100 HOURS PER YEAR FOR MAINTENANCE AND TESTING. | 3.5 | GR/KW-H | - |
| SC-0113 | 02/08/2012  ACT | EMERGENCY GENERATORS 1 THRU 8 | 17.11 | DIESEL | 757 | HP | Carbon Monoxide | ENGINES MUST BE CERTIFIED TO COMPLY WITH NSPS, SUBPART IIII. | 3.5 | GR/KW-H | - |

## BACT Determinations for Emergency Diesel Engines - CO (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *SD-0005 | 06/29/2010  ACT | Emergency Generator | 17.11 | Distillate Oil | 2000 | Kilowatts | Carbon Monoxide | | 0 | | |
| *SD-0005 | 06/29/2010  ACT | Fire Water Pump | 17.11 | Distillate Oil | 577 | horsepower | Carbon Monoxide | | 0 | | |
| TX-0728 | 04/01/2015  ACT | Emergency Diesel Generator | 17.11 | Diesel | 1500 | hp | Carbon Monoxide | Minimized hours of operations Tier II engine | 0.0126 | G/HP HR | - |
| TX-0799 | 06/08/2016  ACT | Fire pump engines | 17.11 | diesel | 0 | | Carbon Monoxide | Equipment specifications and good combustion practices. Operation limited to 100 hours per year. | 0.0055 | LB/HP-HR | - |
| TX-0799 | 06/08/2016  ACT | EMERGENCY ENGINES | 17.21 | diesel | 0 | | Carbon Monoxide | Equipment specifications and good combustion practices. Operation limited to 100 hours per year. | 0.0068 | LB/HP-HR | - |
| TX-0846 | 09/23/2018  ACT | FIRE PUMP DIESEL ENGINE | 17.21 | NO 2 DIESEL | 214 | kW | Carbon Monoxide | Meets EPA Tier 4 requirements | 3.58 | G/KW | - |
| TX-0864 | 09/09/2019  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Carbon Monoxide | Tier 4 exhaust emission standards specified at 40 CFR Â§ 1039.101(b) | 0 | | |
| TX-0872 | 10/31/2019  ACT | Emergency Generators | 17.11 | ultra low sulfur diesel | 0 | | Carbon Monoxide | Limiting duration and frequency of generator use to 100 hr/yr. Good combustion practices will be used to reduce VOC including maintaining proper air-to-fuel ratio. | 0.6 | G/KW HR | - |
| TX-0876 | 02/06/2020  ACT | Emergency generator | 17.11 | DIESEL | 0 | | Carbon Monoxide | Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101, limited to 100 hours per year of non-emergency operation | 0 | | |
| TX-0882 | 01/17/2020  ACT | EMERGENCY ENGINES | 17.12 | DIESEL | 0 | | Carbon Monoxide | GOOD COMBUSTION PRACTICES, CLEAN FUEL, 100 HR/YR, ULTRA LOW SULFUR FUEL | 0.0057 | LB/MMBTU | |
| TX-0888 | 04/23/2020  ACT | EMERGENCY GENERATORS & FIRE WATER PUMP ENGINES | 17.11 | Ultra-low Sulfur Diesel | 0 | | Carbon Monoxide | well-designed and properly maintained engines and each limited to 100 hours per year of non-emergency use. | 0 | | |
| TX-0889 | 08/08/2020  ACT | Emergency Generator Engines | 17.21 | Ultra-low sulfur diesel | 0 | | Carbon Monoxide | Good combustion practices and limited hours of operation | 100 | HR/YR | |
| *TX-0904 | 09/09/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Carbon Monoxide | 100 HOURS OPERATIONS, Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101 | 0 | | |
| TX-0905 | 09/16/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Carbon Monoxide | limited to 100 hours per year of non-emergency operation | 0 | | |
| VA-0321 | 03/12/2013  ACT | Emergency diesel generator- 2200 kW | 17.11 | ultra low sulfur diesel | 500 | hrs/yr | Carbon Monoxide | good combustion practices | 3.5 | G/KW-HR | - |
| VA-0321 | 03/12/2013  ACT | Diesel Fire water pump 376 bhp | 17.21 | diesel | 500 | h/yr | Carbon Monoxide | good combustion practices | 0.9 | G/KW-HR | - |
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED EMERGENCY GENERATOR 3000 kW (1) | 17.11 | DIESEL FUEL | 0 | | Carbon Monoxide | Good Combustion Practices/Maintenance | 3.5 | G/KW | - |
| VA-0328 | 04/26/2018  ACT | Emergency Diesel GEN | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Carbon Monoxide | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 2.6 | G/HP H | - |
| VA-0328 | 04/26/2018  ACT | Emergency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Carbon Monoxide | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 2.6 | G/HP HR | - |
| VA-0332 | 06/24/2019  ACT | Emergency Diesel Generator - 300 kW | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Carbon Monoxide | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 2.6 | G/HP-H | - |
| VA-0332 | 06/24/2019  ACT | Emegency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Carbon Monoxide | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 2.6 | G/HP-H | - |
| WI-0263 | 02/15/2016  ACT | Fire pump (process P05) | 17.21 | Diesel | 1.27 | mmBtu/hr | Carbon Monoxide | Good combustion practices, use diesel fuel, and operate <500 hr/yr | 0 | | |

**BACT Determinations for Emergency Diesel Engines - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *WI-0284 | 04/24/2018  ACT | Diesel-Fired Emergency Generators | 17.11 | Diesel Fuel | 0 | | Carbon Monoxide | Good Combustion Practices | 0.6 | G/KWH | - |
| *WI-0286 | 04/24/2018  ACT | P42 -Diesel Fired Emergency Generator | 17.11 | Diesel Fuel | 0 | | Carbon Monoxide | Good Combustion Practices | 0.6 | G/KWH | - |
| *WI-0291 | 01/28/2019  ACT | P04 Emergency Diesel Generator | 17.21 | Diesel Fuel | 0.22 | mmBTU/hr | Carbon Monoxide | Good Combustion Practices | 5 | G/KWH | - |
| WV-0025 | 11/21/2014  ACT | Emergency Generator | 17.11 | Diesel | 2015.7 | HP | Carbon Monoxide | | 0 | | - |
| WV-0025 | 11/21/2014  ACT | Fire Pump Engine | 17.21 | Diesel | 251 | HP | Carbon Monoxide | | 1.44 | LB/H | - |
| WY-0070 | 08/28/2012  ACT | Diesel Emergency Generator (EP15) | 17.11 | Ultra Low Sulfur Diesel | 839 | hp | Carbon Monoxide | EPA Tier 2 rated | 0 | | |
| WY-0070 | 08/28/2012  ACT | Diesel Fire Pump Engine (EP16) | 17.21 | Ultra Low Sulfur Diesel | 327 | hp | Carbon Monoxide | EPA Tier 3 rated | 0 | | |
| WY-0071 | 10/15/2012  ACT | Emergency Air Compressor | 17.21 | Ultra Low Sulfur Diesel | 400 | hp | Carbon Monoxide | EPA Tier 3 Rated Diesel Engine | 0 | | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Emergency Camp Generators | 17.11 | Ultra Low Sulfur Diesel | 2695 | hp | Nitrogen Oxides (NOx) | | 4.8 | GRAMS/HP-H | 6.4 | |
| AK-0082 | 01/23/2015  ACT | Emergency Camp Generators | 17.11 | Ultra Low Sulfur Diesel | 2695 | hp | Volatile Organic Compounds (VOC) | | 0.0007 | LB/HP-H | 0.43 | 6.9 |
| AK-0084 | 06/30/2017  ACT | Black Start and Emergency Internal Cumbustion Engines | 17.11 | Diesel | 1500 | kWe | Nitrogen Oxides (NOx) | Good Combustion Practices | 8 | G/KW-HR | - | |
| AK-0084 | 06/30/2017  ACT | Fire Pump Diesel Internal Combustion Engines | 17.21 | Diesel | 252 | hp | Nitrogen Oxides (NOx) | Good Combustion Practices | 3.7 | G/KW-HR | - | |
| *AK-0085 | 08/13/2020  ACT | Three (3) Firewater Pump Engines and two (2) Emergency Diesel Generators | 17.21 | ULSD | 19.4 | gph | Nitrogen Oxides (NOx) | Good combustion practices, limit operation to 500 hours per year per engine | 3.6 | G/HP-HR | - | |
| *AK-0085 | 08/13/2020  ACT | Three (3) Firewater Pump Engines and two (2) Emergency Diesel Generators | 17.21 | ULSD | 19.4 | gph | Volatile Organic Compounds (VOC) | Good combustion practices, ULSD, and limit operation to 500 hours per year. | 0.19 | G/HP-HR | - | 5.1 |
| AL-0301 | 07/22/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | DIESEL | 800 | HP | Nitrogen Oxides (NOx) | | 0.015 | LB/HP-H | - | |
| *AL-0318 | 12/18/2017  ACT | 250 Hp Emergency CI, Diesel-fired RICE | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 0 | | | |
| *AL-0318 | 12/18/2017  ACT | 250 Hp Emergency CI, Diesel-fired RICE | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0 | | | |
| AR-0161 | 09/23/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 1.9 | G/KW-HR | - | |
| AR-0161 | 09/23/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 0.4 | G/KW-H | - | 2.3 |
| AR-0163 | 06/09/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 1.55 | G/KW-HR | - | |
| AR-0163 | 06/09/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 4.86 | G/KW-HR | - | 6.4 |
| AR-0168 | 03/17/2021  ACT | Emergency Engines | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 1.55 | G/KW-HR | - | |
| AR-0168 | 03/17/2021  ACT | Emergency Engines | 17.21 | Diesel | 0 | | Nitrogen Oxides (NOx) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 4.86 | G/KW-HR | - | 6.4 |
| AR-0171 | 02/14/2019  ACT | SN-106 Cold Mill 1 Diesel Fired Emergency Generator | 17.21 | Diesel | 1073 | bhp | Nitrogen Oxides (NOx) | Good operating practices. | 2 | G/KW-HR | - | |
| AR-0171 | 02/14/2019  ACT | SN-106 Cold Mill 1 Diesel Fired Emergency Generator | 17.21 | Diesel | 1073 | bhp | Volatile Organic Compounds (VOC) | Good operating practices. | 1 | G/KW-HR | - | 3.0 |
| CA-1192 | 06/21/2011  ACT | EMERGENCY FIREWATER PUMP ENGINE | 17.21 | DIESEL | 288 | HP | Nitrogen Oxides (NOx) | EQUIPPED W/ A TURBOCHARGER AND AN INTERCOOLER/AFTERCOOLER | 3.4 | G/HP-H | - | |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.11 | DIESEL | 2683 | HP | Nitrogen Oxides (NOx) | | 6.4 | G/KW-H | - | |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.21 | DIESEL | 182 | HP | Nitrogen Oxides (NOx) | | 4 | G/KW-H | - | |
| CA-1220 | 10/03/2011  ACT | ICE:Emergency-Compression Ignition | 17.11 | diesel | 1881 | BHP | Nitrogen Oxides (NOx) | Tier 2 certified and 50 hr/y M&T limit | 3.9 | G/B-HP-H | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA-1221 | 12/05/2011  ACT | ICE:Emergency-Compression Ignition | 17.11 | diesel | 3634 | bhp | Nitrogen Oxides (NOx) | Tier 2 certified and 50 hr/yr for M&T limit | 3.5 | G/B-HP-H | - | |
| DC-0009 | 03/15/2012  ACT | Diesel Emergency Generator | 17.11 | Ultra-low Sulfur Diesel | 2682 | hp | Nitrogen Oxides (NOx) | | 31.87 | LB/HR | - | |
| FL-0327 | 06/13/2011  ACT | Emergency Engine | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Limited use of 24 hours/week and recordkeeping of operation. | 9.4 | TONS PER PROJECT | | |
| FL-0328 | 10/27/2011  ACT | Emergency Engine | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.4 | TONS PER YEAR | | |
| FL-0328 | 10/27/2011  ACT | Emergency Engine | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.03 | TONS PER YEAR | | |
| FL-0328 | 10/27/2011  ACT | Emergency Fire Pump Engine | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.02 | TONS PER YEAR | | |
| FL-0328 | 10/27/2011  ACT | Emergency Fire Pump Engine | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.002 | TONS PER YEAR | | |
| FL-0332 | 09/23/2011  ACT | 600 HP Emergency Equipment | 17.11 | Ultra-Low Sulfur Oil | 0 | | Nitrogen Oxides (NOx) | See Pollutant Notes. | 3 | G/HP-H | - | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - Development Driller 1 | 17.11 | Diesel | 2229 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 1.6 | T/12MO ROLLING TOTAL | | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - Development Driller 1 | 17.11 | Diesel | 2229 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 0.04 | T/12MO ROLLING TOTAL | | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - C.R. Luigs | 17.11 | diesel | 2064 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 1.49 | T/12MO ROLLING TOTAL | | |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - C.R. Luigs | 17.11 | diesel | 2064 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 0.04 | T/12MO ROLLING TOTAL | | |
| FL-0347 | 09/16/2014  ACT | Emergency Diesel Engine | 17.11 | Diesel | 3300 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | | |
| FL-0347 | 09/16/2014  ACT | Emergency Diesel Engine | 17.11 | Diesel | 3300 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | | |
| FL-0347 | 09/16/2014  ACT | Remotely Operated Vehicle Emergency Generator | 17.21 | Diesel | 427 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | | |
| FL-0347 | 09/16/2014  ACT | Remotely Operated Vehicle Emergency Generator | 17.21 | Diesel | 427 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0348 | 05/15/2012  ACT | Emergency Electrical Generator | 17.11 | Diesel | 1100 | hp | Nitrogen Oxides (NOx) | Use of good combustion and maintenance practices based on the current manufacturerâ€™s specifications for this engine. | 0.22 | TONS | | |
| FL-0354 | 08/25/2015  ACT | Emergency fire pump engine, 300 HP | 17.21 | Diesel | 29 | MMBTU/H | Nitrogen Oxides (NOx) | Low-emitting fuel and certified engine | 4 | G / KWH | - | |
| *FL-0367 | 07/27/2018  ACT | 1,500 kW Emergency Diesel Generator | 17.11 | ULSD | 14.82 | MMBtu/hour | Nitrogen Oxides (NOx) | Operate and maintain the engine according to the manufacturer's written instructions | 6.4 | G/KW-HOUR | - | |
| *FL-0367 | 07/27/2018  ACT | Emergency Fire Pump Engine (347 HP) | 17.21 | ULSD | 8700 | gal/year | Nitrogen Oxides (NOx) | Operate and maintain the engine according to the manufacturer's written instructions | 4 | G/KW-HR | - | |
| IA-0105 | 10/26/2012  ACT | Emergency Generator | 17.11 | diesel fuel | 142 | GAL/H | Nitrogen Oxides (NOx) | good combustion practices | 6 | G/KW-H | - | |
| IA-0105 | 10/26/2012  ACT | Emergency Generator | 17.11 | diesel fuel | 142 | GAL/H | Volatile Organic Compounds (VOC) | good combustion practices | 0.4 | G/KW-H | - | 6.4 |
| IA-0105 | 10/26/2012  ACT | Fire Pump | 17.21 | diesel fuel | 14 | GAL/H | Nitrogen Oxides (NOx) | good combustion practices | 3.75 | G/KW-H | - | |
| IA-0105 | 10/26/2012  ACT | Fire Pump | 17.21 | diesel fuel | 14 | GAL/H | Volatile Organic Compounds (VOC) | good combustion practices | 0.25 | G/KW-H | - | 4.0 |
| IA-0106 | 07/12/2013  ACT | Emergency Generators | 17.11 | diesel fuel | 180 | GAL/H | Volatile Organic Compounds (VOC) | good combustion practices | 4 | G/KW-H | - | |
| IL-0114 | 09/05/2014  ACT | Emergency Generator | 17.11 | distillate fuel oil | 3755 | HP | Nitrogen Oxides (NOx) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 0.67 | G/KW-H | - | |
| IL-0114 | 09/05/2014  ACT | Emergency Generator | 17.11 | distillate fuel oil | 3755 | HP | Volatile Organic Compounds (VOC) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 0.4 | G/KW-H | - | 1.1 |
| IL-0129 | 07/30/2018  ACT | Emergency Engines | 17.11 | Ultra-low sulfur diesel | 0 | | Nitrogen Oxides (NOx) | | 0 | | | |
| IL-0130 | 12/31/2018  ACT | Emergency Engine | 17.11 | Ultra-Low Sulfur Diesel | 1500 | kW | Nitrogen Oxides (NOx) | | 6.4 | G/KW-HR | - | |
| IN-0158 | 12/03/2012  ACT | TWO (2) EMERGENCY DIESEL GENERATORS | 17.11 | DIESEL | 1006 | HP EACH | Volatile Organic Compounds (VOC) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 1.04 | LB/H | - | |
| IN-0158 | 12/03/2012  ACT | TWO (2) EMERGENCY DIESEL GENERATORS | 17.11 | DIESEL | 1006 | HP EACH | Nitrogen Oxides (NOx) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 4.8 | G/HP-H | - | 7.1 |
| IN-0158 | 12/03/2012  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 2012 | HP | Volatile Organic Compounds (VOC) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 1.04 | LB/H | - | |
| IN-0158 | 12/03/2012  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 2012 | HP | Nitrogen Oxides (NOx) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 4.8 | G/HP-H | - | 6.8 |
| IN-0166 | 06/27/2012  ACT | TWO (2) EMERGENCY GENERATORS | 17.11 | DIESEL | 1341 | HORSEPOWER, EACH | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES AND LIMITED HOURS OF NON-EMERGENCY OPERATION | 0 | | | |
| IN-0173 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 4.46 | G/BHP-H | - | |
| IN-0173 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.31 | G/BHP-H | - | 6.4 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR | 17.11 | NO. 2 FUEL OIL | 4690 | B-HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 4.46 | G/B-HP-H | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR | 17.11 | NO. 2 FUEL OIL | 4690 | B-HP | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.31 | G/B-HP-H | - | 6.4 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY WATER PUMP | 17.21 | NO. 2 FUEL OIL | 481 | BHP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 2.86 | G/B-HP-H | - | |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY WATER PUMP | 17.21 | NO. 2 FUEL OIL | 481 | BHP | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.141 | G/B-HP-H | - | 4.0 |
| IN-0180 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 4.46 | G/B-HP-H | - | |
| IN-0180 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.31 | G/B-HP-H | - | 6.4 |
| IN-0185 | 04/24/2014  ACT | DIESEL FIRE PUMP | 17.11 | DIESEL | 300 | HP | Nitrogen Oxides (NOx) | | 3 | G/HP-H | - | |
| IN-0234 | 12/08/2015  ACT | EMERGENCY FIRE PUMP ENGINE | 17.21 | DISTILLATE OIL | 0 | | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.05 | G/HP-H | - | |
| IN-0234 | 12/08/2015  ACT | EMERGENCY FIRE PUMP ENGINE | 17.21 | DISTILLATE OIL | 0 | | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 9.5 | G/HP-H | - | 12.8 |
| IN-0263 | 03/23/2017  ACT | EMERGENCY GENERATORS (EU014A AND EU-014B) | 17.11 | DISTILLATE OIL | 3600 | HP EACH | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 4.42 | G/HP-H EACH | - | |
| IN-0263 | 03/23/2017  ACT | EMERGENCY GENERATORS (EU014A AND EU-014B) | 17.11 | DISTILLATE OIL | 3600 | HP EACH | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.35 | G/HP-H EACH | - | 6.4 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Deisel | 150 | hp | Volatile Organic Compounds (VOC) | | 1.134 | G/HP-HR | - | |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Deisel | 150 | hp | Nitrogen Oxides (NOx) | | 14.06 | G/HP-HR | - | 20.4 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Diesel | 250 | hp | Volatile Organic Compounds (VOC) | | 1.134 | G/HP-HR | - | 20.4 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Diesel | 250 | hp | Nitrogen Oxides (NOx) | | 9.2 | G/KW-HR | - | 10.7 |
| IN-0317 | 06/11/2019  ACT | Emergency generator EU-6006 | 17.11 | Diesel | 2800 | HP | Nitrogen Oxides (NOx) | Tier II diesel engine | 6.4 | G/KWH | - | |
| IN-0317 | 06/11/2019  ACT | Emergency generator EU-6006 | 17.11 | Diesel | 2800 | HP | Volatile Organic Compounds (VOC) | Tier II diesel engine | 6.4 | G/KWH | - | 12.8 |
| IN-0317 | 06/11/2019  ACT | Emergency fire pump EU-6008 | 17.11 | Diesel | 750 | HP | Nitrogen Oxides (NOx) | Engine that complies with Table 4 to Subpart IIII of Part 60 | 4 | G/KWH | - | |
| IN-0317 | 06/11/2019  ACT | Emergency fire pump EU-6008 | 17.11 | Diesel | 750 | HP | Volatile Organic Compounds (VOC) | Engine that complies with Table 4 to Subpart IIII of Part 60 | 4 | G/KWH | - | 8.0 |
| *KS-0030 | 03/31/2016  ACT | Compression ignition RICE emergency fire pump | 17.21 | Ultra-lowsulfur diesel (ULSD) | 197 | HP | Nitrogen Oxides (NOx) | | 3 | G/HP-HR | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *KS-0030 | 03/31/2016  ACT | Compression ignition RICE emergency fire pump | 17.21 | Ultra-lowsulfur diesel (ULSD) | 197 | HP | Volatile Organic Compounds (VOC) | | 1.14 | G/HP-HR | - | 5.6 |
| *KS-0036 | 03/18/2013  ACT | Cummins 6BTA 5.9F-1 Diesel Engine Fire Pump | 17.21 | No. 2 Fuel Oil | 182 | BHP | Nitrogen Oxides (NOx) | utilize efficient combustion/design technology | 2 | LB/HR | - | |
| *KS-0036 | 03/18/2013  ACT | Cummins 6BTA 5.9F-1 Diesel Engine Fire Pump | 17.21 | No. 2 Fuel Oil | 182 | BHP | Volatile Organic Compounds (VOC) | utilize efficient combustion/design technology | 0.77 | G/BHP-H | - | 7.7 |
| KY-0109 | 10/24/2016  ACT | Emergency Generators #1, #2, & #3 (EU72, EU73, & EU74) | 17.11 | Diesel | 53.6 | gal/hr | Volatile Organic Compounds (VOC) | The permittee shall prepare and maintain for EU72, EU73, and EU74, within 90 days of startup, a good combustion and operation practices plan (GCOP) that defines, measures and verifies the use of operational and design practices determined as BACT for minimizing CO, VOC, PM, PM10, and PM2.5 emissions. Any revisions requested by the Division shall be made and the plan shall be maintained on site. The permittee shall operate according to the provisions of this plan at all times, including periods of startup, shutdown, and malfunction. The plan shall be incorporated into the plant standard operating procedures (SOP) and shall be made available for the Divisionâ€™s inspection. The plan shall include, but not be limited to: i. A list of combustion optimization practices and a means of verifying the practices have occurred. ii. A list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred. iii. A list of the design choices determined to be BACT and verification that designs were implemented in the final construction. | 4.77 | G/HP-HR (EU72 &EU73) | - | |
| KY-0110 | 07/23/2020  ACT | EP 10-02 - North Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 4.77 | G/HP-HR | - | |
| KY-0110 | 07/23/2020  ACT | EP 10-02 - North Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | | |
| KY-0110 | 07/23/2020  ACT | EP 10-03 - South Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 4.77 | G/HP-HR | - | |
| KY-0110 | 07/23/2020  ACT | EP 10-03 - South Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | | |
| KY-0110 | 07/23/2020  ACT | EP 10-04 - Emergency Fire Water Pump | 17.11 | Diesel | 920 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 4.77 | G/HP-HR | - | |
| KY-0110 | 07/23/2020  ACT | EP 10-04 - Emergency Fire Water Pump | 17.11 | Diesel | 920 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | | |
| KY-0110 | 07/23/2020  ACT | EP 11-01 - Melt Shop Emergency Generator | 17.21 | Diesel | 260 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.98 | G/HP-HR | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KY-0110 | 07/23/2020  ACT | EP 11-01 - Melt Shop Emergency Generator | 17.21 | Diesel | 260 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | | |
| KY-0110 | 07/23/2020  ACT | EP 11-02 - Reheat Furnace Emergency Generator | 17.21 | Diesel | 190 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.98 | G/HP-HR | - | |
| KY-0110 | 07/23/2020  ACT | EP 11-02 - Reheat Furnace Emergency Generator | 17.21 | Diesel | 190 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | | |
| KY-0110 | 07/23/2020  ACT | EP 10-07 - Air Separation Plant Emergency Generator | 17.11 | Diesel | 700 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 4.77 | G/HP-HR | - | |
| KY-0110 | 07/23/2020  ACT | EP 10-07 - Air Separation Plant Emergency Generator | 17.11 | Diesel | 700 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | | |
| KY-0110 | 07/23/2020  ACT | EP 10-01 - Caster Emergency Generator | 17.11 | Diesel | 2922 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 4.77 | G/HP-HR | - | |
| KY-0110 | 07/23/2020  ACT | EP 10-01 - Caster Emergency Generator | 17.11 | Diesel | 2922 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | | |
| KY-0110 | 07/23/2020  ACT | EP 11-03 - Rolling Mill Emergency Generator | 17.21 | Diesel | 440 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.98 | G/HP-HR | - | |
| KY-0110 | 07/23/2020  ACT | EP 11-03 - Rolling Mill Emergency Generator | 17.21 | Diesel | 440 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | | |
| KY-0110 | 07/23/2020  ACT | EP 11-04 - IT Emergency Generator | 17.21 | Diesel | 190 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.98 | G/HP-HR | - | |
| KY-0110 | 07/23/2020  ACT | EP 11-04 - IT Emergency Generator | 17.21 | Diesel | 190 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | | |
| KY-0110 | 07/23/2020  ACT | EP 11-05 - Radio Tower Emergency Generator | 17.21 | Diesel | 61 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | | |
| KY-0110 | 07/23/2020  ACT | EP 11-05 - Radio Tower Emergency Generator | 17.21 | Diesel | 61 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 3.5 | G/HP-HR | - | |
| KY-0115 | 04/19/2021  ACT | New Pumphouse (XB13) Emergency Generator #1 (EP 08-05) | 17.11 | Diesel | 2922 | HP | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | - | |
| KY-0115 | 04/19/2021  ACT | Tunnel Furnace Emergency Generator (EP 08-06) | 17.11 | Diesel | 2937 | HP | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | - | |
| KY-0115 | 04/19/2021  ACT | Caster B Emergency Generator (EP 08-07) | 17.11 | Diesel | 2937 | HP | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | - | |
| KY-0115 | 04/19/2021  ACT | Air Separation Unit Emergency Generator (EP 08-08) | 17.11 | Diesel | 700 | HP | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | - | |
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Emergency Generator (EP 09-05) | 17.21 | Diesel | 350 | HP | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | - | |
| LA-0251 | 04/26/2011  ACT | Fire Pump Engines - 2 units | 17.21 | diesel | 444 | hp | Nitrogen Oxides (NOx) | | 5.82 | LB/H | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0254 | 08/16/2011  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 1250 | HP | Volatile Organic Compounds (VOC) | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 1 | G/HP-H | - | |
| LA-0254 | 08/16/2011  ACT | EMERGENCY FIRE PUMP | 17.21 | DIESEL | 350 | HP | Volatile Organic Compounds (VOC) | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 1 | G/HP-H | - | |
| LA-0276 | 12/15/2016  ACT | Fire Pump Engines (2 units) | 17.11 | Diesel | 700 | hp | Volatile Organic Compounds (VOC) | Comply with standards of NSPS Subpart IIII | 0 | | | |
| LA-0292 | 01/22/2016  ACT | Emergency Generators No. 1 & No. 2 | 17.11 | Diesel | 1341 | HP | Nitrogen Oxides (NOx) | Good equipment design, proper combustion techniques, use of low sulfur fuel, and compliance with 40 CFR 60 Subpart IIII | 14.16 | LB/HR | - | |
| LA-0292 | 01/22/2016  ACT | Emergency Generators No. 1 & No. 2 | 17.11 | Diesel | 1341 | HP | Volatile Organic Compounds (VOC) | Good combustion practices consistent with the manufacturer's recommendations to maximize fuel efficiency and minimize emissions | 0.83 | LB/HR | - | 6.8 |
| LA-0296 | 05/23/2014  ACT | Emergency Diesel Generators (EQTs 622, 671, 773, 850, 994, 995, 996, 1033, 1077, 1105, & 1202) | 17.11 | Diesel | 2682 | HP | Nitrogen Oxides (NOx) | Compliance with 40 CFR 60 Subpart IIII; operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage. | 27.37 | LB/HR | - | |
| LA-0296 | 05/23/2014  ACT | Emergency Diesel Generators (EQTs 622, 671, 773, 850, 994, 995, 996, 1033, 1077, 1105, & 1202) | 17.11 | Diesel | 2682 | HP | Volatile Organic Compounds (VOC) | Compliance with 40 CFR 60 Subpart IIII; operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage. | 0.85 | LB/HR | - | 6.4 |
| LA-0305 | 06/30/2016  ACT | Diesel Engines (Emergency) | 17.11 | Diesel | 4023 | hp | Nitrogen Oxides (NOx) | Complying with 40 CFR 60 Subpart IIII | 0 | | | |
| LA-0308 | 09/26/2013  ACT | 2000 KW Diesel Fired Emergency Generator Engine | 17.11 | Diesel | 20.4 | MMBTU/hr | Nitrogen Oxides (NOx) | Good combustion and maintenance practices, and compliance with NSPS 40 CFR 60 Subpart IIII | 33.07 | LB/H | - | |
| LA-0309 | 06/04/2015  ACT | Emergency Generator Engines | 17.11 | Diesel | 2922 | hp (each) | Nitrogen Oxides (NOx) | Complying with 40 CFR 60 Subpart IIII | 6.4 | G/KW-HR | - | |
| LA-0309 | 06/04/2015  ACT | Emergency Generator Engines | 17.11 | Diesel | 2922 | hp (each) | Volatile Organic Compounds (VOC) | Complying with 40 CFR 60 Subpart IIII | 0 | | | |
| *LA-0312 | 06/30/2017  ACT | DFP1-13 - Diesel Fire Pump Engine (EQT0013) | 17.11 | Diesel | 650 | horsepower | Nitrogen Oxides (NOx) | Compliance with NSPS Subpart IIII | 6.6 | LB/HR | - | |
| *LA-0312 | 06/30/2017  ACT | DFP1-13 - Diesel Fire Pump Engine (EQT0013) | 17.11 | Diesel | 650 | horsepower | Volatile Organic Compounds (VOC) | Compliance with NNSPS Subpart IIII | 0.13 | LB/HR | - | 6.3 |
| *LA-0312 | 06/30/2017  ACT | DEG1-13 - Diesel Fired Emergency Generator Engine (EQT0012) | 17.11 | Diesel | 1474 | horsepower | Nitrogen Oxides (NOx) | Compliance with NSPS Subpart IIII | 19.23 | LB/HR | - | |
| *LA-0312 | 06/30/2017  ACT | DEG1-13 - Diesel Fired Emergency Generator Engine (EQT0012) | 17.11 | Diesel | 1474 | horsepower | Volatile Organic Compounds (VOC) | Compliance with NSPS Subpart IIII | 0.04 | LB/HR | - | 8.0 |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Generator 1 | 17.11 | Diesel | 2584 | HP | Volatile Organic Compounds (VOC) | Good combustion practices | 27.34 | LB/H | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Generator 1 | 17.11 | Diesel | 2584 | HP | Nitrogen Oxides (NOx) | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel). | 27.34 | LB/H | - | 12.9 |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Firewater Pump 1 | 17.21 | Diesel | 282 | HP | Nitrogen Oxides (NOx) | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel). | 1.87 | LB/H | - | |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Firewater Pump 1 | 17.21 | Diesel | 282 | HP | Volatile Organic Compounds (VOC) | Good combustion practices | 1.87 | LB/H | - | 8.1 |
| LA-0314 | 08/03/2016  ACT | Diesel emergency generator engine - EGEN | 17.21 | diesel | 350 | hp | Nitrogen Oxides (NOx) | complying with 40 CFR 63 subpart ZZZZ | 0 | | | |
| LA-0314 | 08/03/2016  ACT | Diesel emergency generator engine - EGEN | 17.21 | diesel | 350 | hp | Volatile Organic Compounds (VOC) | complying with 40 CFR 63 subpart ZZZZ | 0 | | | |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 1 | 17.11 | Diesel | 5364 | HP | Nitrogen Oxides (NOx) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 52.58 | LB/H | - | |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 1 | 17.11 | Diesel | 5364 | HP | Volatile Organic Compounds (VOC) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 3.86 | LB/H | - | 12.9 |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 2 | 17.11 | Diesel | 5364 | HP | Nitrogen Oxides (NOx) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 52.58 | LB/H | - | |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 2 | 17.11 | Diesel | 5364 | HP | Volatile Organic Compounds (VOC) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 3.86 | LB/H | - | 12.9 |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 1 | 17.11 | Diesel | 751 | HP | Nitrogen Oxides (NOx) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 4.6 | LB/H | - | |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 1 | 17.11 | Diesel | 751 | HP | Volatile Organic Compounds (VOC) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0.34 | LB/H | - | 12.9 |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 2 | 17.11 | Diesel | 751 | HP | Nitrogen Oxides (NOx) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 4.6 | LB/H | - | |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 2 | 17.11 | Diesel | 751 | HP | Volatile Organic Compounds (VOC) | Compliance with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0.34 | LB/H | - | 12.9 |
| LA-0316 | 02/17/2017  ACT | emergency generator engines (6 units) | 17.11 | diesel | 3353 | hp | Nitrogen Oxides (NOx) | Complying with 40 CFR 60 Subpart IIII | 0 | | | |
| LA-0316 | 02/17/2017  ACT | emergency generator engines (6 units) | 17.11 | diesel | 3353 | hp | Volatile Organic Compounds (VOC) | Complying with 40 CFR 60 Subpart IIII | 0 | | | |
| LA-0317 | 12/22/2016  ACT | Emergency Generator Engines (4 units) | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | complying with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0 | | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 3 Engine | 17.11 | Diesel Fuel | 600 | hp | Nitrogen Oxides (NOx) | Proper operation and limits on hours operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 4 Engine | 17.11 | Diesel Fuel | 600 | hp | Nitrogen Oxides (NOx) | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | | |
| LA-0323 | 01/09/2017  ACT | Standby Generator No. 9 Engine | 17.21 | Diesel Fuel | 400 | hp | Nitrogen Oxides (NOx) | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | | |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39A | 17.21 | Diesel Fuel | 375 | HP | Nitrogen Oxides (NOx) | Good combustion practices and NSPS IIII | 4 | G/KW-H | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39A | 17.21 | Diesel Fuel | 375 | HP | Volatile Organic Compounds (VOC) | Good combustion practices and NSPS Subpart IIII | 4 | G/KW-H | - | 8.0 |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39B | 17.21 | Diesel Fuel | 300 | HP | Nitrogen Oxides (NOx) | Good combustion practices and NSPS Subpart IIII | 4 | G/KW-H | - | |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39B | 17.21 | Diesel Fuel | 300 | HP | Volatile Organic Compounds (VOC) | Good combustion practices and NSPS Subpart IIII | 4 | G/KW-H | - | 8.0 |
| LA-0331 | 09/21/2018  ACT | Large Emergency Engines (>50kW) | 17.11 | Diesel Fuel | 5364 | HP | Nitrogen Oxides (NOx) | Good Combustion and Operating Practices | 5.6 | G/KW-H | - | |
| LA-0331 | 09/21/2018  ACT | Large Emergency Engines (>50kW) | 17.11 | Diesel Fuel | 5364 | HP | Volatile Organic Compounds (VOC) | Good combustion and operating practices. | 0.79 | G/KW-H | - | 6.4 |
| LA-0364 | 01/06/2020  ACT | Emergency Generator Diesel Engines | 17.11 | Diesel Fuel | 550 | hp | Nitrogen Oxides (NOx) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | | |
| LA-0364 | 01/06/2020  ACT | Emergency Generator Diesel Engines | 17.11 | Diesel Fuel | 550 | hp | Volatile Organic Compounds (VOC) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | | |
| LA-0364 | 01/06/2020  ACT | Emergency Fire Water Pumps | 17.11 | Diesel Fuel | 550 | hp | Nitrogen Oxides (NOx) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | | |
| LA-0364 | 01/06/2020  ACT | Emergency Fire Water Pumps | 17.11 | Diesel Fuel | 550 | hp | Volatile Organic Compounds (VOC) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | | |
| LA-0366 | 02/03/2021  ACT | Fire Pump, Sawmill Emergency, and Planer Mill Emergency Generator Engines | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Good Combustion Practices and Compliance with NSPS 40 CFR 60 Subpart IIII | 804.6 | HP | | |
| *LA-0370 | 04/27/2020  ACT | Emergency Fire Pump Engine (EQT0021, ENG-1) | 17.21 | Diesel | 1.1 | MM BTU/hr | Nitrogen Oxides (NOx) | The use of low sulfur fuels and compliance with 40 CFR 60 Subpart IIII | 1.15 | LB/HR | | |
| MA-0039 | 01/30/2014  ACT | Emergency Engine/Generator | 17.11 | ULSD | 7.4 | MMBTU/H | Nitrogen Oxides (NOx) | | 4.8 | GM/BHP-H | - | |
| MA-0039 | 01/30/2014  ACT | Fire Pump Engine | 17.21 | ULSD | 2.7 | MMBTU/H | Nitrogen Oxides (NOx) | | 3 | GM/BHP-H | - | |
| MD-0041 | 04/23/2014  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, AND LIMITING THE HOURS OF OPERATION | 4.8 | G/HP-H | - | |
| MD-0041 | 04/23/2014  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Volatile Organic Compounds (VOC) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, AND LIMITING THE HOURS OF OPERATION | 4.8 | LB/MMBTU | | |
| MD-0041 | 04/23/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, AND LIMITING THE HOURS OF OPERATION | 3 | G/HP-H | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MD-0042 | 04/08/2014  ACT | EMERGENCY GENERATOR 1 | 17.11 | ULTRA LOW SULFU DIESEL | 2250 | KW | Nitrogen Oxides (NOx) | LIMITED OPERATING HOURS, USE OF ULTRA-LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 4.8 | G/HP-H | - | |
| MD-0042 | 04/08/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA LOW SULFUR DIESEL | 477 | HP | Nitrogen Oxides (NOx) | LIMITED OPERATING HOURS, USE OF ULTRA-LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 3 | G/HP-H | - | |
| MD-0043 | 07/01/2014  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 1300 | HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND EXCLUSIVE USE OF ULSD | 4.8 | G/HP-H | - | |
| MD-0043 | 07/01/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRAL LOW SULFUR DIESEL | 350 | HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND EXCLUSIVE USE OF ULSD | 3 | G/HP-H | - | |
| MD-0044 | 06/09/2014  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 1550 | HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION LIMIT | 4.8 | G/HP-H | - | |
| MD-0044 | 06/09/2014  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 1550 | HP | Volatile Organic Compounds (VOC) | USE ONLY ULSD, GOOD COMBUSTION PRACTICES, AND DESIGNED TO ACHIEVE EMISSION LIMIT | 4.8 | G/HP-H | - | 12.9 |
| MD-0044 | 06/09/2014  ACT | 5 EMERGENCY FIRE WATER PUMP ENGINES | 17.21 | ULTRA LOW SULFUR DIESEL | 350 | HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION LIMIT | 3 | G/HP-H | - | |
| MD-0044 | 06/09/2014  ACT | 5 EMERGENCY FIRE WATER PUMP ENGINES | 17.21 | ULTRA LOW SULFUR DIESEL | 350 | HP | Volatile Organic Compounds (VOC) | USE ONLY ULSD, GOOD COMBUSTION PRACTICES, AND DESIGNED TO ACHIEVE EMISSION LIMIT | 3 | G/HP-H | - | 8.0 |
| MD-0045 | 11/13/2015  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1490 | HP | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 6.4 | G/KW-H | - | |
| MD-0045 | 11/13/2015  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 305 | HP | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 4 | G/KW-H | - | |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED AUXILIARY (EMERGENCY) ENGINES (TWO) | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 6.4 | G/KW-H | - | |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED FIRE PUMP ENGINE | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF ULTRA LOW SULFUR DIESEL FUEL AND GOOD COMBUSTION PRACTICES | 4 | G/KW-H | - | |
| MI-0394 | 02/29/2012  ACT | Four (4) Emergency Generators | 17.11 | Diesel | 2280 | KW | Nitrogen Oxides (NOx) | No add-on controls, but ignition timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. | 6.93 | G/KW-H | - | |
| MI-0394 | 02/29/2012  ACT | Nine (9) DRUPS Emergency Generators | 17.11 | Diesel | 3010 | KW | Nitrogen Oxides (NOx) | No add-on controls, but ignition timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. | 5.98 | G/KW-H | - | |
| MI-0395 | 07/13/2012  ACT | Nine (9) DRUPS Emergency Generators | 17.11 | Diesel | 3010 | KW | Nitrogen Oxides (NOx) | No add-on controls, but ignition timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. | 5.98 | G/KW-H | - | |
| MI-0395 | 07/13/2012  ACT | Four (4) Emergency Generators | 17.11 | Diesel | 2500 | KW | Nitrogen Oxides (NOx) | No add-on control, but ignition timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. | 7.13 | G/KW-H | - | |
| MI-0400 | 06/29/2011  ACT | Fire Pump | 17.21 | Diesel | 420 | HP | Nitrogen Oxides (NOx) | | 3 | G/HP-H | - | |
| MI-0406 | 11/01/2013  ACT | FG-EMGEN7-8; Two (2) 1,000kW diesel-fueled emergency reciprocating internal combustion engines | 17.11 | Diesel | 1000 | kW | Nitrogen Oxides (NOx) | Good combustion practices | 4.8 | G/B-HP-H | - | |

## BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0410 | 07/25/2013  ACT | EU-FPENGINE: Diesel fuel fired emergency backup fire pump | 17.21 | diesel fuel | 315 | hp nameplate | Volatile Organic Compounds (VOC) | Proper combustion design and ultra low sulfur diesel fuel. | 0 | | | |
| MI-0410 | 07/25/2013  ACT | EU-FPENGINE: Diesel fuel fired emergency backup fire pump | 17.21 | diesel fuel | 315 | hp nameplate | Nitrogen Oxides (NOx) | Proper combustion design and ultra low sulfur diesel fuel. | 3 | G/HP-H | - | |
| MI-0412 | 12/04/2013  ACT | Emergency Engine -- Diesel Fire Pump (EUFPENGINE) | 17.21 | Diesel | 165 | HP | Nitrogen Oxides (NOx) | Good combustion practices | 3 | G/HP-H | - | |
| MI-0412 | 12/04/2013  ACT | Emergency Engine -- Diesel Fire Pump (EUFPENGINE) | 17.21 | Diesel | 165 | HP | Volatile Organic Compounds (VOC) | Good combustion practices | 0.001 | LB/H | - | 4.0 |
| MI-0418 | 01/14/2015  ACT | FG-BACKUPGENS (Nine (9) DRUPS Emergency Engines) | 17.11 | Diesel | 3490 | KW | Nitrogen Oxides (NOx) | No add-on controls, but injection timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. | 8 | G/KW-H | - | |
| MI-0418 | 01/14/2015  ACT | Four (4) emergency engines in FG-BACKUPGENS | 17.11 | Diesel | 2710 | KW | Nitrogen Oxides (NOx) | No add-on controls, but injection timing retardation (ITR) is good design. Engines are tuned for low-NOx operation versus low CO operation. | 7.13 | G/KW-H | - | |
| MI-0421 | 08/26/2016  ACT | Emergency Diesel Generator Engine (EUEMRGRICE in FGRICE) | 17.11 | Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | Certified engines, limited operating hours. | 22.6 | LB/H | | |
| MI-0421 | 08/26/2016  ACT | Dieself fire pump engine (EUFIREPUMP in FGRICE) | 17.11 | Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | Certified engines, limited operating hours. | 3.53 | LB/H | | |
| MI-0423 | 01/04/2017  ACT | EUEMENGINE (Diesel fuel emergency engine) | 17.11 | Diesel Fuel | 22.68 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices and meeting NSPS IIII requirements. | 6.4 | G/KW-H | - | |
| MI-0423 | 01/04/2017  ACT | EUEMENGINE (Diesel fuel emergency engine) | 17.11 | Diesel Fuel | 22.68 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices. | 1.87 | LB/H | | |
| MI-0423 | 01/04/2017  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | Diesel | 1.66 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices and meeting NSPS Subpart IIII requirements. | 3 | G/BHP-H | - | |
| MI-0423 | 01/04/2017  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | Diesel | 1.66 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0.64 | LB/H | | |
| MI-0424 | 12/05/2016  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | diesel | 500 | H/YR | Nitrogen Oxides (NOx) | Good combustion practices. | 3 | G/HP-H | - | |
| MI-0424 | 12/05/2016  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | diesel | 500 | H/YR | Volatile Organic Compounds (VOC) | Good combustion practices | 0.47 | LB/H | | |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE1 in FGRICE (Emergency diesel generator engine) | 17.11 | Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | Certified engines, limited operating hours. | 21.2 | LB/H | | |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE2 in FGRICE (Emergency Diesel Generator Engine) | 17.11 | Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | Certified engines, limited operating hours | 4.4 | LB/H | | |
| MI-0425 | 05/09/2017  ACT | EUFIREPUMP in FGRICE (Diesel fire pump engine) | 17.11 | Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | Certified engines. Limited operating hours. | 3.53 | LB/H | | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (South Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Nitrogen Oxides (NOx) | Good combustion practices and meeting NSPS Subpart IIII requirements. | 3 | G/BHP-H | - | |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (South Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Volatile Organic Compounds (VOC) | Good combustion practices. | 0.75 | LB/H | - | 5.5 |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (North Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Nitrogen Oxides (NOx) | Good combustion practices and meeting NSPS Subpart IIII requirements. | 6.4 | G/KW-H | - | |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (North Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Volatile Organic Compounds (VOC) | Good combustion practices. | 0.86 | LB/H | - | 6.8 |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (North Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Nitrogen Oxides (NOx) | Good combustion practices and meeting NSPS Subpart IIII requirements. | 3 | G/BHP-H | - | |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (North Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Volatile Organic Compounds (VOC) | Good combustion practices | 0.75 | LB/H | - | 5.5 |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (South Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Nitrogen Oxides (NOx) | Good combustion practices and meeting NSPS IIII requirements. | 6.4 | G/KW-H | - | |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (South Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Volatile Organic Compounds (VOC) | Good combustion practices | 0.86 | LB/H | - | 6.8 |
| MI-0434 | 03/22/2018  ACT | EUFIREPUMPENGS (2 emergency fire pump engines) | 17.21 | Diesel | 250 | BHP | Nitrogen Oxides (NOx) | Good combustion practices. | 3 | G/B-HP-H | - | |
| MI-0434 | 03/22/2018  ACT | EULIFESAFETYENG - One diesel-fueled emergency engine/generator | 17.21 | Diesel | 500 | KW | Nitrogen Oxides (NOx) | Good combustion practices. | 4 | G/KW-H | - | |
| MI-0435 | 07/16/2018  ACT | EUEMENGINE: Emergency engine | 17.11 | Diesel | 2 | MW | Nitrogen Oxides (NOx) | State of the art combustion design. | 6.4 | G/KW-H | - | |
| MI-0435 | 07/16/2018  ACT | EUEMENGINE: Emergency engine | 17.11 | Diesel | 2 | MW | Volatile Organic Compounds (VOC) | State of the art combustion design. | 1.89 | LB/H | | |
| MI-0435 | 07/16/2018  ACT | EUFPENGINE: Fire pump engine | 17.21 | Diesel | 399 | BHP | Nitrogen Oxides (NOx) | State of the art combustion design. | 4 | G/KW-H | - | |
| MI-0435 | 07/16/2018  ACT | EUFPENGINE: Fire pump engine | 17.21 | Diesel | 399 | BHP | Volatile Organic Compounds (VOC) | State of the art combustion design. | 0.13 | LB/H | - | 4.2 |
| MI-0441 | 12/21/2018  ACT | EUEMGD1--A 1500 HP diesel fueled emergency engine | 17.11 | Diesel | 1500 | HP | Nitrogen Oxides (NOx) | Good combustion practices and will be NSPS compliant. | 6.4 | G/KW-H | - | |
| MI-0441 | 12/21/2018  ACT | EUEMGD2--A 6000 HP diesel fuel fired emergency engine | 17.11 | Diesel | 6000 | HP | Nitrogen Oxides (NOx) | Good combustion practices and will be NSPS compliant. | 6.4 | G/KW-H | - | |
| *MI-0445 | 11/26/2019  ACT | EUFPENGINE (Emergency engine- diesel fire pump | 17.21 | diesel fuel | 1.66 | MMBTU/H | Nitrogen Oxides (NOx) | Good Combustion Practices and meeting NSPS Subpart IIII requirements | 3 | G/BHP-H | - | |
| *MI-0445 | 11/26/2019  ACT | EUEMENGINE (diesel fuel emergency engine) | 17.11 | diesel fuel | 22.68 | MMBTU/H | Nitrogen Oxides (NOx) | Good Combustion Practices and meeting NSPS Subpart IIII requirements | 6.4 | G/KW-H | - | |
| NJ-0079 | 07/25/2012  ACT | Emergency Generator | 17.11 | Ultra Low Sulfur distillate Diesel | 100 | H/YR | Nitrogen Oxides (NOx) | Use of ULSD diesel oil | 21.16 | LB/H | | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NJ-0079 | 07/25/2012  ACT | Emergency Generator | 17.11 | Ultra Low Sulfur distillate Diesel | 100 | H/YR | Volatile Organic Compounds (VOC) | Use of ULSD oil | 0.49 | LB/H | | |
| NJ-0080 | 11/01/2012  ACT | Emergency Generator | 17.11 | ULSD | 200 | H/YR | Nitrogen Oxides (NOx) | use of ultra low sulfur diesel (ULSD) a clean fuel | 18.53 | LB/H | | |
| NJ-0080 | 11/01/2012  ACT | Emergency Generator | 17.11 | ULSD | 200 | H/YR | Volatile Organic Compounds (VOC) | use of ULSD, a low sulfur clean fuel | 2.62 | LB/H | | |
| NJ-0081 | 03/07/2014  ACT | Emergency diesel fire pump | 17.21 | Ultra Low Sulfur Distillate oil | 0 | | Nitrogen Oxides (NOx) | | 1.75 | LB/H | | |
| NJ-0081 | 03/07/2014  ACT | Emergency diesel fire pump | 17.21 | Ultra Low Sulfur Distillate oil | 0 | | Volatile Organic Compounds (VOC) | | 0.119 | LB/H | | |
| NJ-0084 | 03/10/2016  ACT | Diesel Fired Emergency Generator | 17.11 | ULSD | 44 | H/YR | Volatile Organic Compounds (VOC) | use of ULSD a clean burning fuel, and limited hours of operation | 1 | LB/H | | |
| NJ-0084 | 03/10/2016  ACT | Diesel Fired Emergency Generator | 17.11 | ULSD | 44 | H/YR | Nitrogen Oxides (NOx) | use of ultra low sulfur diesel a clean burning fuel. | 42.3 | LB/H | | |
| NJ-0084 | 03/10/2016  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD | 100 | H/YR | Nitrogen Oxides (NOx) | use of ULSD a clean burning fuel, and limited hours of operation | 1.7 | LB/H | | |
| NJ-0084 | 03/10/2016  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD | 100 | H/YR | Volatile Organic Compounds (VOC) | use of ULSD a clean burning fuel, and limited hours of operation | 0.1 | LB/H | | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY GENERATOR DIESEL | 17.21 | DIESEL OIL | 0 | 100 H/YR | Nitrogen Oxides (NOx) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 20.6 | LB/H | | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY GENERATOR DIESEL | 17.21 | DIESEL OIL | 0 | 100 H/YR | Volatile Organic Compounds (VOC) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 0.557 | LB/H | | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY DIESEL FIRE PUMP | 17.21 | ULSD | 100 | H/YR | Nitrogen Oxides (NOx) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 2.05 | LB/H | | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY DIESEL FIRE PUMP | 17.21 | ULSD | 100 | H/YR | Volatile Organic Compounds (VOC) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 0.117 | LB/H | | |
| NY-0103 | 02/03/2016  ACT | Emergency fire pump | 17.21 | ultra low sulfur diesel | 460 | hp | Volatile Organic Compounds (VOC) | Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations. | 0.1 | G/BHP-H | - | |
| NY-0103 | 02/03/2016  ACT | Emergency fire pump | 17.21 | ultra low sulfur diesel | 460 | hp | Nitrogen Oxides (NOx) | Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations. | 2.6 | G/BHP-H | - | 3.6 |
| NY-0104 | 08/01/2013  ACT | Emergency generator | 17.11 | ultra low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | Good combustion practice. | 0.0331 | LB/MMBTU | | |
| NY-0104 | 08/01/2013  ACT | Fire pump | 17.21 | ultra low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | Good combustion practice. | 0.3612 | LB/MMBTU | | |
| OH-0352 | 06/18/2013  ACT | Emergency fire pump engine | 17.21 | diesel | 300 | HP | Nitrogen Oxides (NOx) | Purchased certified to the standards in NSPS Subpart IIII | 1.7 | LB/H | - | |
| OH-0352 | 06/18/2013  ACT | Emergency fire pump engine | 17.21 | diesel | 300 | HP | Volatile Organic Compounds (VOC) | Purchased certified to the standards in NSPS Subpart IIII | 0.25 | LB/H | - | 4.0 |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0352 | 06/18/2013  ACT | Emergency generator | 17.11 | diesel | 2250 | KW | Nitrogen Oxides (NOx) | Purchased certified to the standards in NSPS Subpart IIII | 27.8 | LB/H | - | |
| OH-0352 | 06/18/2013  ACT | Emergency generator | 17.11 | diesel | 2250 | KW | Volatile Organic Compounds (VOC) | Purchased certified to the standards in NSPS Subpart IIII | 3.93 | LB/H | - | 6.4 |
| OH-0360 | 11/05/2013  ACT | Emergency generator (P003) | 17.11 | diesel | 1112 | KW | Nitrogen Oxides (NOx) | Purchased certified to the standards in NSPS Subpart IIII | 13.74 | LB/H | - | |
| OH-0360 | 11/05/2013  ACT | Emergency generator (P003) | 17.11 | diesel | 1112 | KW | Volatile Organic Compounds (VOC) | Purchased certified to the standards in NSPS Subpart IIII | 1.93 | LB/H | - | 6.4 |
| OH-0360 | 11/05/2013  ACT | Emergency fire pump engine (P004) | 17.21 | diesel | 400 | HP | Nitrogen Oxides (NOx) | Purchased certified to the standards in NSPS Subpart IIII | 2.3 | LB/H | - | |
| OH-0360 | 11/05/2013  ACT | Emergency fire pump engine (P004) | 17.21 | diesel | 400 | HP | Volatile Organic Compounds (VOC) | Purchased certified to the standards in NSPS Subpart IIII | 0.325 | LB/H | - | 4.0 |
| OH-0363 | 11/05/2014  ACT | Emergency generator (P002) | 17.11 | Diesel fuel | 1100 | KW | Nitrogen Oxides (NOx) | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 29.01 | LB/H | - | |
| OH-0363 | 11/05/2014  ACT | Emergency Fire Pump Engine (P003) | 17.21 | Diesel fuel | 260 | HP | Nitrogen Oxides (NOx) | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 1.72 | LB/H | - | |
| OH-0366 | 08/25/2015  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 140 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 0.81 | LB/H | - | |
| OH-0366 | 08/25/2015  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 140 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 0.11 | LB/H | - | 4.0 |
| OH-0366 | 08/25/2015  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2346 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 21.6 | LB/H | - | |
| OH-0366 | 08/25/2015  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2346 | HP | Volatile Organic Compounds (VOC) | | 3.1 | LB/H | - | 6.4 |
| OH-0367 | 09/23/2016  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 311 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 1.79 | LB/H | - | |
| OH-0367 | 09/23/2016  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 311 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 0.25 | LB/H | - | 4.0 |
| OH-0367 | 09/23/2016  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2947 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 27.18 | LB/H | - | |
| OH-0367 | 09/23/2016  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2947 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 3.84 | LB/H | - | 6.4 |
| OH-0368 | 04/19/2017  ACT | Emergency Fire Pump Diesel Engine (P008) | 17.21 | Diesel fuel | 460 | HP | Nitrogen Oxides (NOx) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 0.3 | LB/H | - | |
| OH-0368 | 04/19/2017  ACT | Emergency Fire Pump Diesel Engine (P008) | 17.21 | Diesel fuel | 460 | HP | Volatile Organic Compounds (VOC) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 0.14 | LB/H | - | 0.6 |
| OH-0368 | 04/19/2017  ACT | Emergency Generator (P009) | 17.11 | Diesel fuel | 5000 | HP | Nitrogen Oxides (NOx) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 5.5 | LB/H | - | |
| OH-0368 | 04/19/2017  ACT | Emergency Generator (P009) | 17.11 | Diesel fuel | 5000 | HP | Volatile Organic Compounds (VOC) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 1.6 | LB/H | - | 0.9 |
| OH-0370 | 09/07/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 16.07 | LB/H | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0370 | 09/07/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 2 | LB/H | - | 7.2 |
| OH-0370 | 09/07/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 1.97 | LB/H | - | |
| OH-0370 | 09/07/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 0.24 | LB/H | - | 4.5 |
| OH-0372 | 09/27/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 16.1 | LB/H | - | |
| OH-0372 | 09/27/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 2 | LB/H | - | 7.2 |
| OH-0372 | 09/27/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 1.97 | LB/H | - | |
| OH-0372 | 09/27/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 0.24 | LB/H | - | 4.5 |
| OH-0374 | 10/23/2017  ACT | Emergency Generators (2 identical, P004 and P005) | 17.11 | Diesel fuel | 2206 | HP | Nitrogen Oxides (NOx) | Certified to the meet the emissions standards in 40 CFR 89.112 and 89.113 pursuant to 40 CFR 60.4205(b) and 60.4202(a)(2). Good combustion practices per the manufacturerâ€™s operating manual. | 23.21 | LB/H | - | |
| OH-0374 | 10/23/2017  ACT | Emergency Generators (2 identical, P004 and P005) | 17.11 | Diesel fuel | 2206 | HP | Volatile Organic Compounds (VOC) | Certified to the meet the emissions standards in 40 CFR 89.112 and 89.113 pursuant to 40 CFR 60.4205(b) and 60.4202(a)(2). Good combustion practices per the manufacturerâ€™s operating manual. | 23.21 | LB/H | - | 12.8 |
| OH-0374 | 10/23/2017  ACT | Emergency Fire Pump (P006) | 17.21 | Diesel fuel | 410 | HP | Nitrogen Oxides (NOx) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII. Good combustion practices per the manufacturerâ€™s operating manual | 2.7 | LB/H | - | |
| OH-0374 | 10/23/2017  ACT | Emergency Fire Pump (P006) | 17.21 | Diesel fuel | 410 | HP | Volatile Organic Compounds (VOC) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII. Good combustion practices per the manufacturerâ€™s operating manual. | 2.7 | LB/H | - | 8.0 |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Generator Engine (P001) | 17.11 | Diesel fuel | 2206 | HP | Nitrogen Oxides (NOx) | Good combustion design | 24.71 | LB/H | - | |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Generator Engine (P001) | 17.11 | Diesel fuel | 2206 | HP | Volatile Organic Compounds (VOC) | Good combustion design | 24.71 | LB/H | - | 12.9 |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Fire Pump Engine (P002) | 17.11 | Diesel fuel | 700 | HP | Nitrogen Oxides (NOx) | Good combustion design | 4.97 | LB/H | - | |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Fire Pump Engine (P002) | 17.11 | Diesel fuel | 700 | HP | Volatile Organic Compounds (VOC) | Good combustion design | 4.97 | LB/H | - | 8.0 |
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fueled fire pump (P006) | 17.21 | Diesel fuel | 250 | HP | Nitrogen Oxides (NOx) | Comply with NSPS 40 CFR 60 Subpart IIII | 1.6 | LB/H | - | |
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fired generator (P007) | 17.11 | Diesel fuel | 2682 | HP | Nitrogen Oxides (NOx) | Comply with NSPS 40 CFR 60 Subpart IIII | 28.2 | LB/H | - | |
| OH-0377 | 04/19/2018  ACT | Emergency Diesel Generator (P003) | 17.11 | Diesel fuel | 1860 | HP | Nitrogen Oxides (NOx) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 19.68 | LB/H | - | |
| OH-0377 | 04/19/2018  ACT | Emergency Diesel Generator (P003) | 17.11 | Diesel fuel | 1860 | HP | Volatile Organic Compounds (VOC) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 19.68 | LB/H | - | 12.9 |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0377 | 04/19/2018  ACT | Emergency Fire Pump (P004) | 17.21 | Diesel fuel | 320 | HP | Nitrogen Oxides (NOx) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 2.12 | LB/H | - | |
| OH-0377 | 04/19/2018  ACT | Emergency Fire Pump (P004) | 17.21 | Diesel fuel | 320 | HP | Volatile Organic Compounds (VOC) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 2.12 | LB/H | - | 8.0 |
| OH-0378 | 12/21/2018  ACT | Emergency Diesel-fired Generator Engine (P007) | 17.11 | Diesel fuel | 3353 | HP | Nitrogen Oxides (NOx) | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 37.41 | LB/H | - | |
| OH-0378 | 12/21/2018  ACT | Emergency Diesel-fired Generator Engine (P007) | 17.11 | Diesel fuel | 3353 | HP | Volatile Organic Compounds (VOC) | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 37.41 | LB/H | - | 12.9 |
| OH-0378 | 12/21/2018  ACT | 1,000 kW Emergency Generators (P008 - P010) | 17.11 | Diesel fuel | 1341 | HP | Nitrogen Oxides (NOx) | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 14.96 | LB/H | - | |
| OH-0378 | 12/21/2018  ACT | 1,000 kW Emergency Generators (P008 - P010) | 17.11 | Diesel fuel | 1341 | HP | Volatile Organic Compounds (VOC) | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 14.96 | LB/H | - | 12.9 |
| OH-0379 | 02/06/2019  ACT | Emergency Generators (P005 and P006) | 17.11 | Diesel fuel | 3131 | HP | Nitrogen Oxides (NOx) | Tier IV engine<br>Tier IV NSPS standards certified by engine manufacturer. | 3.45 | LB/H | - | |
| OK-0145 | 06/25/2012  ACT | Emerg Diesel Gen, Fire Pump, Rail Steam Gen, Air Makeup Units | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 0 | | | |
| OK-0154 | 07/02/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR ENGINE | 17.11 | DIESEL | 1341 | HP | Nitrogen Oxides (NOx) | COMBUSTION CONTROL | 0.011 | LB/HP-HR | - | |
| OK-0154 | 07/02/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR ENGINE | 17.11 | DIESEL | 1341 | HP | Volatile Organic Compounds (VOC) | COMBUSTION CONTROL. | 0.0007 | LB/HP-HR | - | 7.1 |
| OK-0156 | 07/31/2013  ACT | Fire Pump Engine | 17.11 | Diesel | 550 | hp | Volatile Organic Compounds (VOC) | Good Combustion | 0.35 | LB/MMBTU | | |
| OK-0164 | 01/08/2015  ACT | Diesel-Fueled Fire Pump Engines | 17.21 | Ultra-Low Sulfur Distillate Fuel | 300 | HP | Volatile Organic Compounds (VOC) | 1. Good Combustion Practices. | 0.15 | GRAMS PER HP-HR | - | |
| OK-0175 | 06/29/2017  ACT | Emergency Use Engines > 500 HP | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Good combustion practices. Certified to meet EPA Tier 3 engine standards. Shall be limited to operate at no more than 500 hr/yr. | 3 | GM/HP-HR | - | |
| OK-0175 | 06/29/2017  ACT | Emergency Use Engine less than or equal to 500 HP | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Good combustion practices, certified to meet EPA Tier 3 engine standards. Gen-1, FP-1, and FP-2 shall be limited to operate no more than 500 hr/yr. | 3 | GM/HP-HR | - | |
| OK-0176 | 07/19/2017  ACT | Emergency Generator | 17.21 | Diesel | 400 | HP | Volatile Organic Compounds (VOC) | Equipped with non-resettable hour meter. Fired with ultra-low sulfur diesel fuel (0.015 % or less by wt. sulfur. | 217.24 | TONS/YEAR/FACILITY | | |
| OK-0181 | 09/11/2019  ACT | EMERGENCY USE ENGINES > 500 HP | 17.11 | DIESEL | 0 | | Volatile Organic Compounds (VOC) | Good combustion practices. Certified to meet EPA Tier 3 engine standards. Each engine shall be limited to operate not more than 500 hours per year. | 3 | GM/HP-HR | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OK-0181 | 09/11/2019  ACT | EMERGENCY USE ENGINES < 500 HP | 17.21 | DIESEL | 0 | | Volatile Organic Compounds (VOC) | Good Combustion Practices. Certified to meet EPA Tier 3 engine standards. Gen-1 and FP-1 shall be limited to operate not more than 500 hours per year. SP-1 shall be limited to operate not more than 876 hours per year. | 3 | GM/HP-HR | - | |
| PA-0275 | 10/24/2011  ACT | Fire Water Pump | 17.29 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.625 | LB/H | | |
| PA-0275 | 10/24/2011  ACT | Fire Water Pump | 17.29 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 0.83 | LB/H | | |
| PA-0278 | 10/10/2012  ACT | Emergency Generator | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.01 | G/B-HP-H | - | |
| PA-0278 | 10/10/2012  ACT | Emergency Generator | 17.11 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 4.93 | G/B-HP-H | - | 6.6 |
| PA-0278 | 10/10/2012  ACT | Fire Pump | 17.21 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 2.6 | G/B-HP-H | - | |
| PA-0278 | 10/10/2012  ACT | Fire Pump | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.1 | G/B-HP-H | - | 3.6 |
| *PA-0282 | 06/01/2012  ACT | 650-KW BACKUP DIESEL GENERATOR | 17.11 | Diesel / #2 Oil | 45.8 | GAL/H | Nitrogen Oxides (NOx) | | 6.9 | G/HP-H | - | |
| *PA-0282 | 06/01/2012  ACT | 400-KW DIESEL EMERGENCY GENERATOR | 17.21 | #2 Oil | 29.2 | GAL/H | Nitrogen Oxides (NOx) | | 6.9 | G/B-HP-H | - | |
| PA-0286 | 01/31/2013  ACT | Fire Pump Engine - 460 BHP | 17.21 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 2.6 | G/HP-H | - | |
| PA-0286 | 01/31/2013  ACT | Fire Pump Engine - 460 BHP | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.1 | G/HP-H | - | 3.6 |
| PA-0286 | 01/31/2013  ACT | EMERGENCY GENERATOR-ENGINE | 17.13 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 4.93 | GM/B-HP-H | - | |
| PA-0286 | 01/31/2013  ACT | EMERGENCY GENERATOR-ENGINE | 17.13 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.01 | GM/B-HP-H | - | 6.6 |
| PA-0291 | 04/23/2013  ACT | EMERGENCY FIREWATER PUMP | 17.21 | ULTRA LOW SULFUR DISTILLATE | 3.25 | MMBTU/H | Nitrogen Oxides (NOx) | | 1.86 | LB/H | | |
| PA-0291 | 04/23/2013  ACT | EMERGENCY FIREWATER PUMP | 17.21 | ULTRA LOW SULFUR DISTILLATE | 3.25 | MMBTU/H | Volatile Organic Compounds (VOC) | | 1.11 | LB/H | | |
| PA-0291 | 04/23/2013  ACT | EMERGENCY GENERATOR | 17.11 | Ultra Low sulfur Distillate | 7.8 | MMBTU/H | Nitrogen Oxides (NOx) | | 9.89 | LB/H | | |
| PA-0291 | 04/23/2013  ACT | EMERGENCY GENERATOR | 17.11 | Ultra Low sulfur Distillate | 7.8 | MMBTU/H | Volatile Organic Compounds (VOC) | | 0.7 | LB/H | | |
| PA-0296 | 12/17/2013  ACT | Emergency Firewater Pump | 17.21 | Diesel | 16 | Gal/hr | Nitrogen Oxides (NOx) | | 0.09 | T/YR | | |
| PA-0296 | 12/17/2013  ACT | Emergency Firewater Pump | 17.21 | Diesel | 16 | Gal/hr | Volatile Organic Compounds (VOC) | | 0.013 | T/YR | | |
| PA-0309 | 12/23/2015  ACT | Fire pump engine | 17.21 | Ultra-low sulfur diesel | 15 | gal/hr | Nitrogen Oxides (NOx) | | 3 | GM/HP-HR | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PA-0309 | 12/23/2015  ACT | Fire pump engine | 17.21 | Ultra-low sulfur diesel | 15 | gal/hr | Volatile Organic Compounds (VOC) | | 0.12 | GM/HP-HR | - | 4.2 |
| PA-0309 | 12/23/2015  ACT | 2000 kW Emergency Generator | 17.11 | Ultra-low sulfur Diesel | 0 | | Nitrogen Oxides (NOx) | | 5.45 | GM/HP-HR | - | |
| PA-0309 | 12/23/2015  ACT | 2000 kW Emergency Generator | 17.11 | Ultra-low sulfur Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.22 | GM/HP-HR | - | 7.6 |
| PA-0310 | 09/02/2016  ACT | Emergency Generator Engines | 17.11 | ULSD | 0 | | Nitrogen Oxides (NOx) | | 4.8 | G/BHP-HR | - | |
| PA-0310 | 09/02/2016  ACT | Emergency Fire Pump Engine | 17.21 | ULSD | 0 | | Nitrogen Oxides (NOx) | | 3 | G/BHP-HR | - | |
| PA-0311 | 09/01/2015  ACT | Fire Pump Engine | 17.11 | diesel | 0 | | Nitrogen Oxides (NOx) | | 3 | G/HP-HR | - | |
| PA-0311 | 09/01/2015  ACT | Fire Pump Engine | 17.11 | diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.2 | G/HP-HR | - | 4.3 |
| *PA-0313 | 07/27/2017  ACT | Emergency Generator | 17.11 | Diesel | 2500 | bhp | Volatile Organic Compounds (VOC) | | 3.5 | G | - | |
| *PA-0326 | 02/18/2021  ACT | Emergency Generator Parking Garage | 17.21 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of certified engines, design of engines to include turbocharger and an intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards | 2.37 | GRAM | - | |
| *PA-0326 | 02/18/2021  ACT | Emergency Generator Parking Garage | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | The use of certified engines, design of engines to include turbocharger and an intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards | 2.37 | GRAM | - | 6.4 |
| *PA-0326 | 02/18/2021  ACT | Emergency GeneratorTelecom Hut & Tower | 17.21 | diesel | 0 | | Nitrogen Oxides (NOx) | The use of certified engines, design of engines to include turbocharger and an intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards | 2.83 | G | - | |
| *PA-0326 | 02/18/2021  ACT | Emergency GeneratorTelecom Hut & Tower | 17.21 | diesel | 0 | | Volatile Organic Compounds (VOC) | The use of certified engines, design of engines to include turbocharger and an intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards | 2.83 | G | - | 7.6 |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD Fuel Oil #2 | 0 | | Nitrogen Oxides (NOx) | | 2.85 | G/B-HP-H | - | |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD Fuel Oil #2 | 0 | | Volatile Organic Compounds (VOC) | | 0.15 | G/B-HP-H | - | 4.0 |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Generator | 17.11 | ULSD Fuel oil # 2 | 0 | | Nitrogen Oxides (NOx) | | 2.85 | G/B-HP-H | - | |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Generator | 17.11 | ULSD Fuel oil # 2 | 0 | | Volatile Organic Compounds (VOC) | | 0.15 | G/B-HP-H | - | 4.0 |
| SC-0113 | 02/08/2012  ACT | EMERGENCY ENGINE 1 THRU 8 | 17.21 | DIESEL | 29 | HP | Nitrogen Oxides (NOx) | PURCHASE OF CERTIFIED ENGINE. | 7.5 | GR/KW-H | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SC-0113 | 02/08/2012  ACT | EMERGENCY ENGINE 1 THRU 8 | 17.21 | DIESEL | 29 | HP | Volatile Organic Compounds (VOC) | PURCHASE OF CERTIFIED ENGINES. HOURS OF OPERATION LIMITED TO 100 HOURS FOR MAINTENANCE AND TESTING. | 7.5 | GR/KW-H | - | 15.0 |
| SC-0113 | 02/08/2012  ACT | FIRE PUMP | 17.21 | DIESEL | 500 | HP | Nitrogen Oxides (NOx) | PURCHASE OF CERTIFIED ENGINE BASED ON NSPS, SUBPART IIII. | 4 | GR/KW-H | - | |
| SC-0113 | 02/08/2012  ACT | FIRE PUMP | 17.21 | DIESEL | 500 | HP | Volatile Organic Compounds (VOC) | CERTIFIED ENGINES THAT COMPLY WITH NSPS, SUBPART IIII. HOURS OF OPERATION LIMITED TO 100 HOURS PER YEAR FOR MAINTENANCE AND TESTING. | 4 | GR/KW-H | - | 8.0 |
| SC-0113 | 02/08/2012  ACT | EMERGENCY GENERATORS 1 THRU 8 | 17.11 | DIESEL | 757 | HP | Nitrogen Oxides (NOx) | ENGINES MUST BE CERTIFIED TO COMPLY WITH NSPS, SUBPART IIII. | 4 | GR/KW-H | - | |
| SC-0113 | 02/08/2012  ACT | EMERGENCY GENERATORS 1 THRU 8 | 17.11 | DIESEL | 757 | HP | Volatile Organic Compounds (VOC) | PURCHASE ENGINES CERTIFIED TO COMPLY WITH NSPS, SUBPART IIII. | 4 | GR/KW-H | - | 8.0 |
| SC-0159 | 07/09/2012  ACT | EMERGENCY GENERATORS, GEN1, GEN2 | 17.11 | DIESEL | 1000 | KW | Volatile Organic Compounds (VOC) | BACT HAS BEEN DETERMINED TO BE COMPLIANCE WITH NSPS, SUBPART IIII, 40 CFR60.4202 AND 40 CFR60.4205. | 6.4 | G/KW-H | - | |
| SC-0159 | 07/09/2012  ACT | FIRE PUMPS, FIRE1, FIRE2, FIRE3 | 17.21 | DIESEL | 211 | KW | Volatile Organic Compounds (VOC) | BACT HAS BEEN DETERMINED TO BE COMPLIANCE WITH NSPS, SUBPART IIII, 40 CFR60.4202 AND 40 CFR60.4205. | 4 | GKW-H | - | |
| SC-0193 | 04/15/2016  ACT | Emergency Generators and Fire Pump | 17.11 | No. 2 Fuel Oil | 1500 | hp | Volatile Organic Compounds (VOC) | Must meet the standards of 40 CFR 60, Subpart IIII | 100 | HR/YR | | |
| *SD-0005 | 06/29/2010  ACT | Emergency Generator | 17.11 | Distillate Oil | 2000 | Kilowatts | Nitrogen Oxides (NOx) | | 0 | | | |
| *SD-0005 | 06/29/2010  ACT | Fire Water Pump | 17.11 | Distillate Oil | 577 | horsepower | Nitrogen Oxides (NOx) | | 0 | | | |
| TX-0706 | 01/23/2014  ACT | Emergency Engines | 17.21 | Ultra-low sulfur diesel | 0 | | Nitrogen Oxides (NOx) | | 0.33 | TPY | | |
| TX-0706 | 01/23/2014  ACT | Emergency Engines | 17.21 | Ultra-low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.03 | TPY | | |
| TX-0728 | 04/01/2015  ACT | Emergency Diesel Generator | 17.11 | Diesel | 1500 | hp | Nitrogen Oxides (NOx) | Minimized hours of operations Tier II engine | 0.0218 | G/HP HR | - | |
| TX-0728 | 04/01/2015  ACT | Emergency Diesel Generator | 17.11 | Diesel | 1500 | hp | Volatile Organic Compounds (VOC) | Minimized hours of operations Tier II engine | 0.7 | LB/H | - | 0.3 |
| TX-0799 | 06/08/2016  ACT | Fire pump engines | 17.11 | diesel | 0 | | Volatile Organic Compounds (VOC) | Equipment specifications and good combustion practices. Operation limited to 100 hours per year. | 0.0007 | LB/HP-HR | - | |
| TX-0799 | 06/08/2016  ACT | EMERGENCY ENGINES | 17.21 | diesel | 0 | | Volatile Organic Compounds (VOC) | Equipment specifications and good combustion practices. Operation limited to 100 hours per year. | 0.0025 | LB/HP-HR | - | |
| TX-0846 | 09/23/2018  ACT | FIRE PUMP DIESEL ENGINE | 17.21 | NO 2 DIESEL | 214 | kW | Nitrogen Oxides (NOx) | Meets EPA Tier 4 requirements | 0.4 | G/KW | - | |
| TX-0846 | 09/23/2018  ACT | FIRE PUMP DIESEL ENGINE | 17.21 | NO 2 DIESEL | 214 | kW | Volatile Organic Compounds (VOC) | Meets EPA Tier 4 requirements | 0.19 | G/KW | - | 0.6 |
| TX-0864 | 09/09/2019  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | Tier 4 exhaust emission standards specified at 40 CFR Â§ 1039.101(b), 100 HR / YR | 0 | | | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0864 | 09/09/2019  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Nitrogen Oxides (NOx) | Tier 4 exhaust emission standards specified at 40 CFR Â§ 1039.101(b) | 0 | | | |
| TX-0872 | 10/31/2019  ACT | Emergency Generators | 17.11 | ultra low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | Limiting duration and frequency of generator use to 100 hr/yr. Good combustion practices will be used to reduce VOC including maintaining proper air-to-fuel ratio. | 0.12 | G/KW HR | - | |
| TX-0876 | 02/06/2020  ACT | Emergency generator | 17.11 | DIESEL | 0 | | Nitrogen Oxides (NOx) | Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101, limited to 100 hours per year of non-emergency operation | 0 | | | |
| TX-0876 | 02/06/2020  ACT | Emergency generator | 17.11 | DIESEL | 0 | | Volatile Organic Compounds (VOC) | Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101, limited to 100 hours per year of non-emergency operation | 0 | | | |
| TX-0879 | 02/19/2020  ACT | Emergency Firewater Engine | 17.11 | Ultra-low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs/yr of non-emergency operation. Have a non-resettable runtime meter. | 0.1 | G/HP HR | - | |
| TX-0879 | 02/19/2020  ACT | Emergency Firewater Engine | 17.11 | Ultra-low sulfur diesel | 0 | | Nitrogen Oxides (NOx) | Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs/yr of non-emergency operation. Have a non-resettable runtime meter. | 0 | | | |
| TX-0882 | 01/17/2020  ACT | EMERGENCY ENGINES | 17.12 | DIESEL | 0 | | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES, CLEAN FUEL, 100 HR/YR, ULTRA LOW SULFUR FUEL | 0.0092 | LB/MMBTU | | |
| TX-0882 | 01/17/2020  ACT | EMERGENCY ENGINES | 17.12 | DIESEL | 0 | | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES, CLEAN FUEL, 100 HR/YR, ULTRA LOW SULFUR FUEL | 0.001 | LB/MMBTU | | |
| TX-0886 | 03/31/2020  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Nitrogen Oxides (NOx) | Limited operating hours, good combustion practices meets NSPS IIII Tier 3 engine | 0 | | | |
| TX-0886 | 03/31/2020  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | Limited operating hours, good combustion practices meets NSPS IIII Tier 3 engine | 0 | | | |
| TX-0888 | 04/23/2020  ACT | EMERGENCY GENERATORS & FIRE WATER PUMP ENGINES | 17.11 | Ultra-low Sulfur Diesel | 0 | | Nitrogen Oxides (NOx) | well-designed and properly maintained engines and each limited to 100 hours per year of non-emergency use. | 0 | | | |
| TX-0888 | 04/23/2020  ACT | EMERGENCY GENERATORS & FIRE WATER PUMP ENGINES | 17.11 | Ultra-low Sulfur Diesel | 0 | | Volatile Organic Compounds (VOC) | well-designed and properly maintained engines and each limited to 100 hours per year of non-emergency use. | 0 | | | |
| *TX-0904 | 09/09/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Nitrogen Oxides (NOx) | 100 HOURS OPERATIONS, Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101 | 0 | | | |
| *TX-0904 | 09/09/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Volatile Organic Compounds (VOC) | 100 HOURS OPERATIONS, Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101 | 0 | | | |
| TX-0905 | 09/16/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Nitrogen Oxides (NOx) | limited to 100 hours per year of non-emergency operation | 0 | | | |
| TX-0905 | 09/16/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Volatile Organic Compounds (VOC) | limited to 100 hours per year of non-emergency operation | 0 | | | |
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED EMERGENCY GENERATOR 3000 kW (1) | 17.11 | DIESEL FUEL | 0 | | Nitrogen Oxides (NOx) | Good Combustion Practices/Maintenance | 6.4 | G/KW | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED EMERGENCY GENERATOR 3000 kW (1) | 17.11 | DIESEL FUEL | 0 | | Volatile Organic Compounds (VOC) | Good Combustion Practices/Maintenance | 6.4 | G/KW | - | 12.8 |
| VA-0327 | 07/12/2017  ACT | Emergency Generator | 17.11 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.49 | LB/HR | | |
| VA-0328 | 04/26/2018  ACT | Emergency Diesel GEN | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 4.8 | G/HP H | - | |
| VA-0328 | 04/26/2018  ACT | Emergency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Volatile Organic Compounds (VOC) | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 0 | | | |
| VA-0328 | 04/26/2018  ACT | Emergency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Nitrogen Oxides (NOx) | Good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 3 | G/HP-HR | - | |
| VA-0332 | 06/24/2019  ACT | Emergency Diesel Generator - 300 kW | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Nitrogen Oxides (NOx) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 4.8 | G/HP-H | - | |
| VA-0332 | 06/24/2019  ACT | Emegency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Volatile Organic Compounds (VOC) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 0.11 | G/HP-HR | - | |
| VA-0332 | 06/24/2019  ACT | Emegency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Nitrogen Oxides (NOx) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 3 | G/HP-HR | - | 4.2 |
| *WI-0261 | 06/12/2014  ACT | EG7 - Diesel Emergency Electric Generator w/ tank | 17.21 | Diesel fuel oil | 197 | BHP | Volatile Organic Compounds (VOC) | NSPS engine [Tier 3 emergency engine]. EG7 Storage tank, conventional fuel oil storage tank, good operating practices; limiting leakage, spills. (FT01). Engine limited to 200 hours / year (total) and NSPS requirements. | 3.75 | GRAM / HP-HR | - | |
| WI-0263 | 02/15/2016  ACT | Fire pump (process P05) | 17.21 | Diesel | 1.27 | mmBtu/hr | Nitrogen Oxides (NOx) | Good combustion practices, use diesel fuel, and operate <500 hr/yr | 0 | | | |
| WI-0263 | 02/15/2016  ACT | Fire pump (process P05) | 17.21 | Diesel | 1.27 | mmBtu/hr | Volatile Organic Compounds (VOC) | Good combustion practices, use diesel fuel, and operate <500 hr/yr | 0 | | | |
| *WI-0271 | 06/05/2015  ACT | P10K â€“ Diesel Powered Emergency Generator | 17.21 | Distillate Fuel | 0 | | Nitrogen Oxides (NOx) | Expected NOx emission without controls are 0.59 tons/year and 5.9 pounds/hour. Given this low rate of NOx emissions, due to the 200 hour/year operational limitation, the Department believes, based on engineering judgment, that controls are not economically feasible for this unit. Thus, the RICE MACT remains the only control option. | 5.9 | LB/HR | | |
| *WI-0279 | 10/02/2017  ACT | EG8 â€“ Diesel Emergency Generator | 17.21 | Diesel Fuel | 0 | | Volatile Organic Compounds (VOC) | Complying with NSPS Standards under 40 CFR Part 60 Subpart IIII | 0 | | | |
| *WI-0284 | 04/24/2018  ACT | Diesel-Fired Emergency Generators | 17.11 | Diesel Fuel | 0 | | Nitrogen Oxides (NOx) | The Use of Ultra-Low Sulfur Fuel and Good Combustion Practices | 5.36 | G/KWH | - | |
| *WI-0284 | 04/24/2018  ACT | Diesel-Fired Emergency Generators | 17.11 | Diesel Fuel | 0 | | Volatile Organic Compounds (VOC) | Good Combustion Practices | 0.56 | G/KWH | - | 5.9 |
| *WI-0286 | 04/24/2018  ACT | P42 -Diesel Fired Emergency Generator | 17.11 | Diesel Fuel | 0 | | Nitrogen Oxides (NOx) | Good Combustion Practices, The Use of an Engine Turbocharger and Aftercooler. | 5.36 | G/KWH | - | |

**BACT Determinations for Emergency Diesel Engines - NOX + VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr | $NO_X$ + VOC g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *WI-0286 | 04/24/2018  ACT | P42 -Diesel Fired Emergency Generator | 17.11 | Diesel Fuel | 0 | | Volatile Organic Compounds (VOC) | Good Combustion Practices | 0.56 | G/KWH | - | 5.9 |
| *WI-0291 | 01/28/2019  ACT | P04 Emergency Diesel Generator | 17.21 | Diesel Fuel | 0.22 | mmBTU/hr | Nitrogen Oxides (NOx) | Good Combustion Practices | 4.7 | G/KWH | - | |
| *WI-0292 | 04/01/2019  ACT | P37 Diesel-Fired Emergency Fire Pump | 17.21 | Diesel Fuel | 0 | | Volatile Organic Compounds (VOC) | Hours of Operation | 200 | HOURS | | |
| WV-0025 | 11/21/2014  ACT | Emergency Generator | 17.11 | Diesel | 2015.7 | HP | Nitrogen Oxides (NOx) | | 0 | | - | |
| WV-0025 | 11/21/2014  ACT | Emergency Generator | 17.11 | Diesel | 2015.7 | HP | Volatile Organic Compounds (VOC) | | 1.24 | LB/H | - | 6.8 |
| WV-0025 | 11/21/2014  ACT | Fire Pump Engine | 17.21 | Diesel | 251 | HP | Nitrogen Oxides (NOx) | | 0 | | - | |
| WV-0025 | 11/21/2014  ACT | Fire Pump Engine | 17.21 | Diesel | 251 | HP | Volatile Organic Compounds (VOC) | | 0.17 | LB/H | - | 4.4 |
| WV-0027 | 09/15/2017  ACT | Emergency Generator - ESDG14 | 17.11 | ULSD | 900 | bhp | Nitrogen Oxides (NOx) | Engine Design | 4.77 | G/HP-HR | - | |
| WY-0070 | 08/28/2012  ACT | Diesel Emergency Generator (EP15) | 17.11 | Ultra Low Sulfur Diesel | 839 | hp | Nitrogen Oxides (NOx) | EPA Tier 2 rated | 0 | | | |
| WY-0070 | 08/28/2012  ACT | Diesel Fire Pump Engine (EP16) | 17.21 | Ultra Low Sulfur Diesel | 327 | hp | Nitrogen Oxides (NOx) | EPA Tier 3 rated | 0 | | | |
| WY-0071 | 10/15/2012  ACT | Emergency Air Compressor | 17.21 | Ultra Low Sulfur Diesel | 400 | hp | Nitrogen Oxides (NOx) | EPA Tier 3 Rated Diesel Engine | 0 | | | |

## BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Emergency Camp Generators | 17.11 | Ultra Low Sulfur Diesel | 2695 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.15 | GRAMS/HP-H | 0.20 |
| AK-0084 | 06/30/2017  ACT | Black Start and Emergency Internal Cumbustion Engines | 17.11 | Diesel | 1500 | kWe | Particulate matter, total (TPM) | Clean Fuel and Good Combustion Practices | 0.25 | G/KW-HR | 0.25 |
| AK-0084 | 06/30/2017  ACT | Fire Pump Diesel Internal Combustion Engines | 17.21 | Diesel | 252 | hp | Particulate matter, total (TPM) | Clean Fuel and Good Combustion Practices | 0.19 | G/KW-HR | - |
| *AK-0085 | 08/13/2020  ACT | Three (3) Firewater Pump Engines and two (2) Emergency Diesel Generators | 17.21 | ULSD | 19.4 | gph | Particulate matter, total (TPM) | Good combustion practices, ULSD, and limit operation to 500 hours per year per engine | 0.19 | G/HP-HR | - |
| AL-0301 | 07/22/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | DIESEL | 800 | HP | Particulate matter, filterable (FPM) | | 0.0007 | LB/HP-H | - |
| *AL-0318 | 12/18/2017  ACT | 250 Hp Emergency CI, Diesel-fired RICE | 17.11 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0 | | |
| AR-0140 | 09/18/2013  ACT | EMERGENCY GENERATORS | 17.11 | DIESEL | 1500 | KW | Particulate matter, total < 10 Âµ (TPM10) | GOOD OPERATING PRACTICES, LIMITED HOURS OF OPERATION, COMPLIANCE WITH NSPS SUBPART IIII | 0.04 | G/KW-H | 0.040 |
| AR-0161 | 09/23/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 0.02 | G/KW-H | 0.020 |
| AR-0163 | 06/09/2019  ACT | Emergency Engines | 17.11 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 0.2 | G/KW-HR | 0.20 |
| AR-0168 | 03/17/2021  ACT | Emergency Engines | 17.21 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 0.2 | G/KW-HR | 0.20 |
| AR-0171 | 02/14/2019  ACT | SN-106 Cold Mill 1 Diesel Fired Emergency Generator | 17.21 | Diesel | 1073 | bhp | Particulate matter, total < 10 Âµ (TPM10) | Good operating practices. | 0.2 | G/KW-HR | 0.20 |
| CA-1192 | 06/21/2011  ACT | EMERGENCY FIREWATER PUMP ENGINE | 17.21 | DIESEL | 288 | HP | Particulate matter, total (TPM) | USE ULTRA LOW SULFUR FUELNOT TO EXCEED 15 PPMVD FUEL SULFUR, OPERATIONAL LIMIT OF 50 HRS/YR | 0 | | |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.11 | DIESEL | 2683 | HP | Particulate matter, total (TPM) | USE ULTRA LOW SULFUR FUEL | 0.2 | G/KW-H | 0.20 |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.21 | DIESEL | 182 | HP | Particulate matter, total (TPM) | USE ULTRA LOW SULFUR FUEL | 0.2 | G/KW-H | 0.20 |
| FL-0328 | 10/27/2011  ACT | Emergency Engine | 17.11 | Diesel | 0 | | Particulate matter, total (TPM) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.03 | TONS PER YEAR | |
| FL-0328 | 10/27/2011  ACT | Emergency Fire Pump Engine | 17.11 | Diesel | 0 | | Particulate matter, total (TPM) | Use of good combustion practices, based on the current manufacturerâ€™s specifications for this engine | 0.002 | TONS PER YEAR | |
| FL-0332 | 09/23/2011  ACT | 600 HP Emergency Equipment | 17.11 | Ultra-Low Sulfur Oil | 0 | | Particulate matter, total (TPM) | See Pollutant Notes. | 0.15 | G/HP-H | - |
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - Development Driller 1 | 17.11 | Diesel | 2229 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 0.03 | T/12MO ROLLING TOTAL | |

## BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0338 | 05/30/2012  ACT | Emergency Generator Diesel Engine - C.R. Luigs | 17.11 | diesel | 2064 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 0.04 | T/12MO ROLLING TOTAL | |
| FL-0346 | 04/22/2014  ACT | Four 3100 kW black start emergency generators | 17.11 | ULSD | 2.32 | MMBtu/hr (HHV) per engine | Particulate matter, total (TPM) | Good combustion practice | 0.2 | GRAMS PER KW-HR | 0.20 |
| FL-0346 | 04/22/2014  ACT | Emergency fire pump engine (300 HP) | 17.21 | USLD | 29 | MMBTU/H | Particulate matter, total (TPM) | Good combustion practice | 0.2 | GRAM PER HP-HR | 0.27 |
| FL-0347 | 09/16/2014  ACT | Emergency Diesel Engine | 17.11 | Diesel | 3300 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0347 | 09/16/2014  ACT | Remotely Operated Vehicle Emergency Generator | 17.21 | Diesel | 427 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0354 | 08/25/2015  ACT | Emergency fire pump engine, 300 HP | 17.21 | Diesel | 29 | MMBTU/H | Particulate matter, total (TPM) | Low-emitting fuel and certified engine | 0.2 | G / KWH | 0.20 |
| FL-0356 | 03/09/2016  ACT | Three 3300-kW ULSD emergency generators | 17.11 | ULSD | 0 | | Particulate matter, total (TPM) | Use of clean fuel | 0.2 | G / KW-HR | 0.2 |
| FL-0356 | 03/09/2016  ACT | One 422-hp emergency fire pump engine | 17.21 | ULSD | 0 | | Particulate matter, total (TPM) | Use of clean fuel | 0.2 | G / KW-HR | 0.2 |
| *FL-0363 | 12/04/2017  ACT | Two 3300 kW emergency generators | 17.11 | ULSD | 0 | | Particulate matter, filterable (FPM) | Clean fuel | 0.2 | GRAMS PER KWH | 0.20 |
| *FL-0363 | 12/04/2017  ACT | Emergency Fire Pump Engine (422 hp) | 17.21 | ULSD | 0 | | Particulate matter, filterable (FPM) | Certified engine | 0.2 | G / KWH | 0.2 |
| *FL-0367 | 07/27/2018  ACT | 1,500 kW Emergency Diesel Generator | 17.11 | ULSD | 14.82 | MMBtu/hour | Particulate matter, filterable (FPM) | Operate and maintain the engine according to the manufacturer's written instructions | 0.2 | G/KW-HOUR | 0.20 |
| *FL-0367 | 07/27/2018  ACT | Emergency Fire Pump Engine (347 HP) | 17.21 | ULSD | 8700 | gal/year | Particulate matter, filterable (FPM) | Operate and maintain the engine according to the manufacturer's written instructions | 0.2 | G/KW-HOUR | 0.20 |
| IA-0105 | 10/26/2012  ACT | Emergency Generator | 17.11 | diesel fuel | 142 | GAL/H | Particulate matter, total (TPM) | good combustion practices | 0.2 | G/KW-H | 0.20 |
| IA-0105 | 10/26/2012  ACT | Fire Pump | 17.21 | diesel fuel | 14 | GAL/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | good combustion practices | 0.2 | G/KW-H | 0.20 |
| IA-0106 | 07/12/2013  ACT | Emergency Generators | 17.11 | diesel fuel | 180 | GAL/H | Particulate matter, total (TPM) | good combustion practices | 0.2 | G/KW-H | 0.20 |
| *IA-0117 | 03/17/2021  ACT | Emergency Fire Pump Engine | 17.11 | diesel | 510 | bhp | Particulate matter, total (TPM) | | 0.17 | LB/HR | 0.20 |
| IL-0114 | 09/05/2014  ACT | Emergency Generator | 17.11 | distillate fuel oil | 3755 | HP | Particulate matter, total < 10 Âµ (TPM10) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 0.1 | G/KW-H | 0.10 |

## BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IL-0129 | 07/30/2018  ACT | Emergency Engines | 17.11 | Ultra-low sulfur diesel | 0 | | Particulate matter, total (TPM) | | 0 | | |
| IL-0130 | 12/31/2018  ACT | Emergency Engine | 17.11 | Ultra-Low Sulfur Diesel | 1500 | kW | Particulate matter, total (TPM) | | 0.2 | G/KW-HR | 0.20 |
| IN-0158 | 12/03/2012  ACT | TWO (2) EMERGENCY DIESEL GENERATORS | 17.11 | DIESEL | 1006 | HP EACH | Particulate matter, filterable < 10 Âµ (FPM10) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 0.15 | G/HP-H | 0.20 |
| IN-0158 | 12/03/2012  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 2012 | HP | Particulate matter, filterable < 10 Âµ (FPM10) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 0.15 | G/HP-H | - |
| IN-0166 | 06/27/2012  ACT | TWO (2) EMERGENCY GENERATORS | 17.11 | DIESEL | 1341 | HORSEPOWER, EACH | Particulate matter, total < 10 Âµ (TPM10) | USE OF LOW-S DIESEL AND LIMITED HOURS OF NON-EMERGENCY OPERATION | 15 | PPM SULFUR | |
| IN-0173 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES | 0.15 | G/BHP-H | 0.20 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR | 17.11 | NO. 2 FUEL OIL | 4690 | B-HP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.20 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY WATER PUMP | 17.21 | NO. 2 FUEL OIL | 481 | BHP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.20 |
| IN-0180 | 06/04/2014  ACT | DIESEL FIRED EMERGENCY GENERATOR | 17.11 | NO. 2, DIESEL | 3600 | BHP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.20 |
| IN-0185 | 04/24/2014  ACT | DIESEL FIRE PUMP | 17.11 | DIESEL | 300 | HP | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.15 | G/HP-H | 0.20 |
| IN-0234 | 12/08/2015  ACT | EMERGENCY FIRE PUMP ENGINE | 17.21 | DISTILLATE OIL | 0 | | Particulate matter, filterable (FPM) | GOOD COMBUSTION PRACTICES | 0.16 | G/HP-H | 0.21 |
| IN-0263 | 03/23/2017  ACT | EMERGENCY GENERATORS (EU014A AND EU-014B) | 17.11 | DISTILLATE OIL | 3600 | HP EACH | Particulate matter, total (TPM) | GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H EACH | 0.20 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Deisel | 150 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 1.34 | G/KW-HR | 1.34 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Diesel | 250 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 1.34 | G/KW-HR | 1.34 |
| IN-0317 | 06/11/2019  ACT | Emergency generator EU-6006 | 17.11 | Diesel | 2800 | HP | Particulate matter, total (TPM) | Tier II diesel engine | 0.2 | G/KWH | 0.20 |
| IN-0317 | 06/11/2019  ACT | Emergency fire pump EU-6008 | 17.11 | Diesel | 750 | HP | Particulate matter, total < 10 Âµ (TPM10) | Engine that complies with Table 4 to Subpart IIII of Part 60 | 0.2 | G/KWH | 0.20 |
| KS-0029 | 07/14/2015  ACT | Emergency diesel engine | 17.21 | diesel | 750 | KW | Particulate matter, total < 10 Âµ (TPM10) | Low sulfur fuel oil (<15 ppm sulfur) | 0.15 | G PER BHP-HR | 0.201 |
| *KS-0030 | 03/31/2016  ACT | Compression ignition RICE emergency fire pump | 17.21 | Ultra-lowsulfur diesel (ULSD) | 197 | HP | Particulate matter, total < 10 Âµ (TPM10) | | 0.15 | G/HP-HR | - |

**BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *KS-0036 | 03/18/2013  ACT | Cummins 6BTA 5.9F-1 Diesel Engine Fire Pump | 17.21 | No. 2 Fuel Oil | 182 | BHP | Particulate matter, total < 10 Âµ (TPM10) | utilize efficient combustion/design technology | 0.25 | G/BHP-H | - |
| KY-0109 | 10/24/2016  ACT | Emergency Generators #1, #2, & #3 (EU72, EU73, & EU74) | 17.11 | Diesel | 53.6 | gal/hr | Particulate matter, total < 10 Âµ (TPM10) | The permittee shall prepare and maintain for EU72, EU73, and EU74, within 90 days of startup, a good combustion and operation practices plan (GCOP) that defines, measures<br>and verifies the use of operational and design practices determined as BACT for minimizing CO, VOC, PM, PM10, and PM2.5 emissions. Any revisions requested by the Division shall be made and the plan shall be maintained on site. The permittee shall operate according to the provisions of this plan at all times, including periods of startup, shutdown, and malfunction. The plan shall be incorporated into the plant standard operating procedures (SOP) and shall be made available for the Divisionâ€™s inspection. The plan shall include, but not be limited to:<br>i. A list of combustion optimization practices and a means of verifying the practices have occurred.<br>ii. A list of combustion and operation practices to be used to lower energy consumption and a means of verifying the practices have occurred.<br>iii. A list of the design choices determined to be BACT and verification that designs were implemented in the final construction. | 0.149 | G/HP-HR (EU72 &EU73) | - |
| KY-0110 | 07/23/2020  ACT | EP 10-02 - North Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 10-03 - South Water System Emergency Generator | 17.11 | Diesel | 2922 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 10-04 - Emergency Fire Water Pump | 17.11 | Diesel | 920 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 11-01 - Melt Shop Emergency Generator | 17.21 | Diesel | 260 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 11-02 - Reheat Furnace Emergency Generator | 17.21 | Diesel | 190 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 10-07 - Air Separation Plant Emergency Generator | 17.11 | Diesel | 700 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 10-01 - Caster Emergency Generator | 17.11 | Diesel | 2922 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 11-03 - Rolling Mill Emergency Generator | 17.21 | Diesel | 440 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | - |
| KY-0110 | 07/23/2020  ACT | EP 11-04 - IT Emergency Generator | 17.21 | Diesel | 190 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | - |

## BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| KY-0110 | 07/23/2020  ACT | EP 11-05 - Radio Tower Emergency Generator | 17.21 | Diesel | 61 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.3 | G/HP-HR | - |
| KY-0115 | 04/19/2021  ACT | New Pumphouse (XB13) Emergency Generator #1 (EP 08-05) | 17.11 | Diesel | 2922 | HP | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0.15 | G/HP-HR | - |
| KY-0115 | 04/19/2021  ACT | Tunnel Furnace Emergency Generator (EP 08-06) | 17.11 | Diesel | 2937 | HP | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0.15 | G/HP-HR | - |
| KY-0115 | 04/19/2021  ACT | Caster B Emergency Generator (EP 08-07) | 17.11 | Diesel | 2937 | HP | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0.15 | G/HP-HR | - |
| KY-0115 | 04/19/2021  ACT | Air Separation Unit Emergency Generator (EP 08-08) | 17.11 | Diesel | 700 | HP | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0.15 | G/HP-HR | - |
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Emergency Generator (EP 09-05) | 17.21 | Diesel | 350 | HP | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0.15 | G/HP-HR | - |
| LA-0251 | 04/26/2011  ACT | Fire Pump Engines - 2 units | 17.21 | diesel | 444 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.01 | LB/H | 0.20 |
| LA-0254 | 08/16/2011  ACT | EMERGENCY DIESEL GENERATOR | 17.11 | DIESEL | 1250 | HP | Particulate matter, total < 10 Âµ (TPM10) | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H | 0.20 |
| LA-0254 | 08/16/2011  ACT | EMERGENCY FIRE PUMP | 17.21 | DIESEL | 350 | HP | Particulate matter, total < 10 Âµ (TPM10) | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H | 0.20 |
| LA-0292 | 01/22/2016  ACT | Emergency Generators No. 1 & No. 2 | 17.11 | Diesel | 1341 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Use of a certified engine, low sulfur diesel, and limiting non-emergency use to no more than 100 hours per year | 0.44 | LB/HR | 0.20 |
| LA-0296 | 05/23/2014  ACT | Emergency Diesel Generators (EQTs 622, 671, 773, 850, 994, 995, 996, 1033, 1077, 1105, & 1202) | 17.11 | Diesel | 2682 | HP | Particulate matter, total < 10 Âµ (TPM10) | Compliance with 40 CFR 60 Subpart IIII; operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage. | 0.88 | LB/HR | 0.20 |
| LA-0305 | 06/30/2016  ACT | Diesel Engines (Emergency) | 17.11 | Diesel | 4023 | hp | Particulate matter, total < 10 Âµ (TPM10) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0308 | 09/26/2013  ACT | 2000 KW Diesel Fired Emergency Generator Engine | 17.11 | Diesel | 20.4 | MMBTU/hr | Particulate matter, filterable < 10 Âµ (FPM10) | Good combustion and maintenance practices, and compliance with NSPS 40 CFR 60 Subpart IIII | 1.06 | LB/H | |
| LA-0309 | 06/04/2015  ACT | Emergency Generator Engines | 17.11 | Diesel | 2922 | hp (each) | Particulate matter, total < 10 Âµ (TPM10) | Complying with 40 CFR 60 Subpart IIII | 0.2 | G/KW-HR | 0.20 |
| *LA-0312 | 06/30/2017  ACT | DFP1-13 - Diesel Fire Pump Engine (EQT0013) | 17.11 | Diesel | 650 | horsepower | Particulate matter, total < 10 Âµ (TPM10) | Compliance with NSPS Subpart IIII | 0.15 | LB/HR | 0.14 |
| *LA-0312 | 06/30/2017  ACT | DEG1-13 - Diesel Fired Emergency Generator Engine (EQT0012) | 17.11 | Diesel | 1474 | horsepower | Particulate matter, total < 10 Âµ (TPM10) | Compliance with NSPS Subpart IIII | 0.08 | LB/HR | 0.03 |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Generator 1 | 17.11 | Diesel | 2584 | HP | Particulate matter, filterable < 10 Âµ (FPM10) | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel). | 0.86 | LB/H | 0.20 |

**BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Firewater Pump 1 | 17.21 | Diesel | 282 | HP | Particulate matter, filterable < 10 Âµ (FPM10) | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel). | 0.09 | LB/H | 0.20 |
| LA-0314 | 08/03/2016  ACT | Diesel emergency generator engine - EGEN | 17.21 | diesel | 350 | hp | Particulate matter, total < 10 Âµ (TPM10) | complying with 40 CFR 63 subpart ZZZZ | 0 | | |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 1 | 17.11 | Diesel | 5364 | HP | Particulate matter, total < 10 Âµ (TPM10) | Proper design and operation; use of ultra-low sulfur diesel | 1.76 | LB/H | 0.20 |
| *LA-0315 | 05/23/2014  ACT | Emergency Diesel Generator 2 | 17.11 | Diesel | 5364 | HP | Particulate matter, total < 10 Âµ (TPM10) | Proper design and operation; use of ultra-low sulfur diesel | 1.76 | LB/H | 0.20 |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 1 | 17.11 | Diesel | 751 | HP | Particulate matter, total < 10 Âµ (TPM10) | Proper design and operation; use of ultra-low sulfur diesel | 0.25 | LB/H | - |
| *LA-0315 | 05/23/2014  ACT | Fire Pump Diesel Engine 2 | 17.11 | Diesel | 751 | HP | Particulate matter, total < 10 Âµ (TPM10) | Proper design and operation; use of ultra-low sulfur diesel | 0.25 | LB/H | - |
| LA-0316 | 02/17/2017  ACT | emergency generator engines (6 units) | 17.11 | diesel | 3353 | hp | Particulate matter, total < 10 Âµ (TPM10) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0317 | 12/22/2016  ACT | Emergency Generator Engines (4 units) | 17.11 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | complying with 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ | 0 | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 3 Engine | 17.11 | Diesel Fuel | 600 | hp | Particulate matter, total < 10 Âµ (TPM10) | Proper operation and limits on hours operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0323 | 01/09/2017  ACT | Fire Water Diesel Pump No. 4 Engine | 17.11 | Diesel Fuel | 600 | hp | Particulate matter, total < 10 Âµ (TPM10) | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0323 | 01/09/2017  ACT | Standby Generator No. 9 Engine | 17.21 | Diesel Fuel | 400 | hp | Particulate matter, total < 10 Âµ (TPM10) | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39A | 17.21 | Diesel Fuel | 375 | HP | Particulate matter, total < 10 Âµ (TPM10) | Compliance with 40 CFR 60 Subpart IIII. | 0.2 | | |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39B | 17.21 | Diesel Fuel | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | Compliance with 40 CFR 60 Subpart IIII | 0.2 | | |
| LA-0331 | 09/21/2018  ACT | Large Emergency Engines (>50kW) | 17.11 | Diesel Fuel | 5364 | HP | Particulate matter, total < 10 Âµ (TPM10) | Good combustion and operating practices. | 0.2 | G/KW-H | - |
| LA-0364 | 01/06/2020  ACT | Emergency Generator Diesel Engines | 17.11 | Diesel Fuel | 550 | hp | Particulate matter, total < 10 Âµ (TPM10) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| LA-0364 | 01/06/2020  ACT | Emergency Fire Water Pumps | 17.11 | Diesel Fuel | 550 | hp | Particulate matter, total < 10 Âµ (TPM10) | Compliance with the limitations imposed by 40 CFR 63 Subpart IIII and operating the engine in accordance with the engine manufacturer's instructions and/or written procedures designed to maximize combustion efficiency and minimize fuel usage. | 0 | | |
| *LA-0370 | 04/27/2020  ACT | Emergency Fire Pump Engine (EQT0021, ENG-1) | 17.21 | Diesel | 1.1 | MM BTU/hr | Particulate matter, total < 2.5 Âµ (TPM2.5) | The use of low sulfur fuels and compliance with 40 CFR 60 Subpart IIII | 0.04 | LB/HR | |

**BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MA-0039 | 01/30/2014  ACT | Emergency Engine/Generator | 17.11 | ULSD | 7.4 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | | 0.15 | GM/BHP-H | 0.201153 |
| MA-0039 | 01/30/2014  ACT | Fire Pump Engine | 17.21 | ULSD | 2.7 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | | 0.15 | GM/BHP-H | 0.20 |
| MD-0041 | 04/23/2014  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H | - |
| MD-0041 | 04/23/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H | - |
| MD-0042 | 04/08/2014  ACT | EMERGENCY GENERATOR 1 | 17.11 | ULTRA LOW SULFU DIESEL | 2250 | KW | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND DESIGNED TO ACHIEVE EMISSION LIMITS | 0.15 | G/HP-H | 0.20 |
| MD-0042 | 04/08/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA LOW SULFUR DIESEL | 477 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND DESIGNED TO ACHIEVE EMISSION LIMITS | 0.15 | G/HP-H | - |
| MD-0043 | 07/01/2014  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 1300 | HP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND EXCLUSIVE USE OF ULSD | 0.17 | G/HP-H | - |
| MD-0043 | 07/01/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRAL LOW SULFUR DIESEL | 350 | HP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND EXCLUSIVE USE OF ULSD | 0.17 | G/HP-H | 0.23 |
| MD-0044 | 06/09/2014  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 1550 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION LIMITS | 0.17 | G/HP-H | - |
| MD-0044 | 06/09/2014  ACT | 5 EMERGENCY FIRE WATER PUMP ENGINES | 17.21 | ULTRA LOW SULFUR DIESEL | 350 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION LIMITS | 0.17 | G/BHP-H | - |
| MD-0045 | 11/13/2015  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1490 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES. | 0.18 | G/HP-H | 0.2 |
| MD-0045 | 11/13/2015  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 305 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES. | 0.18 | G/HP-H | 0.24 |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED AUXILIARY (EMERGENCY) ENGINES (TWO) | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Particulate matter, total < 10 Âµ (TPM10) | USE OF ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES. | 0.18 | G/HP-H | 0.2 |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED FIRE PUMP ENGINE | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULTRA LOW SULFUR DIESEL FUEL AND GOOD COMBUSTION PRACTICES | 0.18 | G/HP-H | 0.24 |
| MI-0400 | 06/29/2011  ACT | Emergency generator | 17.11 | Diesel | 4000 | HP | Particulate matter, total < 10 Âµ (TPM10) | | 1.76 | LB/H | 0.27 |
| MI-0400 | 06/29/2011  ACT | Fire Pump | 17.21 | Diesel | 420 | HP | Particulate matter, total < 10 Âµ (TPM10) | | 0.14 | LB/H | - |

**BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0406 | 11/01/2013  ACT | FG-EMGEN7-8; Two (2) 1,000kW diesel-fueled emergency reciprocating internal combustion engines | 17.11 | Diesel | 1000 | kW | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices. | 0.15 | G/B-HP-H | - |
| MI-0410 | 07/25/2013  ACT | EU-FPENGINE: Diesel fuel fired emergency backup fire pump | 17.21 | diesel fuel | 315 | hp nameplate | Particulate matter, total < 10 Âµ (TPM10) | Proper combustion design and ultra low sulfur diesel fuel | 0.6 | LB/H | 1.16 |
| MI-0412 | 12/04/2013  ACT | Emergency Engine -- Diesel Fire Pump (EUFPENGINE) | 17.21 | Diesel | 165 | HP | Particulate matter, filterable (FPM) | Good combustion practices | 0.22 | G/HP-H | 0.30 |
| MI-0421 | 08/26/2016  ACT | Emergency Diesel Generator Engine (EUEMRGRICE in FGRICE) | 17.11 | Diesel | 500 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Certified engines, good design, operation and combustion practices. Operational restrictions/limited use. | 1.41 | LB/H | |
| MI-0421 | 08/26/2016  ACT | Dieself fire pump engine (EUFIREPUMP in FGRICE) | 17.11 | Diesel | 500 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Certified engines. Good design, operation and combustion practices. Operational restrictions/limited use. | 0.18 | LB/H | |
| MI-0423 | 01/04/2017  ACT | EUEMENGINE (Diesel fuel emergency engine) | 17.11 | Diesel Fuel | 22.68 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices. | 1.58 | LB/H | |
| MI-0423 | 01/04/2017  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | Diesel | 1.66 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 0.57 | LB/H | |
| MI-0424 | 12/05/2016  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | diesel | 500 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices. | 0.09 | LB/MMBTU | |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE1 in FGRICE (Emergency diesel generator engine) | 17.11 | Diesel | 500 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Certified engines, good design, operation and combustion practices. Operational restrictions/limited use. | 0.66 | LB/H | |
| MI-0425 | 05/09/2017  ACT | EUEMRGRICE2 in FGRICE (Emergency Diesel Generator Engine) | 17.11 | Diesel | 500 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Certified engines. Good design, operation and combustion practices. Operational restrictions/limited use. | 0.22 | LB/H | |
| MI-0425 | 05/09/2017  ACT | EUFIREPUMP in FGRICE (Diesel fire pump engine) | 17.11 | Diesel | 500 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Certified engines. Good design, operation and combustion practices. Operational restrictions/limited use. | 0.18 | LB/H | |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (South Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | Diesel particulate filter, good combustion practices and meeting NSPS Subpart IIII requirements. | 0.66 | LB/H | 1.338201176 |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (North Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Particulate matter, total < 10 Âµ (TPM10) | Diesel particulate filter, good combustion practices and meeting NSPS Subpart IIII requirements. | 0.54 | LB/H | 0.244942253 |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (North Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | Diesel particulate filter, good combustion practices and meeting NSPS Subpart IIII requirements. | 0.66 | LB/H | - |
| MI-0433 | 06/29/2018  ACT | EUEMENGINE (South Plant): Emergency Engine | 17.11 | Diesel | 1341 | HP | Particulate matter, total < 10 Âµ (TPM10) | Diesel particulate filter, good combustion practices and meeting NSPS Subpart IIII requirements. | 0.54 | LB/H | - |
| MI-0435 | 07/16/2018  ACT | EUEMENGINE: Emergency engine | 17.11 | Diesel | 2 | MW | Particulate matter, total < 10 Âµ (TPM10) | State of the art combustion design | 1.18 | LB/H | - |
| MI-0435 | 07/16/2018  ACT | EUFPENGINE: Fire pump engine | 17.21 | Diesel | 399 | BHP | Particulate matter, total < 10 Âµ (TPM10) | State of the art combustion design. | 0.13 | LB/H | - |
| MI-0441 | 12/21/2018  ACT | EUEMGD1--A 1500 HP diesel fueled emergency engine | 17.11 | Diesel | 1500 | HP | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices, burn ultra-low sulfur diesel fuel and be NSPS compliant. | 0.69 | LB/H | - |

## BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0441 | 12/21/2018  ACT | EUEMGD2--A 6000 HP diesel fuel fired emergency engine | 17.11 | Diesel | 6000 | HP | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices, burn ultra low sulfur diesel fuel, and be NSPS compliant. | 2.7 | LB/H | - |
| MI-0441 | 12/21/2018  ACT | EUFPRICE--A 315 HP diesel fueled emergency engine | 17.21 | Diesel | 2.5 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Ultra low sulfur diesel fuel and good combustion practices. | 0.12 | LB/H | |
| *MI-0445 | 11/26/2019  ACT | EUFPENGINE (Emergency engine-diesel fire pump | 17.21 | diesel fuel | 1.66 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 0.57 | LB/H | |
| *MI-0445 | 11/26/2019  ACT | EUEMENGINE (diesel fuel emergency engine) | 17.11 | diesel fuel | 22.68 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 1.58 | LB/H | |
| MI-0447 | 01/07/2021  ACT | EUEMGD--emergency engine | 17.11 | diesel fuel | 4474.2 | KW | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices, burn ultra-low diesel fuel and be NSPS compliant. | 1 | LB/H | - |
| MI-0447 | 01/07/2021  ACT | EUFPRICE--A 315 HP diesel fueled emergency engine | 17.21 | Diesel | 2.5 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Ultra low sulfur diesel fuel and good combustion practices | 0.12 | LB/H | |
| MO-0089 | 05/12/2016  ACT | emergency engines | 17.21 | ULSD | 0 | | Particulate matter, filterable (FPM) | good operating practices | 0 | G/KW | |
| NJ-0079 | 07/25/2012  ACT | Emergency Generator | 17.11 | Ultra Low Sulfur distillate Diesel | 100 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Use of ULSD oil | 0.13 | LB/H | |
| NJ-0080 | 11/01/2012  ACT | Emergency Generator | 17.11 | ULSD | 200 | H/YR | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.66 | LB/H | |
| NJ-0081 | 03/07/2014  ACT | Emergency diesel fire pump | 17.21 | Ultra Low Sulfur Distillate oil | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Use of ultra low sulfur distillate oil | 0.15 | G/B-HP-H | 0.20 |
| NJ-0084 | 03/10/2016  ACT | Diesel Fired Emergency Generator | 17.11 | ULSD | 44 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | use of ULSD a clean burning fuel, and limited hours of operation | 0.26 | LB/H | |
| NJ-0084 | 03/10/2016  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD | 100 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | use of ULSD a clean burning fuel, and limited hours of operation | 0.1 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY GENERATOR DIESEL | 17.21 | DIESEL OIL | 0 | 100 H/YR | Particulate matter, total < 10 Âµ (TPM10) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 0.661 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY DIESEL FIRE PUMP | 17.21 | ULSD | 100 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 0.108 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Emergency fire pump | 17.21 | ultra low sulfur diesel | 460 | hp | Particulate matter, filterable (FPM) | Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations. | 0.087 | G/BHP-H | 0.12 |
| NY-0104 | 08/01/2013  ACT | Emergency generator | 17.11 | ultra low sulfur diesel | 0 | | Particulate matter, filterable (FPM) | Ultra low sulfur diesel with maximum sulfur content 0.0015 percent. | 0.03 | G/BHP-H | 0.04 |
| NY-0104 | 08/01/2013  ACT | Fire pump | 17.21 | ultra low sulfur diesel | 0 | | Particulate matter, filterable (FPM) | Ultra low sulfur diesel with maximum sulfur content 0.0015 percent. | 0.043 | LB/MMBTU | |
| OH-0352 | 06/18/2013  ACT | Emergency fire pump engine | 17.21 | diesel | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | Purchased certified to the standards in NSPS Subpart IIII | 0.1 | LB/H | 0.200 |
| OH-0352 | 06/18/2013  ACT | Emergency generator | 17.11 | diesel | 2250 | KW | Particulate matter, total < 10 Âµ (TPM10) | Purchased certified to the standards in NSPS Subpart IIII | 0.99 | LB/H | 0.200 |

**BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0360 | 11/05/2013  ACT | Emergency generator (P003) | 17.11 | diesel | 1112 | KW | Particulate matter, total < 10 Âµ (TPM10) | Purchased certified to the standards in NSPS Subpart IIII | 0.49 | LB/H | 0.200 |
| OH-0360 | 11/05/2013  ACT | Emergency fire pump engine (P004) | 17.21 | diesel | 400 | HP | Particulate matter, total < 10 Âµ (TPM10) | Purchased certified to the standards in NSPS Subpart IIII | 0.131 | LB/H | 0.200 |
| OH-0363 | 11/05/2014  ACT | Emergency generator (P002) | 17.11 | Diesel fuel | 1100 | KW | Particulate matter, total (TPM) | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 0.77 | LB/H | 0.32 |
| OH-0363 | 11/05/2014  ACT | Emergency Fire Pump Engine (P003) | 17.21 | Diesel fuel | 260 | HP | Particulate matter, total (TPM) | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 0.09 | LB/H | 0.20 |
| OH-0366 | 08/25/2015  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 140 | HP | Particulate matter, total < 10 Âµ (TPM10) | State-of-the-art combustion design | 0.07 | LB/H | 0.30 |
| OH-0366 | 08/25/2015  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2346 | HP | Particulate matter, total < 10 Âµ (TPM10) | State-of-the-art combustion design | 0.77 | LB/H | 0.20 |
| OH-0367 | 09/23/2016  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 311 | HP | Particulate matter, total < 10 Âµ (TPM10) | State-of-the-art combustion design | 0.1 | LB/H | 0.20 |
| OH-0367 | 09/23/2016  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 2947 | HP | Particulate matter, total < 10 Âµ (TPM10) | State-of-the-art combustion design | 0.97 | LB/H | 0.20 |
| OH-0368 | 04/19/2017  ACT | Emergency Fire Pump Diesel Engine (P008) | 17.21 | Diesel fuel | 460 | HP | Particulate matter, total < 10 Âµ (TPM10) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 0.02 | LB/H | 0.02 |
| OH-0368 | 04/19/2017  ACT | Emergency Generator (P009) | 17.11 | Diesel fuel | 5000 | HP | Particulate matter, total < 10 Âµ (TPM10) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 0.2 | LB/H | 0.03 |
| OH-0370 | 09/07/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Particulate matter, total < 10 Âµ (TPM10) | Ultra low sulfur diesel fuel | 0.5 | LB/H | 0.20 |
| OH-0370 | 09/07/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | Ultra low sulfur diesel fuel | 0.1 | LB/H | 0.20 |
| OH-0372 | 09/27/2017  ACT | Emergency generator (P003) | 17.11 | Diesel fuel | 1529 | HP | Particulate matter, total < 10 Âµ (TPM10) | Ultra low sulfur diesel fuel | 0.5 | LB/H | 0.20 |
| OH-0372 | 09/27/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | Ultra low sulfur diesel fuel | 0.1 | LB/H | 0.20 |
| OH-0374 | 10/23/2017  ACT | Emergency Generators (2 identical, P004 and P005) | 17.11 | Diesel fuel | 2206 | HP | Particulate matter, total (TPM) | Certified to the meet the emissions standards in 40 CFR 89.112 and 89.113 pursuant to 40 CFR 60.4205(b) and 60.4202(a)(2). Good combustion practices per the manufacturerâ€™s operating manual. | 0.73 | LB/H | 0.20 |
| OH-0374 | 10/23/2017  ACT | Emergency Fire Pump (P006) | 17.21 | Diesel fuel | 410 | HP | Particulate matter, total (TPM) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII. Good combustion practices per the manufacturerâ€™s operating manual. | 0.13 | LB/H | 0.20 |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Generator Engine (P001) | 17.11 | Diesel fuel | 2206 | HP | Particulate matter, total < 10 Âµ (TPM10) | Good combustion design | 0.73 | LB/H | 0.20 |
| OH-0375 | 11/07/2017  ACT | Emergency Diesel Fire Pump Engine (P002) | 17.11 | Diesel fuel | 700 | HP | Particulate matter, total < 10 Âµ (TPM10) | Good combustion design | 0.23 | LB/H | 0.20 |

## BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fueled fire pump (P006) | 17.21 | Diesel fuel | 250 | HP | Particulate matter, total < 10 Âµ (TPM10) | Comply with NSPS 40 CFR 60 Subpart IIII | 0.1 | LB/H | 0.24 |
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fired generator (P007) | 17.11 | Diesel fuel | 2682 | HP | Particulate matter, total < 10 Âµ (TPM10) | Comply with NSPS 40 CFR 60 Subpart IIII | 1.01 | LB/H | 0.23 |
| OH-0377 | 04/19/2018  ACT | Emergency Diesel Generator (P003) | 17.11 | Diesel fuel | 1860 | HP | Particulate matter, total (TPM) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 0.62 | LB/H | 0.20 |
| OH-0377 | 04/19/2018  ACT | Emergency Fire Pump (P004) | 17.21 | Diesel fuel | 320 | HP | Particulate matter, total (TPM) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 0.11 | LB/H | 0.20 |
| OH-0378 | 12/21/2018  ACT | Emergency Diesel-fired Generator Engine (P007) | 17.11 | Diesel fuel | 3353 | HP | Particulate matter, total (TPM) | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 1.1 | LB/H | 0.20 |
| OH-0378 | 12/21/2018  ACT | 1,000 kW Emergency Generators (P008 - P010) | 17.11 | Diesel fuel | 1341 | HP | Particulate matter, total (TPM) | certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII, shall employ good combustion practices per the manufacturerâ€™s operating manual | 0.44 | LB/H | 0.20 |
| OH-0379 | 02/06/2019  ACT | Emergency Generators (P005 and P006) | 17.11 | Diesel fuel | 3131 | HP | Particulate matter, filterable < 10 Âµ (FPM10) | Tier IV engine Good combustion practices | 0.15 | LB/H | 0.03 |
| OK-0154 | 07/02/2013  ACT | DIESEL-FIRED EMERGENCY GENERATOR ENGINE | 17.11 | DIESEL | 1341 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | COMBUSTION CONTROL. | 0.44 | LB/HR | 0.20 |
| OK-0156 | 07/31/2013  ACT | Fire Pump Engine | 17.11 | Diesel | 550 | hp | Particulate matter, total < 10 Âµ (TPM10) | | 0.2 | GM/HP-HR | 0.27 |
| PA-0275 | 10/24/2011  ACT | Fire Water Pump | 17.29 | Diesel | 0 | | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.08 | LB/H | |
| PA-0278 | 10/10/2012  ACT | Emergency Generator | 17.11 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.02 | G/B-HP-H | 0.03 |
| PA-0278 | 10/10/2012  ACT | Fire Pump | 17.21 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.09 | G/B-HP-H | 0.12 |
| PA-0286 | 01/31/2013  ACT | Fire Pump Engine - 460 BHP | 17.21 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.09 | G/HP-H | 0.12 |
| PA-0286 | 01/31/2013  ACT | EMERGENCY GENERATOR-ENGINE | 17.13 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.02 | GM/B-HP-H | 0.027 |
| PA-0291 | 04/23/2013  ACT | EMERGENCY FIREWATER PUMP | 17.21 | ULTRA LOW SULFUR DISTILLATE | 3.25 | MMBTU/H | Particulate matter, total (TPM) | | 0.15 | LB/H | |
| PA-0291 | 04/23/2013  ACT | EMERGENCY GENERATOR | 17.11 | Ultra Low sulfur Distillate | 7.8 | MMBTU/H | Particulate matter, total (TPM) | | 0.02 | TPY | |
| PA-0296 | 12/17/2013  ACT | Emergency Firewater Pump | 17.21 | Diesel | 16 | Gal/hr | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.005 | T/YR | |

## BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PA-0309 | 12/23/2015  ACT | Fire pump engine | 17.21 | Ultra-low sulfur diesel | 15 | gal/hr | Particulate matter, total < 10 Âµ (TPM10) | | 0.11 | GM/HP-HR | 0.15 |
| PA-0309 | 12/23/2015  ACT | 2000 kW Emergency Generator | 17.11 | Ultra-low sulfur Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.025 | GM/HP-HR | 0.03 |
| PA-0310 | 09/02/2016  ACT | Emergency Generator Engines | 17.11 | ULSD | 0 | | Particulate matter, total (TPM) | | 0.15 | G/BHP-HR | 0.201 |
| PA-0310 | 09/02/2016  ACT | Emergency Fire Pump Engine | 17.21 | ULSD | 0 | | Particulate matter, total (TPM) | | 0.15 | G/BHP-HR | 0.20 |
| PA-0311 | 09/01/2015  ACT | Fire Pump Engine | 17.11 | diesel | 0 | | Particulate matter, total (TPM) | | 0.2 | G/HP-HR | 0.27 |
| *PA-0313 | 07/27/2017  ACT | Emergency Generator | 17.11 | Diesel | 2500 | bhp | Particulate matter, total (TPM) | | 0.2 | G | 0.27 |
| *PA-0326 | 02/18/2021  ACT | Emergency Generator Parking Garage | 17.21 | Diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | LAER PM2.5 BACT PM/PM25 certified engines,include trubocharger and intercooler/aftercooler GCP ULSD | 0.06 | G | 0.080 |
| *PA-0326 | 02/18/2021  ACT | Emergency GeneratorTelecom Hut & Tower | 17.21 | diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | LAER PM2.5 BACT PM/PM25 certified engines,include trubocharger and intercooler/aftercooler GCP ULSD | 0.22 | G | 0.295 |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD Fuel Oil #2 | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.15 | G/B-HP-H | 0.20 |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Generator | 17.11 | ULSD Fuel oil # 2 | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.15 | G/B-HP-H | 0.20 |
| SC-0193 | 04/15/2016  ACT | Emergency Generators and Fire Pump | 17.11 | No. 2 Fuel Oil | 1500 | hp | Particulate matter, total (TPM) | Meet emission standards of 40 CFR 60, Subpart IIII | 100 | HRS/YR | |
| *SD-0005 | 06/29/2010  ACT | Emergency Generator | 17.11 | Distillate Oil | 2000 | Kilowatts | Particulate matter, filterable (FPM) | | 0 | | |
| *SD-0005 | 06/29/2010  ACT | Fire Water Pump | 17.11 | Distillate Oil | 577 | horsepower | Particulate matter, filterable (FPM) | | 0 | | |
| TX-0728 | 04/01/2015  ACT | Emergency Diesel Generator | 17.11 | Diesel | 1500 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | Minimized hours of operations Tier II engine | 0.15 | LB/H | 0.061 |
| TX-0846 | 09/23/2018  ACT | FIRE PUMP DIESEL ENGINE | 17.21 | NO 2 DIESEL | 214 | kW | Particulate matter, total < 10 Âµ (TPM10) | Meets EPA Tier 4 requirements | 0.02 | G/KW | 0.02 |
| TX-0864 | 09/09/2019  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Tier 4 exhaust emission standards specified at 40 CFR Â§ 1039.101(b) | 0 | | |
| TX-0876 | 02/06/2020  ACT | Emergency generator | 17.11 | DIESEL | 0 | | Particulate matter, filterable < 10 Âµ (FPM10) | Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101, limited to 100 hours per year of non-emergency operation | 0 | | |
| TX-0882 | 01/17/2020  ACT | EMERGENCY ENGINES | 17.12 | DIESEL | 0 | | Particulate matter, total (TPM) | GOOD COMBUSTION PRACTICES, CLEAN FUEL, 100 HR/YR, ULTRA LOW SULFUR FUEL | 0.0001 | LB/MMBTU | |
| TX-0882 | 01/17/2020  ACT | EMERGENCY ENGINES | 17.12 | DIESEL | 0 | | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES, CLEAN FUEL, 100 HR/YR, ULTRA LOW SULFUR FUEL | 0.0001 | LB/MMBTU | |

## BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0882 | 01/17/2020  ACT | EMERGENCY ENGINES | 17.12 | DIESEL | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | GOOD COMBUSTION PRACTICES, CLEAN FUEL, 100 HR/YR, ULTRA LOW SULFUR FUEL | 0.0001 | LB/MMBTU | |
| TX-0888 | 04/23/2020  ACT | EMERGENCY GENERATORS & FIRE WATER PUMP ENGINES | 17.11 | Ultra-low Sulfur Diesel | 0 | | Particulate matter, filterable < 10 Âµ (FPM10) | well-designed and properly maintained engines and each limited to 100 hours per year of non-emergency use. | 0 | | |
| *TX-0904 | 09/09/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Particulate matter, filterable < 10 Âµ (FPM10) | 100 HOURS OPERATIONS, Tier 4 exhaust emission standards specified in 40 CFR Â§ 1039.101 | 0 | | |
| TX-0905 | 09/16/2020  ACT | EMERGENCY GENERATOR | 17.11 | ULTRA LOW SULFUR DIESEL | 0 | | Particulate matter, filterable < 10 Âµ (FPM10) | limited to 100 hours per year of non-emergency operation | 0 | | |
| VA-0319 | 08/27/2012  ACT | FIRE WATER PUMP | 17.21 | diesel (ultra low sulfur) | 1.86 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Clean burning ULSD fuel and good combusion practices | 0.15 | G/HP-H | 0.201 |
| VA-0319 | 08/27/2012  ACT | FIRE WATER PUMP | 17.21 | diesel (ultra low sulfur) | 1.86 | MMBTU/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | Clean burning ULSD fuel and good combustion practices. | 0.15 | G/HP-H | 0.201 |
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED EMERGENCY GENERATOR 3000 kW (1) | 17.11 | DIESEL FUEL | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Ultra Low Sulfur Diesel/Fuel (15 ppm max) | 0.4 | G/KW | 0.400 |
| VA-0328 | 04/26/2018  ACT | Emergency Diesel GEN | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 0.15 | G/HP H | 0.201 |
| VA-0328 | 04/26/2018  ACT | Emergency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Particulate matter, total < 10 Âµ (TPM10) | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 0.15 | G/HP HR | 0.201 |
| VA-0332 | 06/24/2019  ACT | Emergency Diesel Generator - 300 kW | 17.11 | Ultra Low Sulfur Diesel | 500 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 0.15 | G/HP-HR | - |
| VA-0332 | 06/24/2019  ACT | Emegency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Particulate matter, total < 10 Âµ (TPM10) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 0.15 | G/HP-HR | - |
| *VA-0333 | 12/09/2020  ACT | One (1) emergency engine generator | 17.11 | ULSD | 2220 | HP | Particulate matter, total < 10 Âµ (TPM10) | | 1.1 | LB | - |
| WI-0263 | 02/15/2016  ACT | Fire pump (process P05) | 17.21 | Diesel | 1.27 | mmBtu/hr | Particulate matter, total (TPM) | Good combustion practices, use diesel fuel with sulfur content < 15 ppm, and operate <500 hr/yr | 0 | | |
| *WI-0271 | 06/05/2015  ACT | P10K â€“ Diesel Powered Emergency Generator | 17.21 | Distillate Fuel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | BACT is the use of ultra-low sulfur distillate in the generator. Compliance with this requirement will be determined using sulfur content testing for all shipments of fuel received. | 0.29 | ;B/HR | |
| *WI-0284 | 04/24/2018  ACT | Diesel-Fired Emergency Generators | 17.11 | Diesel Fuel | 0 | | Particulate matter, total (TPM) | The Use of Ultra-Low Sulfur Fuel and Good Combustion Practices | 0.17 | G/KWH | - |
| *WI-0286 | 04/24/2018  ACT | P42 -Diesel Fired Emergency Generator | 17.11 | Diesel Fuel | 0 | | Particulate matter, total (TPM) | Good Combustion Practices and The Use of Ultra-low Sulfur Fuel | 17 | G/KWH | - |

**BACT Determinations for Emergency Diesel Engines - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WV-0025 | 11/21/2014  ACT | Emergency Generator | 17.11 | Diesel | 2015.7 | HP | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | | 0 | | - |
| WV-0025 | 11/21/2014  ACT | Fire Pump Engine | 17.21 | Diesel | 251 | HP | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | | 0 | | 0.20 |
| WV-0027 | 09/15/2017  ACT | Emergency Generator - ESDG14 | 17.11 | ULSD | 900 | bhp | Particulate matter, total < 10 Âµ (TPM10) | ULSD | 0.2 | G/HP-HR | 0.27 |

## BACT Determinations for Small Internal Combustion Engine (< 500 HP) - CO (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Airstrip Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 490 | hp | Carbon Monoxide | | 2.6 | GRAMS/HP-H | 3.486652 |
| AK-0082 | 01/23/2015  ACT | Agitator Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 98 | hp | Carbon Monoxide | | 3.7 | GRAMS/HP-H | 4.961774 |
| AK-0082 | 01/23/2015  ACT | Incinerator Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 102 | hp | Carbon Monoxide | | 3.7 | GRAMS/HP-H | 4.961774 |
| AK-0083 | 01/06/2015  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBTU/H | Carbon Monoxide | Limited Operation of 168 hr/yr. | 0.95 | LB/MMBTU | |
| AK-0084 | 06/30/2017  ACT | Fire Pump Diesel Internal Combustion Engines | 17.21 | Diesel | 252 | hp | Carbon Monoxide | Good Combustion Practices | 3.3 | G/KW-HR | 3.3 |
| *AK-0085 | 08/13/2020  ACT | Three (3) Firewater Pump Engines and two (2) Emergency Diesel Generators | 17.21 | ULSD | 19.4 | gph | Carbon Monoxide | Good combustion practices, limit operation to 500 hours per year per engine | 3.3 | G/HP-HR | 4.425366 |
| *AK-0086 | 03/26/2021  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBtu/hr | Carbon Monoxide | Good Combustion Practices and Limited Use | 0.95 | LB/MMBTU | |
| AR-0168 | 03/17/2021  ACT | Emergency Engines | 17.21 | Diesel | 0 | | Carbon Monoxide | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 3.5 | G/KW-HR | 3.5 |
| AR-0171 | 02/14/2019  ACT | SN-106 Cold Mill 1 Diesel Fired Emergency Generator | 17.21 | Diesel | 1073 | bhp | Carbon Monoxide | Good operating practices. | 4 | G/KW-HR | 4 |
| CA-1192 | 06/21/2011  ACT | EMERGENCY FIREWATER PUMP ENGINE | 17.21 | DIESEL | 288 | HP | Carbon Monoxide | EQUIPPED W/ A TURBOCHARGER AND AN INTERCOOLER/AFTERCOOLER | 0.447 | G/HP-H | 0.5994359 |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.21 | DIESEL | 182 | HP | Carbon Monoxide | | 3.5 | G/KW-H | 3.5 |
| FL-0338 | 05/30/2012  ACT | Wireline Unit Engines - C.R. Luigs | 17.21 | diesel | 300 | hp | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 2.9 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Fast Rescue Craft Diesel Engine - Development Driller 1 | 17.21 | Diesel | 142 | hp | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, and turbocharger | 0 | | |
| FL-0338 | 05/30/2012  ACT | Life Boat Diesel Engines - Development Driller 1 | 17.21 | Diesel | 110 | hp | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines and use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Port and Stb Fwd and Aft Crane Diesel Engines - C.R. Luigs | 17.21 | diesel | 305 | HP | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 17.85 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Seismic Operations Diesel Engines - Development Driller 1 | 17.21 | Diesel | 415 | hp | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, and turbocharger | 1.94 | TONS | |
| FL-0338 | 05/30/2012  ACT | Life Boat Diesel Engines - C.R. Luigs | 17.21 | diesel | 39 | hp | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - Development Driller 1 | 17.21 | Diesel | 0 | | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler | 3.73 | T/12MO ROLLING TOTAL | |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0338 | 05/30/2012  ACT | Wireline Unit Diesel Engines - Development Driller 1 | 17.21 | Diesel | 0 | | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 2.9 | TONS | |
| FL-0338 | 05/30/2012  ACT | Black Start Air Compressor - C.R. Luigs | 17.21 | diesel | 6 | hp | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for the engine and the use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - C.R. Luigs | 17.21 | diesel | 0 | | Carbon Monoxide | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler | 3.3 | T/12MO ROLLING TOTAL | |
| FL-0346 | 04/22/2014  ACT | Emergency fire pump engine (300 HP) | 17.21 | USLD | 29 | MMBTU/H | Carbon Monoxide | Good combustion practice. | 3.5 | GRAM PER KW-HR | 3.5 |
| FL-0347 | 09/16/2014  ACT | Diesel Powered Forklift Engine | 17.21 | Diesel | 30 | hp | Carbon Monoxide | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine | 0 | | |
| FL-0347 | 09/16/2014  ACT | Wireline Diesel Engines | 17.21 | Diesel | 0 | | Carbon Monoxide | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0347 | 09/16/2014  ACT | Water Blasting Diesel Engine | 17.21 | Diesel | 208 | hp | Carbon Monoxide | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0347 | 09/16/2014  ACT | Well Evaluation Diesel Engine | 17.21 | Diesel | 140 | hp | Carbon Monoxide | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine | 0 | | |
| FL-0347 | 09/16/2014  ACT | Fast Rescue Craft Diesel Engine | 17.21 | Diesel | 230 | hp | Carbon Monoxide | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0347 | 09/16/2014  ACT | Escape Capsule Diesel Engine | 17.21 | Diesel | 39 | hp | Carbon Monoxide | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine | 0 | | |
| FL-0347 | 09/16/2014  ACT | Remotely Operated Vehicle Emergency Generator | 17.21 | Diesel | 427 | hp | Carbon Monoxide | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0354 | 08/25/2015  ACT | Emergency fire pump engine, 300 HP | 17.21 | Diesel | 29 | MMBTU/H | Carbon Monoxide | Low-emitting fuel and certified engine | 3.5 | G / KWH | 3.5 |
| FL-0356 | 03/09/2016  ACT | One 422-hp emergency fire pump engine | 17.21 | ULSD | 0 | | Carbon Monoxide | Use of clean engine technology | 3.5 | G / KW-HR | 3.5 |
| *FL-0363 | 12/04/2017  ACT | Emergency Fire Pump Engine (422 hp) | 17.21 | ULSD | 0 | | Carbon Monoxide | Certified engine | 3.5 | G / KWH | 3.5 |
| *FL-0367 | 07/27/2018  ACT | Emergency Fire Pump Engine (347 HP) | 17.21 | ULSD | 8700 | gal/year | Carbon Monoxide | Operate and maintain the engine according to the manufacturer's written instructions | 3.5 | G/KW-HOUR | 3.5 |
| IA-0105 | 10/26/2012  ACT | Fire Pump | 17.21 | diesel fuel | 14 | GAL/H | Carbon Monoxide | good combustion practices | 3.5 | G/KW-H | 3.5 |
| IL-0114 | 09/05/2014  ACT | Firewater Pump Engine | 17.21 | distillate fuel oil | 373 | hp | Carbon Monoxide | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 3.5 | G/KW-H | 3.5 |
| IL-0129 | 07/30/2018  ACT | Firewater Pump Engine | 17.21 | Ultra-low sulfur diesel | 0 | | Carbon Monoxide | | 0 | | 3.5 |

## BACT Determinations for Small Internal Combustion Engine (< 500 HP) - CO (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IL-0130 | 12/31/2018  ACT | Firewater Pump Engine | 17.21 | Ultra-Low Sulfur Diesel | 420 | horsepower | Carbon Monoxide | | 3.5 | G/KW-HR | 3.5 |
| IN-0158 | 12/03/2012  ACT | TWO (2) FIREWATER PUMP DIESEL ENGINES | 17.21 | DIESEL | 371 | BHP, EACH | Carbon Monoxide | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 2.6 | G/HP-H | 3.486652 |
| IN-0173 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.6 | G/BHP-H | 3.486652 |
| IN-0173 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.6 | G/BHP-H | 3.486652 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY WATER PUMP | 17.21 | NO. 2 FUEL OIL | 481 | BHP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.6 | G/B-HP-H | 3.486652 |
| IN-0180 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.6 | G/B-HP-H | 3.486652 |
| IN-0180 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.6 | G/B-HP-H | 3.486652 |
| IN-0234 | 12/08/2015  ACT | EMERGENCY FIRE PUMP ENGINE | 17.21 | DISTILLATE OIL | 0 | | Carbon Monoxide | GOOD COMBUSTION PRACTICES | 2.01 | G/HP-H | 2.6954502 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Deisel | 150 | hp | Carbon Monoxide | | 3.08 | G/KW-HR | 3.08 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Diesel | 250 | hp | Carbon Monoxide | | 3.08 | G/HP-HR | 4.1303416 |
| *KS-0036 | 03/18/2013  ACT | Cummins 6BTA 5.9F-1 Diesel Engine Fire Pump | 17.21 | No. 2 Fuel Oil | 182 | BHP | Carbon Monoxide | utilize efficient combustion/design technology | 0.53 | LB/HR | 1.7713452 |
| KY-0110 | 07/23/2020  ACT | EP 11-01 - Melt Shop Emergency Generator | 17.21 | Diesel | 260 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | 3.5000622 |
| KY-0110 | 07/23/2020  ACT | EP 11-02 - Reheat Furnace Emergency Generator | 17.21 | Diesel | 190 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | 3.5000622 |
| KY-0110 | 07/23/2020  ACT | EP 11-03 - Rolling Mill Emergency Generator | 17.21 | Diesel | 440 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | 3.5000622 |
| KY-0110 | 07/23/2020  ACT | EP 11-04 - IT Emergency Generator | 17.21 | Diesel | 190 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.61 | G/HP-HR | 3.5000622 |
| KY-0110 | 07/23/2020  ACT | EP 11-05 - Radio Tower Emergency Generator | 17.21 | Diesel | 61 | HP | Carbon Monoxide | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 3.73 | G/HP-HR | 5.0020046 |
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Emergency Generator (EP 09-05) | 17.21 | Diesel | 350 | HP | Carbon Monoxide | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | 3.486652 |
| LA-0251 | 04/26/2011  ACT | Small Generator Engine | 17.21 | diesel | 193 | hp | Carbon Monoxide | | 0.16 | LB/H | 3.5 |
| LA-0251 | 04/26/2011  ACT | Fire Pump Engines - 2 units | 17.21 | diesel | 444 | hp | Carbon Monoxide | good equipment design and proper combustion practices | 0.65 | LB/H | 0.8904901 |
| LA-0254 | 08/16/2011  ACT | EMERGENCY FIRE PUMP | 17.21 | DIESEL | 350 | HP | Carbon Monoxide | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 2.6 | G/HP-H | 3.486652 |
| LA-0301 | 05/23/2014  ACT | Firewater Pump Nos. 1-3 (EQTs 997, 998, & 999) | 17.21 | Diesel | 500 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII and operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage | 2.87 | LB/HR | 3.486652 |
| *LA-0306 | 12/20/2016  ACT | Genenerator Engine DEG-16-1 (EQT035) | 17.21 | Diesel | 460 | horsepower | Carbon Monoxide | Meet NSPS Subpart IIII Limitations and Good Combustion Practices | 3.18 | LB/H | 3.5 |
| *LA-0306 | 12/20/2016  ACT | Pump Engines DFP-16-1 (EQT036) | 17.21 | Diesel | 225 | horsepower | Carbon Monoxide | Meet NSPS Subpart IIII Limitations and Good Combustion Practices | 1.55 | LB/H | 2.6 |
| *LA-0306 | 12/20/2016  ACT | Pump Engine DFP-16-2 (EQT037) | 17.21 | Diesel | 225 | horsepower | Carbon Monoxide | Meet NSPS Subpart IIII Limitations and Good Combustion Practices | 1.55 | LB/H | 2.6 |
| LA-0309 | 06/04/2015  ACT | Firewater Pump Engines | 17.21 | Diesel | 288 | hp (each) | Carbon Monoxide | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Firewater Pump 1 | 17.21 | Diesel | 282 | HP | Carbon Monoxide | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel). | 1.62 | LB/H | 3.486652 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0314 | 08/03/2016  ACT | Diesel Firewater pump engines (6 units) | 17.21 | diesel | 425 | hp | Carbon Monoxide | complying with 40 CFR 63 subpart ZZZZ | 0 | | |
| LA-0314 | 08/03/2016  ACT | Diesel emergency generator engine - EGEN | 17.21 | diesel | 350 | hp | Carbon Monoxide | complying with 40 CFR 63 subpart ZZZZ | 0 | | |
| LA-0316 | 02/17/2017  ACT | firewater pump engines (8 units) | 17.21 | diesel | 460 | hp | Carbon Monoxide | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0323 | 01/09/2017  ACT | Standby Generator No. 9 Engine | 17.21 | Diesel Fuel | 400 | hp | Carbon Monoxide | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39A | 17.21 | Diesel Fuel | 375 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII | 3.5 | | 3.5 |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39B | 17.21 | Diesel Fuel | 300 | HP | Carbon Monoxide | Compliance with 40 CFR 60 Subpart IIII | 3.5 | | 3.5 |
| LA-0345 | 06/13/2019  ACT | IC engines (14 units) | 17.21 | Diesel | 0 | | Carbon Monoxide | Comply with requirements of 40 CFR 60 Subpart IIII | 0 | | |
| LA-0349 | 07/10/2018  ACT | IC Engines (18) | 17.21 | diesel | 0 | | Carbon Monoxide | Comply with 40 CFR 60 Subpart IIII and Good Combustion Practices | 0 | | |
| *LA-0370 | 04/27/2020  ACT | Emergency Fire Pump Engine (EQT0021, ENG-1) | 17.21 | Diesel | 1.1 | MM BTU/hr | Carbon Monoxide | The use of low sulfur fuels and compliance with 40 CFR 60 Subpart IIII | 0.4 | LB/HR | |
| MA-0039 | 01/30/2014  ACT | Fire Pump Engine | 17.21 | ULSD | 2.7 | MMBTU/H | Carbon Monoxide | | 2.6 | GM/BHP-H | 3.486652 |
| MD-0041 | 04/23/2014  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Carbon Monoxide | USE OF ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 2.6 | G/HP-H | 3.486652 |
| MD-0041 | 04/23/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Carbon Monoxide | USE OF ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 2.6 | G/HP-H | 3.486652 |
| MD-0042 | 04/08/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA LOW SULFUR DIESEL | 477 | HP | Carbon Monoxide | USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES AND HOURS OF OPERATION LIMITED TO 100 HOURS PER YEAR | 2.6 | G/HP-H | 3.49 |
| MD-0044 | 06/09/2014  ACT | 5 EMERGENCY FIRE WATER PUMP ENGINES | 17.21 | ULTRA LOW SULFUR DIESEL | 350 | HP | Carbon Monoxide | GOOD COMBUSTION PRACTICES AND DESIGNED TO MEET EMISSION LIMIT | 3 | G/HP-H | 4 |
| MD-0045 | 11/13/2015  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1490 | HP | Carbon Monoxide | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 3.5 | G/KW-H | 3.5 |
| MD-0045 | 11/13/2015  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 305 | HP | Carbon Monoxide | USE OF ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 3.5 | G/KW-H | 3.5 |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED AUXILIARY (EMERGENCY) ENGINES (TWO) | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Carbon Monoxide | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 3.5 | G/KW-H | 3.5 |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED FIRE PUMP ENGINE | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Carbon Monoxide | EXCLUSIVE USE OF ULTRA LOW SULFUR DIESEL FUEL AND GOOD COMBUSTION PRACTICES | 3.5 | G/KW-H | 3.5 |
| MI-0410 | 07/25/2013  ACT | EU-FPENGINE: Diesel fuel fired emergency backup fire pump | 17.21 | diesel fuel | 315 | hp nameplate | Carbon Monoxide | Proper combustion design and ultra low sulfur diesel fuel. | 2.6 | G/HP-H | 3.486652 |
| MI-0412 | 12/04/2013  ACT | Emergency Engine -- Diesel Fire Pump (EUFPENGINE) | 17.21 | Diesel | 165 | HP | Carbon Monoxide | Good combustion practices | 3.7 | G/HP-H | 4.961774 |
| MI-0423 | 01/04/2017  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | Diesel | 1.66 | MMBTU/H | Carbon Monoxide | Good combustion practices and meeting NSPS Subpart IIII requirements. | 2.6 | G/BHP-H | 3.486652 |
| MI-0424 | 12/05/2016  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | diesel | 500 | H/YR | Carbon Monoxide | Good combustion practices. | 3.7 | G/HP-H | 4.961774 |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (South Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Carbon Monoxide | Good combustion practices and meeting NSPS Subpart IIII requirements. | 2.6 | G/BPH-H | 3.486652 |

## BACT Determinations for Small Internal Combustion Engine (< 500 HP) - CO (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (North Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Carbon Monoxide | Good combustion practices and meeting NSPS Subpart IIII requirements. | 2.6 | G/BHP-H | 3.486652 |
| MI-0435 | 07/16/2018  ACT | EUFPENGINE: Fire pump engine | 17.21 | Diesel | 399 | BHP | Carbon Monoxide | State of the art combustion design. | 3.5 | G/KW-H | 3.5 |
| MI-0441 | 12/21/2018  ACT | EUFPRICE--A 315 HP diesel fueled emergency engine | 17.21 | Diesel | 2.5 | MMBTU/H | Carbon Monoxide | Good combustion practices. | 2.6 | G/HP-H | 3.486652 |
| *MI-0445 | 11/26/2019  ACT | EUFPENGINE (Emergency engine-diesel fire pump | 17.21 | diesel fuel | 1.66 | MMBTU/H | Carbon Monoxide | Good Combustion Practices and meeting NSPS Subpart IIII requirements | 2.6 | G/BHP-H | 3.486652 |
| MI-0447 | 01/07/2021  ACT | EUFPRICE--A 315 HP diesel fueled emergency engine | 17.21 | Diesel | 2.5 | MMBTU/H | Carbon Monoxide | Good combustion practices | 2.6 | G/HP-H | 3.486652 |
| MS-0092 | 05/08/2014  ACT | firewater pumps, diesel | 17.21 | diesel | 325 | HP, EACH | Carbon Monoxide | | 0 | | |
| NJ-0081 | 03/07/2014  ACT | Emergency diesel fire pump | 17.21 | Ultra Low Sulfur Distillate oil | 0 | | Carbon Monoxide | | 0.079 | LB/H | 3.486652 |
| NJ-0084 | 03/10/2016  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD | 100 | H/YR | Carbon Monoxide | use of ULSD a clean burning fuel, and limited hours of operation | 1.1 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY GENERATOR DIESEL | 17.21 | DIESEL OIL | 0 | 100 H/YR | Carbon Monoxide | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation (<= 100 H/YR) | 11.6 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY DIESEL FIRE PUMP | 17.21 | ULSD | 100 | H/YR | Carbon Monoxide | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 1.87 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Emergency fire pump | 17.21 | ultra low sulfur diesel | 460 | hp | Carbon Monoxide | Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations. | 0.53 | G/BHP-H | 0.7107406 |
| NY-0104 | 08/01/2013  ACT | Fire pump | 17.21 | ultra low sulfur diesel | 0 | | Carbon Monoxide | Good combustion practice. | 0.75 | LB/MMBTU | |
| OH-0352 | 06/18/2013  ACT | Emergency fire pump engine | 17.21 | diesel | 300 | HP | Carbon Monoxide | Purchased certified to the standards in NSPS Subpart IIII | 1.7 | LB/H | 3.5 |
| OH-0360 | 11/05/2013  ACT | Emergency fire pump engine (P004) | 17.21 | diesel | 400 | HP | Carbon Monoxide | Purchased certified to the standards in NSPS Subpart IIII | 2.3 | LB/H | 3.486652 |
| OH-0363 | 11/05/2014  ACT | Emergency Fire Pump Engine (P003) | 17.21 | Diesel fuel | 260 | HP | Carbon Monoxide | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 0.69 | LB/H | 1.609224 |
| OH-0366 | 08/25/2015  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 140 | HP | Carbon Monoxide | State-of-the-art combustion design | 1.15 | LB/H | 5 |
| OH-0367 | 09/23/2016  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 311 | HP | Carbon Monoxide | State-of-the-art combustion design | 1.79 | LB/H | 3.5 |
| OH-0368 | 04/19/2017  ACT | Emergency Fire Pump Diesel Engine (P008) | 17.21 | Diesel fuel | 460 | HP | Carbon Monoxide | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 2.6 | LB/H | 3.486652 |
| OH-0370 | 09/07/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Carbon Monoxide | State-of-the-art combustion design | 1.73 | LB/H | 3.5 |
| OH-0372 | 09/27/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Carbon Monoxide | state of the art combustion design | 1.73 | LB/H | 3.486652 |
| OH-0374 | 10/23/2017  ACT | Emergency Fire Pump (P006) | 17.21 | Diesel fuel | 410 | HP | Carbon Monoxide | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII. Good combustion practices per the manufacturerâ€™s operating manual. | 2.36 | LB/H | 3.486652 |
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fueled fire pump (P006) | 17.21 | Diesel fuel | 250 | HP | Carbon Monoxide | Comply with NSPS 40 CFR 60 Subpart IIII | 1.4 | LB/H | 3.486652 |
| OH-0377 | 04/19/2018  ACT | Emergency Fire Pump (P004) | 17.21 | Diesel fuel | 320 | HP | Carbon Monoxide | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 1.83 | LB/H | 3.486652 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0378 | 12/21/2018  ACT | Firewater Pumps (P005 and P006) | 17.21 | Diesel fuel | 402 | HP | Carbon Monoxide | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII and employ good combustion practices per the manufacturerâ€™s operating manual | 2.31 | LB/H | 3.486652 |
| PA-0278 | 10/10/2012  ACT | Fire Pump | 17.21 | Diesel | 0 | | Carbon Monoxide | | 0.5 | G/B-HP-H | 0.67051 |
| PA-0286 | 01/31/2013  ACT | Fire Pump Engine - 460 BHP | 17.21 | Diesel | 0 | | Carbon Monoxide | | 0.5 | G/HP-H | 0.67051 |
| PA-0291 | 04/23/2013  ACT | EMERGENCY FIREWATER PUMP | 17.21 | ULTRA LOW SULFUR DISTILLATE | 3.25 | MMBTU/H | Carbon Monoxide | | 2.58 | LB/H | |
| PA-0296 | 12/17/2013  ACT | Emergency Firewater Pump | 17.21 | Diesel | 16 | Gal/hr | Carbon Monoxide | | 0.09 | T/YR | |
| PA-0309 | 12/23/2015  ACT | Fire pump engine | 17.21 | Ultra-low sulfur diesel | 15 | gal/hr | Carbon Monoxide | | 0.5 | GM/HP-HR | 0.67051 |
| PA-0310 | 09/02/2016  ACT | Emergency Fire Pump Engine | 17.21 | ULSD | 0 | | Carbon Monoxide | | 2.61 | G/BHP-HR | 3.5000622 |
| *PA-0326 | 02/18/2021  ACT | Emergency Generator Parking Garage | 17.21 | Diesel | 0 | | Carbon Monoxide | The use of certified engines, design of engines to include turbocharger and an intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards | 0.5 | G | 0.67051 |
| *PA-0326 | 02/18/2021  ACT | Emergency GeneratorTelecom Hut & Tower | 17.21 | diesel | 0 | | Carbon Monoxide | The use of certified engines, design of engines to include turbocharger and an intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards | 0.5 | G | 0.67051 |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD Fuel Oil #2 | 0 | | Carbon Monoxide | | 2.6 | G/B-HP-H | 3.486652 |
| SC-0113 | 02/08/2012  ACT | EMERGENCY ENGINE 1 THRU 8 | 17.21 | DIESEL | 29 | HP | Carbon Monoxide | PURCHASE OF CERTIFIED ENGINE. HOURS OF OPERATION LIMITED TO 100 HOURS FOR MAINTENANCE AND TESTING. | 5.5 | GR/KW-H | 5.5 |
| SC-0113 | 02/08/2012  ACT | FIRE PUMP | 17.21 | DIESEL | 500 | HP | Carbon Monoxide | ENGINES CERTIFIED TO MEET NSPS, SUBPART IIII. HOURS OF OPERATION LIMITED TO 100 HOURS PER YEAR FOR MAINTENANCE AND TESTING. | 3.5 | GR/KW-H | 3.5 |
| SC-0182 | 10/31/2017  ACT | Emergency Fire Pumps | 17.21 | | 0 | | Carbon Monoxide | Use of Ultra Low Sulfur Diesel Fuel (15 ppm), good combustion, operation, and maintenance practices; compliance with NESHAP Subpart ZZZZ | 200 | OPERATING HR/YR | |
| TX-0799 | 06/08/2016  ACT | EMERGENCY ENGINES | 17.21 | diesel | 0 | | Carbon Monoxide | Equipment specifications and good combustion practices. Operation limited to 100 hours per year. | 0.0068 | LB/HP-HR | 4.1362582 |
| TX-0846 | 09/23/2018  ACT | FIRE PUMP DIESEL ENGINE | 17.21 | NO 2 DIESEL | 214 | kW | Carbon Monoxide | Meets EPA Tier 4 requirements | 3.58 | G/KW | 3.58 |
| TX-0864 | 09/09/2019  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Carbon Monoxide | Tier 4 exhaust emission standards specified at 40 CFR Â§ 1039.101(b) | 0 | | |
| TX-0889 | 08/08/2020  ACT | Emergency Generator Engines | 17.21 | Ultra-low sulfur diesel | 0 | | Carbon Monoxide | Good combustion practices and limited hours of operation | 100 | HR/YR | |
| *TX-0908 | 08/27/2021  ACT | Emergency Engine | 17.21 | natural gas | 74 | KW | Carbon Monoxide | Meet the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low diesel fuel. Limited to 100 hrs/yr of non-emergency operation. | 0 | | |
| VA-0321 | 03/12/2013  ACT | Diesel Fire water pump 376 bhp | 17.21 | diesel | 500 | h/yr | Carbon Monoxide | good combustion practices | 0.9 | G/KW-HR | 0.9 |
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED WATER PUMP 376 bph (1) | 17.21 | DIESEL FUEL | 0 | | Carbon Monoxide | Good Combustion Practices/Maintenance | 2.6 | G/HP-H | 3.486652 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - CO (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VA-0328 | 04/26/2018  ACT | Emergency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Carbon Monoxide | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 2.6 | G/HP HR | 3.486652 |
| VA-0332 | 06/24/2019  ACT | Emegency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Carbon Monoxide | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 2.6 | G/HP-H | 3.486652 |
| WI-0263 | 02/15/2016  ACT | Fire pump (process P05) | 17.21 | Diesel | 1.27 | mmBtu/hr | Carbon Monoxide | Good combustion practices, use diesel fuel, and operate <500 hr/yr | 0 | | |
| *WI-0291 | 01/28/2019  ACT | P04 Emergency Diesel Generator | 17.21 | Diesel Fuel | 0.22 | mmBTU/hr | Carbon Monoxide | Good Combustion Practices | 5 | G/KWH | 5 |
| WV-0025 | 11/21/2014  ACT | Fire Pump Engine | 17.21 | Diesel | 251 | HP | Carbon Monoxide | | 1.44 | LB/H | 3.4896952 |
| WY-0070 | 08/28/2012  ACT | Diesel Fire Pump Engine (EP16) | 17.21 | Ultra Low Sulfur Diesel | 327 | hp | Carbon Monoxide | EPA Tier 3 rated | 0 | | |
| WY-0071 | 10/15/2012  ACT | Emergency Air Compressor | 17.21 | Ultra Low Sulfur Diesel | 400 | hp | Carbon Monoxide | EPA Tier 3 Rated Diesel Engine | 0 | | |

## BACT Determinations for Small Internal Combustion Engine (< 500 HP) - NOx (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Airstrip Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 490 | hp | Nitrogen Oxides (NOx) | | 4.8 | GRAMS/HP-H | 6.4 |
| AK-0082 | 01/23/2015  ACT | Agitator Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 98 | hp | Nitrogen Oxides (NOx) | | 5.6 | GRAMS/HP-H | 7.5 |
| AK-0082 | 01/23/2015  ACT | Incinerator Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 102 | hp | Nitrogen Dioxide (NO2) | | 4.9 | GRAMS/HP-H | 6.6 |
| AK-0083 | 01/06/2015  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBTU/H | Nitrogen Oxides (NOx) | Limited Operation of 168 hr/yr. | 4.41 | LB/MMBTU | |
| AK-0084 | 06/30/2017  ACT | Fire Pump Diesel Internal Combustion Engines | 17.21 | Diesel | 252 | hp | Nitrogen Oxides (NOx) | Good Combustion Practices | 3.7 | G/KW-HR | 3.7 |
| *AK-0085 | 08/13/2020  ACT | Three (3) Firewater Pump Engines and two (2) Emergency Diesel Generators | 17.21 | ULSD | 19.4 | gph | Nitrogen Oxides (NOx) | Good combustion practices, limit operation to 500 hours per year per engine | 3.6 | G/HP-HR | 4.8 |
| *AK-0086 | 03/26/2021  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBtu/hr | Nitrogen Oxides (NOx) | Good Combustion Practices and Limited Use | 4.41 | LB/MMBTU | |
| AR-0168 | 03/17/2021  ACT | Emergency Engines | 17.21 | Diesel | 0 | | Nitrogen Oxides (NOx) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 4.86 | G/KW-HR | 4.9 |
| AR-0171 | 02/14/2019  ACT | SN-106 Cold Mill 1 Diesel Fired Emergency Generator | 17.21 | Diesel | 1073 | bhp | Nitrogen Oxides (NOx) | Good operating practices. | 2 | G/KW-HR | 2.0 |
| CA-1192 | 06/21/2011  ACT | EMERGENCY FIREWATER PUMP ENGINE | 17.21 | DIESEL | 288 | HP | Nitrogen Oxides (NOx) | EQUIPPED W/ A TURBOCHARGER AND AN INTERCOOLER/AFTERCOOLER | 3.4 | G/HP-H | 4.6 |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.21 | DIESEL | 182 | HP | Nitrogen Oxides (NOx) | | 4 | G/KW-H | 4.0 |
| CA-1217 | 08/23/2012  ACT | Internal Combustion Engine - 450 bhp | 17.21 | diesel | 450 | bhp | Nitrogen Oxides (NOx) | | 1.8 | G/KW-H | 1.8 |
| FL-0338 | 05/30/2012  ACT | Wireline Unit Engines - C.R. Luigs | 17.21 | diesel | 300 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 8.92 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Fast Rescue Craft Diesel Engine - Development Driller 1 | 17.21 | Diesel | 142 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, and turbocharger | 0 | | |
| FL-0338 | 05/30/2012  ACT | Life Boat Diesel Engines - Development Driller 1 | 17.21 | Diesel | 110 | hp | Nitrogen Dioxide (NO2) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines and use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Port and Stb Fwd and Aft Crane Diesel Engines - C.R. Luigs | 17.21 | diesel | 305 | HP | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 82.83 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Seismic Operations Diesel Engines - Development Driller 1 | 17.21 | Diesel | 415 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, and turbocharger | 3.54 | TONS | |
| FL-0338 | 05/30/2012  ACT | Life Boat Diesel Engines - C.R. Luigs | 17.21 | diesel | 39 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel | 0 | | |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - NOx (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - Development Driller 1 | 17.21 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler | 9.5 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Wireline Unit Diesel Engines - Development Driller 1 | 17.21 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 8.92 | TONS | |
| FL-0338 | 05/30/2012  ACT | Black Start Air Compressor - C.R. Luigs | 17.21 | diesel | 6 | hp | Nitrogen Dioxide (NO2) | Use of good combustion practices based on the current manufacturerâ€™s specifications for the engine and the use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - C.R. Luigs | 17.21 | diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler | 8.69 | T/12MO ROLLING TOTAL | |
| FL-0347 | 09/16/2014  ACT | Diesel Powered Forklift Engine | 17.21 | Diesel | 30 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine | 0 | | |
| FL-0347 | 09/16/2014  ACT | Wireline Diesel Engines | 17.21 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0347 | 09/16/2014  ACT | Water Blasting Diesel Engine | 17.21 | Diesel | 208 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0347 | 09/16/2014  ACT | Well Evaluation Diesel Engine | 17.21 | Diesel | 140 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine | 0 | | |
| FL-0347 | 09/16/2014  ACT | Fast Rescue Craft Diesel Engine | 17.21 | Diesel | 230 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0347 | 09/16/2014  ACT | Escape Capsule Diesel Engine | 17.21 | Diesel | 39 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine | 0 | | |
| FL-0347 | 09/16/2014  ACT | Remotely Operated Vehicle Emergency Generator | 17.21 | Diesel | 427 | hp | Nitrogen Oxides (NOx) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0348 | 05/15/2012  ACT | Main Propulsion Generators | 17.21 | Diesel | 4425 | hp | Nitrogen Oxides (NOx) | Use of engine with turbo charger with after cooler, an enhanced work practice power management, NOx emissions maintenance system, and good combustion and maintenance practices based on the current manufacturerâ€™s specifications for each engine | 26 | G/KW-H | 26.0 |
| FL-0354 | 08/25/2015  ACT | Emergency fire pump engine, 300 HP | 17.21 | Diesel | 29 | MMBTU/H | Nitrogen Oxides (NOx) | Low-emitting fuel and certified engine | 4 | G / KWH | 4.0 |

## BACT Determinations for Small Internal Combustion Engine (< 500 HP) - NOx (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *FL-0367 | 07/27/2018  ACT | Emergency Fire Pump Engine (347 HP) | 17.21 | ULSD | 8700 | gal/year | Nitrogen Oxides (NOx) | Operate and maintain the engine according to the manufacturer's written instructions | 4 | G/KW-HR | 4.0 |
| IA-0105 | 10/26/2012  ACT | Fire Pump | 17.21 | diesel fuel | 14 | GAL/H | Nitrogen Oxides (NOx) | good combustion practices | 3.75 | G/KW-H | 3.8 |
| IL-0114 | 09/05/2014  ACT | Firewater Pump Engine | 17.21 | distillate fuel oil | 373 | hp | Nitrogen Oxides (NOx) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 3.5 | G/KW-H | 3.5 |
| IL-0129 | 07/30/2018  ACT | Firewater Pump Engine | 17.21 | Ultra-low sulfur diesel | 0 | | Nitrogen Oxides (NOx) | | 0 | | |
| IL-0130 | 12/31/2018  ACT | Firewater Pump Engine | 17.21 | Ultra-Low Sulfur Diesel | 420 | horsepower | Nitrogen Oxides (NOx) | | 4 | G/KW-HR | 4.0 |
| IN-0158 | 12/03/2012  ACT | TWO (2) FIREWATER PUMP DIESEL ENGINES | 17.21 | DIESEL | 371 | BHP, EACH | Nitrogen Oxides (NOx) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 3 | G/HP-H | 4.0 |
| IN-0173 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 2.83 | G/BHP-H | 3.8 |
| IN-0173 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 2.83 | G/BHP-H | 3.8 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY WATER PUMP | 17.21 | NO. 2 FUEL OIL | 481 | BHP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 2.86 | G/B-HP-H | 3.8 |
| IN-0180 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 2.83 | G/B-HP-H | 3.8 |
| IN-0180 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 2.83 | G/B-HP-H | 3.8 |
| IN-0234 | 12/08/2015  ACT | EMERGENCY FIRE PUMP ENGINE | 17.21 | DISTILLATE OIL | 0 | | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES | 9.5 | G/HP-H | 12.7 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Deisel | 150 | hp | Nitrogen Oxides (NOx) | | 14.06 | G/HP-HR | 18.9 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Diesel | 250 | hp | Nitrogen Oxides (NOx) | | 9.2 | G/KW-HR | 9.2 |
| *KS-0030 | 03/31/2016  ACT | Compression ignition RICE emergency fire pump | 17.21 | Ultra-lowsulfur diesel (ULSD) | 197 | HP | Nitrogen Oxides (NOx) | | 3 | G/HP-HR | 4.0 |
| *KS-0036 | 03/18/2013  ACT | Cummins 6BTA 5.9F-1 Diesel Engine Fire Pump | 17.21 | No. 2 Fuel Oil | 182 | BHP | Nitrogen Oxides (NOx) | utilize efficient combustion/design technology | 2 | LB/HR | 6.7 |
| KY-0110 | 07/23/2020  ACT | EP 11-01 - Melt Shop Emergency Generator | 17.21 | Diesel | 260 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.98 | G/HP-HR | 4.0 |
| KY-0110 | 07/23/2020  ACT | EP 11-02 - Reheat Furnace Emergency Generator | 17.21 | Diesel | 190 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.98 | G/HP-HR | 4.0 |
| KY-0110 | 07/23/2020  ACT | EP 11-03 - Rolling Mill Emergency Generator | 17.21 | Diesel | 440 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.98 | G/HP-HR | 4.0 |
| KY-0110 | 07/23/2020  ACT | EP 11-04 - IT Emergency Generator | 17.21 | Diesel | 190 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 2.98 | G/HP-HR | 4.0 |
| KY-0110 | 07/23/2020  ACT | EP 11-05 - Radio Tower Emergency Generator | 17.21 | Diesel | 61 | HP | Nitrogen Oxides (NOx) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 3.5 | G/HP-HR | 4.7 |
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Emergency Generator (EP 09-05) | 17.21 | Diesel | 350 | HP | Nitrogen Oxides (NOx) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0 | | 4.0 |
| LA-0251 | 04/26/2011  ACT | Small Generator Engine | 17.21 | diesel | 193 | hp | Nitrogen Oxides (NOx) | | 1.28 | LB/H | 4.0 |
| LA-0251 | 04/26/2011  ACT | Fire Pump Engines - 2 units | 17.21 | diesel | 444 | hp | Nitrogen Oxides (NOx) | | 5.82 | LB/H | 4.0 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - NOx (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0301 | 05/23/2014  ACT | Firewater Pump Nos. 1-3 (EQTs 997, 998, & 999) | 17.21 | Diesel | 500 | HP | Nitrogen Oxides (NOx) | Compliance with 40 CFR 60 Subpart IIII and operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage | 3.21 | LB/HR | 4.0 |
| LA-0308 | 09/26/2013  ACT | 380 HP Diesel Fired Pump Engine | 17.21 | Diesel | 2.3 | MMBTU/hr | Nitrogen Oxides (NOx) | Good combustion and maintenance practices, and compliance with NSPS 40 CFR 60 Subpart IIII | 2.92 | LB/H | 3.0 |
| LA-0309 | 06/04/2015  ACT | Firewater Pump Engines | 17.21 | Diesel | 288 | hp (each) | Nitrogen Oxides (NOx) | Complying with 40 CFR 60 Subpart IIII | 3 | G/BHP-HR | 4.0 |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Firewater Pump 1 | 17.21 | Diesel | 282 | HP | Nitrogen Oxides (NOx) | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of ultra-low sulfur diesel fuel). | 1.87 | LB/H | 4.0 |
| LA-0314 | 08/03/2016  ACT | Diesel Firewater pump engines (6 units) | 17.21 | diesel | 425 | hp | Nitrogen Oxides (NOx) | complying with 40 CFR 63 subpart ZZZZ | 0 | | |
| LA-0314 | 08/03/2016  ACT | Diesel emergency generator engine - EGEN | 17.21 | diesel | 350 | hp | Nitrogen Oxides (NOx) | complying with 40 CFR 63 subpart ZZZZ | 0 | | |
| LA-0316 | 02/17/2017  ACT | firewater pump engines (8 units) | 17.21 | diesel | 460 | hp | Nitrogen Dioxide (NO2) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0323 | 01/09/2017  ACT | Standby Generator No. 9 Engine | 17.21 | Diesel Fuel | 400 | hp | Nitrogen Oxides (NOx) | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39A | 17.21 | Diesel Fuel | 375 | HP | Nitrogen Oxides (NOx) | Good combustion practices and NSPS IIII | 4 | G/KW-H | 4.0 |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39B | 17.21 | Diesel Fuel | 300 | HP | Nitrogen Oxides (NOx) | Good combustion practices and NSPS Subpart IIII | 4 | G/KW-H | 4.0 |
| LA-0345 | 06/13/2019  ACT | IC engines (14 units) | 17.21 | Diesel | 0 | | Nitrogen Oxides (NOx) | Comply with requirements of 40 CFR 60 Subpart IIII | 0 | | |
| LA-0349 | 07/10/2018  ACT | IC Engines (18) | 17.21 | diesel | 0 | | Nitrogen Oxides (NOx) | Comply with 40 CFR 60 Subpart IIII and Good Combustion Practices | 0 | | |
| *LA-0370 | 04/27/2020  ACT | Emergency Fire Pump Engine (EQT0021, ENG-1) | 17.21 | Diesel | 1.1 | MM BTU/hr | Nitrogen Oxides (NOx) | The use of low sulfur fuels and compliance with 40 CFR 60 Subpart IIII | 1.15 | LB/HR | |
| MA-0039 | 01/30/2014  ACT | Fire Pump Engine | 17.21 | ULSD | 2.7 | MMBTU/H | Nitrogen Oxides (NOx) | | 3 | GM/BHP-H | 4.0 |
| MD-0041 | 04/23/2014  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, AND LIMITING THE HOURS OF OPERATION | 4.8 | G/HP-H | 6.4 |
| MD-0041 | 04/23/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, AND LIMITING THE HOURS OF OPERATION | 3 | G/HP-H | 4.0 |
| MD-0042 | 04/08/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA LOW SULFUR DIESEL | 477 | HP | Nitrogen Oxides (NOx) | LIMITED OPERATING HOURS, USE OF ULTRA- LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 3 | G/HP-H | 4.0 |
| MD-0043 | 07/01/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRAL LOW SULFUR DIESEL | 350 | HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND EXCLUSIVE USE OF ULSD | 3 | G/HP-H | 4.0 |
| MD-0044 | 06/09/2014  ACT | 5 EMERGENCY FIRE WATER PUMP ENGINES | 17.21 | ULTRA LOW SULFUR DIESEL | 350 | HP | Nitrogen Oxides (NOx) | GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION LIMIT | 3 | G/HP-H | 4.0 |
| MD-0045 | 11/13/2015  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1490 | HP | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 6.4 | G/KW-H | 6.4 |
| MD-0045 | 11/13/2015  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 305 | HP | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 4 | G/KW-H | 4.0 |

## BACT Determinations for Small Internal Combustion Engine (< 500 HP) - NOx (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED AUXILIARY (EMERGENCY) ENGINES (TWO) | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 6.4 | G/KW-H | 6.4 |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED FIRE PUMP ENGINE | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Nitrogen Oxides (NOx) | EXCLUSIVE USE OF ULTRA LOW SULFUR DIESEL FUEL AND GOOD COMBUSTION PRACTICES | 4 | G/KW-H | 4.0 |
| MI-0400 | 06/29/2011  ACT | Fire Pump | 17.21 | Diesel | 420 | HP | Nitrogen Oxides (NOx) | | 3 | G/HP-H | 4.0 |
| MI-0410 | 07/25/2013  ACT | EU-FPENGINE: Diesel fuel fired emergency backup fire pump | 17.21 | diesel fuel | 315 | hp nameplate | Nitrogen Oxides (NOx) | Proper combustion design and ultra low sulfur diesel fuel. | 3 | G/HP-H | 4.0 |
| MI-0412 | 12/04/2013  ACT | Emergency Engine -- Diesel Fire Pump (EUFPENGINE) | 17.21 | Diesel | 165 | HP | Nitrogen Oxides (NOx) | Good combustion practices | 3 | G/HP-H | 4.0 |
| MI-0423 | 01/04/2017  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | Diesel | 1.66 | MMBTU/H | Nitrogen Oxides (NOx) | Good combustion practices and meeting NSPS Subpart IIII requirements. | 3 | G/BHP-H | 4.0 |
| MI-0424 | 12/05/2016  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | diesel | 500 | H/YR | Nitrogen Oxides (NOx) | Good combustion practices. | 3 | G/HP-H | 4.0 |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (South Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Nitrogen Oxides (NOx) | Good combustion practices and meeting NSPS Subpart IIII requirements. | 3 | G/BHP-H | 4.0 |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (North Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Nitrogen Oxides (NOx) | Good combustion practices and meeting NSPS Subpart IIII requirements. | 3 | G/BHP-H | 4.0 |
| MI-0434 | 03/22/2018  ACT | EUFIREPUMPENGS (2 emergency fire pump engines) | 17.21 | Diesel | 250 | BHP | Nitrogen Oxides (NOx) | Good combustion practices. | 3 | G/B-HP-H | 4.0 |
| MI-0434 | 03/22/2018  ACT | EULIFESAFETYENG - One diesel-fueled emergency engine/generator | 17.21 | Diesel | 500 | KW | Nitrogen Oxides (NOx) | Good combustion practices. | 4 | G/KW-H | 4.0 |
| MI-0435 | 07/16/2018  ACT | EUFPENGINE: Fire pump engine | 17.21 | Diesel | 399 | BHP | Nitrogen Oxides (NOx) | State of the art combustion design. | 4 | G/KW-H | 4.0 |
| *MI-0445 | 11/26/2019  ACT | EUFPENGINE (Emergency engine-diesel fire pump | 17.21 | diesel fuel | 1.66 | MMBTU/H | Nitrogen Oxides (NOx) | Good Combustion Practices and meeting NSPS Subpart IIII requirements | 3 | G/BHP-H | 4.0 |
| NJ-0081 | 03/07/2014  ACT | Emergency diesel fire pump | 17.21 | Ultra Low Sulfur Distillate oil | 0 | | Nitrogen Oxides (NOx) | | 1.75 | LB/H | 4.0 |
| NJ-0084 | 03/10/2016  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD | 100 | H/YR | Nitrogen Oxides (NOx) | use of ULSD a clean burning fuel, and limited hours of operation | 1.7 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY GENERATOR DIESEL | 17.21 | DIESEL OIL | 0 | 100 H/YR | Nitrogen Oxides (NOx) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 20.6 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY DIESEL FIRE PUMP | 17.21 | ULSD | 100 | H/YR | Nitrogen Oxides (NOx) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 2.05 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Emergency fire pump | 17.21 | ultra low sulfur diesel | 460 | hp | Nitrogen Oxides (NOx) | Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations. | 2.6 | G/BHP-H | 3.5 |
| OH-0352 | 06/18/2013  ACT | Emergency fire pump engine | 17.21 | diesel | 300 | HP | Nitrogen Oxides (NOx) | Purchased certified to the standards in NSPS Subpart IIII | 1.7 | LB/H | 3.5 |
| OH-0360 | 11/05/2013  ACT | Emergency fire pump engine (P004) | 17.21 | diesel | 400 | HP | Nitrogen Oxides (NOx) | Purchased certified to the standards in NSPS Subpart IIII | 2.3 | LB/H | 3.5 |
| OH-0363 | 11/05/2014  ACT | Emergency Fire Pump Engine (P003) | 17.21 | Diesel fuel | 260 | HP | Nitrogen Oxides (NOx) | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 1.72 | LB/H | 4.0 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - NOx (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0366 | 08/25/2015  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 140 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 0.81 | LB/H | 3.5 |
| OH-0367 | 09/23/2016  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 311 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 1.79 | LB/H | 3.5 |
| OH-0368 | 04/19/2017  ACT | Emergency Fire Pump Diesel Engine (P008) | 17.21 | Diesel fuel | 460 | HP | Nitrogen Oxides (NOx) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 0.3 | LB/H | 0.4 |
| OH-0370 | 09/07/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 1.97 | LB/H | 4.0 |
| OH-0372 | 09/27/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Nitrogen Oxides (NOx) | State-of-the-art combustion design | 1.97 | LB/H | 4.0 |
| OH-0374 | 10/23/2017  ACT | Emergency Fire Pump (P006) | 17.21 | Diesel fuel | 410 | HP | Nitrogen Oxides (NOx) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII. Good combustion practices per the manufacturerâ€™s operating manual | 2.7 | LB/H | 4.0 |
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fueled fire pump (P006) | 17.21 | Diesel fuel | 250 | HP | Nitrogen Oxides (NOx) | Comply with NSPS 40 CFR 60 Subpart IIII | 1.6 | LB/H | 4.0 |
| OH-0377 | 04/19/2018  ACT | Emergency Fire Pump (P004) | 17.21 | Diesel fuel | 320 | HP | Nitrogen Oxides (NOx) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 2.12 | LB/H | 4.0 |
| OH-0378 | 12/21/2018  ACT | Firewater Pumps (P005 and P006) | 17.21 | Diesel fuel | 402 | HP | Nitrogen Oxides (NOx) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII and employ good combustion practices per the manufacturerâ€™s operating manual | 2.64 | LB/H | 4.0 |
| OH-0379 | 02/06/2019  ACT | Black Start Generator (P007) | 17.21 | Diesel fuel | 158 | HP | Nitrogen Oxides (NOx) | Tier IV engine<br>Tier IV NSPS standards certified by engine manufacturer. | 0.104 | LB/H | 0.4 |
| PA-0278 | 10/10/2012  ACT | Fire Pump | 17.21 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 2.6 | G/B-HP-H | 3.5 |
| *PA-0282 | 06/01/2012  ACT | 400-KW DIESEL EMERGENCY GENERATOR | 17.21 | #2 Oil | 29.2 | GAL/H | Nitrogen Oxides (NOx) | | 6.9 | G/B-HP-H | 9.3 |
| PA-0286 | 01/31/2013  ACT | Fire Pump Engine - 460 BHP | 17.21 | Diesel | 0 | | Nitrogen Oxides (NOx) | | 2.6 | G/HP-H | 3.5 |
| PA-0291 | 04/23/2013  ACT | EMERGENCY FIREWATER PUMP | 17.21 | ULTRA LOW SULFUR DISTILLATE | 3.25 | MMBTU/H | Nitrogen Oxides (NOx) | | 1.86 | LB/H | |
| PA-0296 | 12/17/2013  ACT | Emergency Firewater Pump | 17.21 | Diesel | 16 | Gal/hr | Nitrogen Oxides (NOx) | | 0.09 | T/YR | |
| PA-0309 | 12/23/2015  ACT | Fire pump engine | 17.21 | Ultra-low sulfur diesel | 15 | gal/hr | Nitrogen Oxides (NOx) | | 3 | GM/HP-HR | 4.0 |
| PA-0310 | 09/02/2016  ACT | Emergency Fire Pump Engine | 17.21 | ULSD | 0 | | Nitrogen Oxides (NOx) | | 3 | G/BHP-HR | 4.0 |
| *PA-0326 | 02/18/2021  ACT | Emergency Generator Parking Garage | 17.21 | Diesel | 0 | | Nitrogen Oxides (NOx) | Use of certified engines, design of engines to include turbocharger and an intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards | 2.37 | GRAM | 3.2 |
| *PA-0326 | 02/18/2021  ACT | Emergency GeneratorTelecom Hut & Tower | 17.21 | diesel | 0 | | Nitrogen Oxides (NOx) | The use of certified engines, design of engines to include turbocharger and an intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards | 2.83 | G | 3.8 |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD Fuel Oil #2 | 0 | | Nitrogen Oxides (NOx) | | 2.85 | G/B-HP-H | 3.8 |
| SC-0113 | 02/08/2012  ACT | EMERGENCY ENGINE 1 THRU 8 | 17.21 | DIESEL | 29 | HP | Nitrogen Oxides (NOx) | PURCHASE OF CERTIFIED ENGINE. | 7.5 | GR/KW-H | 7.5 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - NOx (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SC-0113 | 02/08/2012  ACT | FIRE PUMP | 17.21 | DIESEL | 500 | HP | Nitrogen Oxides (NOx) | PURCHASE OF CERTIFIED ENGINE BASED ON NSPS, SUBPART IIII. | 4 | GR/KW-H | 4.0 |
| SC-0182 | 10/31/2017  ACT | Emergency Fire Pumps | 17.21 | | 0 | | Nitrogen Oxides (NOx) | Use of Ultra Low Sulfur Diesel Fuel (15 ppm), good combustion, operation, and maintenance practices; compliance with NESHAP Subpart ZZZZ | 200 | OPERATING HR/YR | |
| TX-0706 | 01/23/2014  ACT | Emergency Engines | 17.21 | Ultra-low sulfur diesel | 0 | | Nitrogen Oxides (NOx) | | 0.33 | TPY | |
| TX-0846 | 09/23/2018  ACT | FIRE PUMP DIESEL ENGINE | 17.21 | NO 2 DIESEL | 214 | kW | Nitrogen Oxides (NOx) | Meets EPA Tier 4 requirements | 0.4 | G/KW | 0.4 |
| TX-0864 | 09/09/2019  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Nitrogen Oxides (NOx) | Tier 4 exhaust emission standards specified at 40 CFR Â§ 1039.101(b) | 0 | | |
| TX-0886 | 03/31/2020  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Nitrogen Oxides (NOx) | Limited operating hours, good combustion practices meets NSPS IIII Tier 3 engine | 0 | | |
| *TX-0908 | 08/27/2021  ACT | Emergency Engine | 17.21 | natural gas | 74 | KW | Nitrogen Oxides (NOx) | Meet the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low diesel fuel. Limited to 100 hrs/yr of non-emergency operation. | 100 | HR/YR | |
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED WATER PUMP 376 bph (1) | 17.21 | DIESEL FUEL | 0 | | Nitrogen Oxides (NOx) | Good Combustion Practices/Maintenance | 0 | | |
| VA-0328 | 04/26/2018  ACT | Emergency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Nitrogen Oxides (NOx) | Good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 3 | G/HP-HR | 4.0 |
| VA-0332 | 06/24/2019  ACT | Emegency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Nitrogen Oxides (NOx) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 3 | G/HP-HR | 4.0 |
| WI-0263 | 02/15/2016  ACT | Fire pump (process P05) | 17.21 | Diesel | 1.27 | mmBtu/hr | Nitrogen Oxides (NOx) | Good combustion practices, use diesel fuel, and operate <500 hr/yr | 0 | | |
| *WI-0271 | 06/05/2015  ACT | P10K â€“ Diesel Powered Emergency Generator | 17.21 | Distillate Fuel | 0 | | Nitrogen Oxides (NOx) | Expected NOx emission without controls are 0.59 tons/year and 5.9 pounds/hour. Given this low rate of NOx emissions, due to the 200 hour/year operational limitation, the Department believes, based on engineering judgment, that controls are not economically feasible for this unit. Thus, the RICE MACT remains the only control option. | 5.9 | LB/HR | |
| *WI-0291 | 01/28/2019  ACT | P04 Emergency Diesel Generator | 17.21 | Diesel Fuel | 0.22 | mmBTU/hr | Nitrogen Oxides (NOx) | Good Combustion Practices | 4.7 | G/KWH | 4.7 |
| WV-0025 | 11/21/2014  ACT | Fire Pump Engine | 17.21 | Diesel | 251 | HP | Nitrogen Oxides (NOx) | | 0 | | 4.0 |
| WY-0070 | 08/28/2012  ACT | Diesel Fire Pump Engine (EP16) | 17.21 | Ultra Low Sulfur Diesel | 327 | hp | Nitrogen Oxides (NOx) | EPA Tier 3 rated | 0 | | |
| WY-0071 | 10/15/2012  ACT | Emergency Air Compressor | 17.21 | Ultra Low Sulfur Diesel | 400 | hp | Nitrogen Oxides (NOx) | EPA Tier 3 Rated Diesel Engine | 0 | | |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0081 | 06/12/2013  ACT | Combustion | 17.21 | ULSD | 493 | hp | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good combustion and operating practices. | 0.2 | G/KW-H | 0.20 |
| AK-0082 | 01/23/2015  ACT | Airstrip Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 490 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.15 | GRAMS/HP-H | 0.20 |
| AK-0082 | 01/23/2015  ACT | Airstrip Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 490 | hp | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | | 0.15 | GRAMS/HP-H | 0.20 |
| AK-0082 | 01/23/2015  ACT | Agitator Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 98 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.3 | GRAMS/HP-H | 0.40 |
| AK-0082 | 01/23/2015  ACT | Agitator Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 98 | hp | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | | 0.3 | GRAMS/HP-H | 0.40 |
| AK-0082 | 01/23/2015  ACT | Incinerator Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 102 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.22 | GRAMS/HP-H | 0.30 |
| AK-0082 | 01/23/2015  ACT | Incinerator Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 102 | hp | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | | 0.22 | GRAMS/HP-H | 0.30 |
| AK-0083 | 01/06/2015  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Limited Operation of 168 hr/yr. | 0.31 | LB/MMBTU | |
| AK-0083 | 01/06/2015  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBTU/H | Particulate matter, total (TPM) | Limited Operation of 168 hr/yr. | 0.31 | LB/MMBTU | |
| AK-0083 | 01/06/2015  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBTU/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | Limited Operation of 168 hr/yr. | 0.31 | LB/MMBTU | |
| AK-0084 | 06/30/2017  ACT | Fire Pump Diesel Internal Combustion Engines | 17.21 | Diesel | 252 | hp | Particulate matter, total (TPM) | Clean Fuel and Good Combustion Practices | 0.19 | G/KW-HR | 0.19 |
| AK-0084 | 06/30/2017  ACT | Fire Pump Diesel Internal Combustion Engines | 17.21 | Diesel | 252 | hp | Particulate matter, total < 10 Âµ (TPM10) | Clean Fuel and Good Combustion Practices | 0.19 | G/KW-HR | 0.19 |
| AK-0084 | 06/30/2017  ACT | Fire Pump Diesel Internal Combustion Engines | 17.21 | Diesel | 252 | hp | Particulate matter, total < 2.5 Âµ (TPM2.5) | Clean Fuel and Good Combustion Practices | 0.19 | G/KW-HR | 0.19 |
| *AK-0085 | 08/13/2020  ACT | Three (3) Firewater Pump Engines and two (2) Emergency Diesel | 17.21 | ULSD | 19.4 | gph | Particulate matter, total (TPM) | Good combustion practices, ULSD, and limit operation to 500 hours per year per engine | 0.19 | G/HP-HR | 0.25 |
| *AK-0085 | 08/13/2020  ACT | Three (3) Firewater Pump Engines and two (2) Emergency Diesel | 17.21 | ULSD | 19.4 | gph | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices, ULSD, and limit operation to 500 hours per year per engine | 0.19 | G/HP-HR | 0.25 |
| *AK-0085 | 08/13/2020  ACT | Three (3) Firewater Pump Engines and two (2) Emergency Diesel | 17.21 | ULSD | 19.4 | gph | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good combustion practices, ULSD, and limit operation to 500 hours per year per engine | 0.19 | G/HP-HR | 0.25 |
| *AK-0086 | 03/26/2021  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBtu/hr | Particulate matter, total (TPM) | Good Combustion Practices and Limited Use | 0.31 | LB/MMBTU | |
| *AK-0086 | 03/26/2021  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | Good Combustion Practices and Limited Use | 0.31 | LB/MMBTU | |
| *AK-0086 | 03/26/2021  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBtu/hr | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good Combustion Practices and Limited Use | 0.31 | LB/MMBTU | |
| AR-0168 | 03/17/2021  ACT | Emergency Engines | 17.21 | Diesel | 0 | | Particulate matter, total (TPM) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 0.2 | G/KW-HR | 0.20 |

## BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AR-0168 | 03/17/2021  ACT | Emergency Engines | 17.21 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 0.2 | G/KW-HR | 0.20 |
| AR-0168 | 03/17/2021  ACT | Emergency Engines | 17.21 | Diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 0.2 | G/KW-HR | 0.20 |
| AR-0171 | 02/14/2019  ACT | SN-106 Cold Mill 1 Diesel Fired Emergency Generator | 17.21 | Diesel | 1073 | bhp | Particulate matter, filterable (FPM) | Good operating practices. | 0.25 | G/KW-HR | 0.25 |
| AR-0171 | 02/14/2019  ACT | SN-106 Cold Mill 1 Diesel Fired Emergency Generator | 17.21 | Diesel | 1073 | bhp | Particulate matter, total < 10 Âµ (TPM10) | Good operating practices. | 0.2 | G/KW-HR | 0.20 |
| AR-0171 | 02/14/2019  ACT | SN-106 Cold Mill 1 Diesel Fired Emergency Generator | 17.21 | Diesel | 1073 | bhp | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good operating practices. | 0.2 | G/KW-HR | 0.20 |
| CA-1192 | 06/21/2011  ACT | EMERGENCY FIREWATER PUMP ENGINE | 17.21 | DIESEL | 288 | HP | Particulate matter, total (TPM) | USE ULTRA LOW SULFUR FUELNOT TO EXCEED 15 PPMVD FUEL SULFUR, OPERATIONAL LIMIT OF 50 HRS/YR | 0 | | |
| CA-1192 | 06/21/2011  ACT | EMERGENCY FIREWATER PUMP ENGINE | 17.21 | DIESEL | 288 | HP | Particulate matter, total < 10 Âµ (TPM10) | USE ULTRA LOW SULFUR FUEL NOT TO EXCEED 15 PPMVD FUEL SULFUR, OPERATIONAL LIMIT OF 50 HRS/YR | 0 | | |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.21 | DIESEL | 182 | HP | Particulate matter, total (TPM) | USE ULTRA LOW SULFUR FUEL | 0.2 | G/KW-H | 0.20 |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.21 | DIESEL | 182 | HP | Particulate matter, total < 10 Âµ (TPM10) | USE ULTRA LOW SULFUR FUEL | 0.2 | G/KW-H | 0.20 |
| CA-1212 | 10/18/2011  ACT | EMERGENCY IC ENGINE | 17.21 | DIESEL | 182 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | USE ULTRA LOW SULFUR FUEL | 0.2 | G/KW-H | 0.20 |
| FL-0338 | 05/30/2012  ACT | Wireline Unit Engines - C.R. Luigs | 17.21 | diesel | 300 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 0.6 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Fast Rescue Craft Diesel Engine - Development Driller 1 | 17.21 | Diesel | 142 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Life Boat Diesel Engines - Development Driller 1 | 17.21 | Diesel | 110 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines and use of low sulfur diesel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Port and Stb Fwd and Aft Crane Diesel Engines - C.R. Luigs | 17.21 | diesel | 305 | HP | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 5.88 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Port and Stb Fwd and Aft Crane Diesel Engines - C.R. Luigs | 17.21 | diesel | 305 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 5.88 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Port and Stb Fwd and Aft Crane Diesel Engines - C.R. Luigs | 17.21 | diesel | 305 | HP | Particulate matter, total < 10 Âµ (TPM10) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 5.88 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Seismic Operations Diesel Engines - Development Driller 1 | 17.21 | Diesel | 415 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 0.11 | TONS | |
| FL-0338 | 05/30/2012  ACT | Life Boat Diesel Engines - C.R. Luigs | 17.21 | diesel | 39 | hp | Particulate matter, fugitive | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - Development Driller 1 | 17.21 | Diesel | 0 | | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 0.41 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - Development Driller 1 | 17.21 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 0.25 | T/12MO ROLLING TOTAL | |

## BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - Development Driller 1 | 17.21 | Diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 0.25 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Wireline Unit Diesel Engines - Development Driller 1 | 17.21 | Diesel | 0 | | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 0.6 | TONS | |
| FL-0338 | 05/30/2012  ACT | Black Start Air Compressor - C.R. Luigs | 17.21 | diesel | 6 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for the engine and the use of low sulfur | 0 | | |
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - C.R. Luigs | 17.21 | diesel | 0 | | Particulate matter, total (TPM) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 0.38 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - C.R. Luigs | 17.21 | diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 0.23 | TONS | |
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - C.R. Luigs | 17.21 | diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel | 0.22 | TONS | |
| FL-0346 | 04/22/2014  ACT | Emergency fire pump engine (300 HP) | 17.21 | USLD | 29 | MMBTU/H | Particulate matter, total (TPM) | Good combustion practice | 0.2 | GRAM PER HP-HR | 0.27 |
| FL-0347 | 09/16/2014  ACT | Diesel Powered Forklift Engine | 17.21 | Diesel | 30 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine | 0 | | |
| FL-0347 | 09/16/2014  ACT | Wireline Diesel Engines | 17.21 | Diesel | 0 | | Particulate matter, total (TPM) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, | 0 | | |
| FL-0347 | 09/16/2014  ACT | Water Blasting Diesel Engine | 17.21 | Diesel | 208 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, | 0 | | |
| FL-0347 | 09/16/2014  ACT | Well Evaluation Diesel Engine | 17.21 | Diesel | 140 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine | 0 | | |
| FL-0347 | 09/16/2014  ACT | Fast Rescue Craft Diesel Engine | 17.21 | Diesel | 230 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, | 0 | | |
| FL-0347 | 09/16/2014  ACT | Escape Capsule Diesel Engine | 17.21 | Diesel | 39 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine | 0 | | |
| FL-0347 | 09/16/2014  ACT | Remotely Operated Vehicle Emergency Generator | 17.21 | Diesel | 427 | hp | Particulate matter, total (TPM) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, | 0 | | |
| FL-0354 | 08/25/2015  ACT | Emergency fire pump engine, 300 HP | 17.21 | Diesel | 29 | MMBTU/H | Particulate matter, total (TPM) | Low-emitting fuel and certified engine | 0.2 | G / KWH | 0.20 |
| FL-0356 | 03/09/2016  ACT | One 422-hp emergency fire pump engine | 17.21 | ULSD | 0 | | Particulate matter, total (TPM) | Use of clean fuel | 0.2 | G / KW-HR | 0.20 |
| *FL-0363 | 12/04/2017  ACT | Emergency Fire Pump Engine (422 hp) | 17.21 | ULSD | 0 | | Particulate matter, filterable (FPM) | Certified engine | 0.2 | G / KWH | 0.20 |
| *FL-0367 | 07/27/2018  ACT | Emergency Fire Pump Engine (347 HP) | 17.21 | ULSD | 8700 | gal/year | Particulate matter, filterable (FPM) | Operate and maintain the engine according to the manufacturer's written instructions | 0.2 | G/KW-HOUR | 0.20 |
| IA-0105 | 10/26/2012  ACT | Fire Pump | 17.21 | diesel fuel | 14 | GAL/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | good combustion practices | 0.2 | G/KW-H | 0.20 |
| IA-0105 | 10/26/2012  ACT | Fire Pump | 17.21 | diesel fuel | 14 | GAL/H | Particulate matter, total < 10 Âµ (TPM10) | good combustion practices | 0.2 | G/KW-H | 0.20 |

## BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IA-0105 | 10/26/2012  ACT | Fire Pump | 17.21 | diesel fuel | 14 | GAL/H | Particulate matter, total (TPM) | good combustion practices | 0.2 | G/KW-H | 0.20 |
| IL-0114 | 09/05/2014  ACT | Firewater Pump Engine | 17.21 | distillate fuel oil | 373 | hp | Particulate matter, filterable (FPM) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 0.1 | G/KW-H | 0.10 |
| IL-0114 | 09/05/2014  ACT | Firewater Pump Engine | 17.21 | distillate fuel oil | 373 | hp | Particulate matter, total < 10 Âµ (TPM10) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 0.1 | G/KW-H | 0.10 |
| IL-0114 | 09/05/2014  ACT | Firewater Pump Engine | 17.21 | distillate fuel oil | 373 | hp | Particulate matter, total < 2.5 Âµ (TPM2.5) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 0.1 | G/KW-H | 0.10 |
| IL-0129 | 07/30/2018  ACT | Firewater Pump Engine | 17.21 | Ultra-low sulfur diesel | 0 | | Particulate matter, total (TPM) | | 0 | | |
| IL-0130 | 12/31/2018  ACT | Firewater Pump Engine | 17.21 | Ultra-Low Sulfur Diesel | 420 | horsepower | Particulate matter, total (TPM) | | 0.2 | G/KW-HR | 0.20 |
| IN-0158 | 12/03/2012  ACT | TWO (2) FIREWATER PUMP DIESEL ENGINES | 17.21 | DIESEL | 371 | BHP, EACH | Particulate matter, filterable (FPM) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 0.15 | G/HP-H | 0.20 |
| IN-0158 | 12/03/2012  ACT | TWO (2) FIREWATER PUMP DIESEL ENGINES | 17.21 | DIESEL | 371 | BHP, EACH | Particulate matter, filterable < 10 Âµ (FPM10) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 0.15 | G/HP-H | 0.20 |
| IN-0158 | 12/03/2012  ACT | TWO (2) FIREWATER PUMP DIESEL ENGINES | 17.21 | DIESEL | 371 | BHP, EACH | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 0.15 | G/HP-H | 0.20 |
| IN-0173 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Particulate matter, filterable (FPM) | GOOD COMBUSTION PRACTICES | 0.15 | G/BHP-H | 0.20 |
| IN-0173 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES | 0.15 | G/BHP-H | 0.20 |
| IN-0173 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | GOOD COMBUSTION PRACTICES | 0.15 | G/BHP-H | 0.20 |
| IN-0173 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Particulate matter, filterable (FPM) | GOOD COMBUSTION PRACTICES | 0.15 | G/BHP-H | 0.20 |
| IN-0173 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES | 0.15 | G/BHP-H | 0.20 |
| IN-0173 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | GOOD COMBUSTION PRACTICES | 0.15 | G/BHP-H | 0.20 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY WATER PUMP | 17.21 | NO. 2 FUEL OIL | 481 | BHP | Particulate matter, filterable (FPM) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.20 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY WATER PUMP | 17.21 | NO. 2 FUEL OIL | 481 | BHP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.20 |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY WATER PUMP | 17.21 | NO. 2 FUEL OIL | 481 | BHP | Particulate matter, total < 2.5 Âµ (TPM2.5) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.20 |
| IN-0180 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Particulate matter, filterable (FPM) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.20 |
| IN-0180 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.20 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IN-0180 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.20 |
| IN-0180 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Particulate matter, filterable (FPM) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.20 |
| IN-0180 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.20 |
| IN-0180 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | GOOD COMBUSTION PRACTICES | 0.15 | G/B-HP-H | 0.20 |
| IN-0234 | 12/08/2015  ACT | EMERGENCY FIRE PUMP ENGINE | 17.21 | DISTILLATE OIL | 0 | | Particulate matter, filterable (FPM) | GOOD COMBUSTION PRACTICES | 0.16 | G/HP-H | 0.21 |
| IN-0234 | 12/08/2015  ACT | EMERGENCY FIRE PUMP ENGINE | 17.21 | DISTILLATE OIL | 0 | | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES | 0.16 | G/HP-H | 0.21 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Deisel | 150 | hp | Particulate matter, filterable (FPM) | | 1.34 | G/KW-HR | 1.34 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Deisel | 150 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 1.34 | G/KW-HR | 1.34 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Diesel | 250 | hp | Particulate matter, filterable (FPM) | | 0.54 | G/KW-HR | 0.54 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Diesel | 250 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 1.34 | G/KW-HR | 1.34 |
| KS-0029 | 07/14/2015  ACT | Emergency diesel engine | 17.21 | diesel | 750 | KW | Particulate matter, total < 2.5 Âµ (TPM2.5) | Low sulfur fuel oil (<15 ppm sulfur) | 0.15 | G PER BHP-HR | 0.20 |
| KS-0029 | 07/14/2015  ACT | Emergency diesel engine | 17.21 | diesel | 750 | KW | Particulate matter, total < 10 Âµ (TPM10) | Low sulfur fuel oil (<15 ppm sulfur) | 0.15 | G PER BHP-HR | 0.20 |
| KS-0029 | 07/14/2015  ACT | Emergency diesel engine | 17.21 | diesel | 750 | KW | Particulate matter, total (TPM) | Low sulfur fuel oil (<15 ppm sulfur) | 0.15 | G PER BHP-HR | 0.20 |
| *KS-0030 | 03/31/2016  ACT | Compression ignition RICE emergency fire pump | 17.21 | Ultra-lowsulfur diesel (ULSD) | 197 | HP | Particulate matter, total (TPM) | | 0.15 | G/HP-HR | 0.20 |
| *KS-0030 | 03/31/2016  ACT | Compression ignition RICE emergency fire pump | 17.21 | Ultra-lowsulfur diesel (ULSD) | 197 | HP | Particulate matter, total < 10 Âµ (TPM10) | | 0.15 | G/HP-HR | 0.20 |
| *KS-0030 | 03/31/2016  ACT | Compression ignition RICE emergency fire pump | 17.21 | Ultra-lowsulfur diesel (ULSD) | 197 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0.15 | G/HP-HR | 0.20 |
| *KS-0036 | 03/18/2013  ACT | Cummins 6BTA 5.9F-1 Diesel Engine Fire Pump | 17.21 | No. 2 Fuel Oil | 182 | BHP | Particulate matter, total < 10 Âµ (TPM10) | utilize efficient combustion/design technology | 0.25 | G/BHP-H | 0.34 |
| *KS-0036 | 03/18/2013  ACT | Cummins 6BTA 5.9F-1 Diesel Engine Fire Pump | 17.21 | No. 2 Fuel Oil | 182 | BHP | Particulate matter, total (TPM) | utilize efficient combustion/design technology | 0.25 | G/BHP-H | 0.34 |
| KY-0110 | 07/23/2020  ACT | EP 11-01 - Melt Shop Emergency Generator | 17.21 | Diesel | 260 | HP | Particulate matter, filterable (FPM) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.20 |
| KY-0110 | 07/23/2020  ACT | EP 11-01 - Melt Shop Emergency Generator | 17.21 | Diesel | 260 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.20 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| KY-0110 | 07/23/2020  ACT | EP 11-01 - Melt Shop Emergency Generator | 17.21 | Diesel | 260 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.20 |
| KY-0110 | 07/23/2020  ACT | EP 11-02 - Reheat Furnace Emergency Generator | 17.21 | Diesel | 190 | HP | Particulate matter, filterable (FPM) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.20 |
| KY-0110 | 07/23/2020  ACT | EP 11-02 - Reheat Furnace Emergency Generator | 17.21 | Diesel | 190 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.20 |
| KY-0110 | 07/23/2020  ACT | EP 11-02 - Reheat Furnace Emergency Generator | 17.21 | Diesel | 190 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.20 |
| KY-0110 | 07/23/2020  ACT | EP 11-03 - Rolling Mill Emergency Generator | 17.21 | Diesel | 440 | HP | Particulate matter, filterable (FPM) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.20 |
| KY-0110 | 07/23/2020  ACT | EP 11-03 - Rolling Mill Emergency Generator | 17.21 | Diesel | 440 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.20 |
| KY-0110 | 07/23/2020  ACT | EP 11-03 - Rolling Mill Emergency Generator | 17.21 | Diesel | 440 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.20 |
| KY-0110 | 07/23/2020  ACT | EP 11-04 - IT Emergency Generator | 17.21 | Diesel | 190 | HP | Particulate matter, filterable (FPM) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.20 |
| KY-0110 | 07/23/2020  ACT | EP 11-04 - IT Emergency Generator | 17.21 | Diesel | 190 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.20 |
| KY-0110 | 07/23/2020  ACT | EP 11-04 - IT Emergency Generator | 17.21 | Diesel | 190 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.15 | G/HP-HR | 0.20 |
| KY-0110 | 07/23/2020  ACT | EP 11-05 - Radio Tower Emergency Generator | 17.21 | Diesel | 61 | HP | Particulate matter, filterable (FPM) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.3 | G/HP-HR | 0.40 |
| KY-0110 | 07/23/2020  ACT | EP 11-05 - Radio Tower Emergency Generator | 17.21 | Diesel | 61 | HP | Particulate matter, total < 10 Âµ (TPM10) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.3 | G/HP-HR | 0.40 |
| KY-0110 | 07/23/2020  ACT | EP 11-05 - Radio Tower Emergency Generator | 17.21 | Diesel | 61 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0.3 | G/HP-HR | 0.40 |
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Emergency Generator (EP 09-05) | 17.21 | Diesel | 350 | HP | Particulate matter, filterable (FPM) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0.15 | G/HP-HR | 0.20 |
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Emergency Generator (EP 09-05) | 17.21 | Diesel | 350 | HP | Particulate matter, total < 10 Âµ (TPM10) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0.15 | G/HP-HR | 0.20 |
| KY-0115 | 04/19/2021  ACT | Cold Mill Complex Emergency Generator (EP 09-05) | 17.21 | Diesel | 350 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | The permittee must develop a Good Combustion and Operating Practices (GCOP) Plan | 0.15 | G/HP-HR | 0.20 |
| LA-0251 | 04/26/2011  ACT | Small Generator Engine | 17.21 | diesel | 193 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.01 | LB/H | 0.20 |
| LA-0251 | 04/26/2011  ACT | Fire Pump Engines - 2 units | 17.21 | diesel | 444 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.01 | LB/H | 0.20 |
| LA-0254 | 08/16/2011  ACT | EMERGENCY FIRE PUMP | 17.21 | DIESEL | 350 | HP | Particulate matter, total < 10 Âµ (TPM10) | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H | 0.20 |
| LA-0254 | 08/16/2011  ACT | EMERGENCY FIRE PUMP | 17.21 | DIESEL | 350 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H | 0.20 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0301 | 05/23/2014  ACT | Firewater Pump Nos. 1-3 (EQTs 997, 998, & 999) | 17.21 | Diesel | 500 | HP | Particulate matter, total < 10 Âµ (TPM10) | Compliance with 40 CFR 60 Subpart IIII and operating the engine in accordance with the engine manufacturerâ€™s instructions | 0.17 | LB/HR | 0.20 |
| LA-0301 | 05/23/2014  ACT | Firewater Pump Nos. 1-3 (EQTs 997, 998, & 999) | 17.21 | Diesel | 500 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Compliance with 40 CFR 60 Subpart IIII and operating the engine in accordance with the engine manufacturerâ€™s instructions | 0.17 | LB/HR | 0.20 |
| *LA-0306 | 12/20/2016  ACT | Genenerator Engine DEG-16-1 (EQT035) | 17.21 | Diesel | 460 | horsepower | Particulate matter, total < 2.5 Âµ (TPM2.5) | Meet NSPS Subpart IIII Limitations and Good Combustion Practices | 0.18 | LB/H | 0.24 |
| *LA-0306 | 12/20/2016  ACT | Pump Engines DFP-16-1 (EQT036) | 17.21 | Diesel | 225 | horsepower | Particulate matter, total < 2.5 Âµ (TPM2.5) | Meet NSPS Subpart IIII Limitations and Good Combustion Practices | 0.09 | LB/H | 0.24 |
| *LA-0306 | 12/20/2016  ACT | Pump Engine DFP-16-2 (EQT037) | 17.21 | Diesel | 225 | horsepower | Particulate matter, total < 2.5 Âµ (TPM2.5) | Meet NSPS Subpart IIII Limitations and Good Combustion Practices | 0.09 | LB/H | 0.24 |
| LA-0308 | 09/26/2013  ACT | 380 HP Diesel Fired Pump Engine | 17.21 | Diesel | 2.3 | MMBTU/hr | Particulate matter, total < 10 Âµ (TPM10) | Good combustion and maintenance practices, and compliance with NSPS 40 CFR 60 Subpart IIII | 0.15 | LB/H | 0.20 |
| LA-0308 | 09/26/2013  ACT | 380 HP Diesel Fired Pump Engine | 17.21 | Diesel | 2.3 | MMBTU/hr | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | Good combustion and maintenance practices, and compliance with NSPS 40 CFR 60 Subpart IIII | 0.15 | LB/H | 0.20 |
| LA-0309 | 06/04/2015  ACT | Firewater Pump Engines | 17.21 | Diesel | 288 | hp (each) | Particulate matter, total < 10 Âµ (TPM10) | Complying with 40 CFR 60 Subpart IIII | 0.15 | G/BHP-HR | 0.20 |
| LA-0309 | 06/04/2015  ACT | Firewater Pump Engines | 17.21 | Diesel | 288 | hp (each) | Particulate matter, total < 2.5 Âµ (TPM2.5) | Complying with 40 CFR 60 Subpart IIII | 0.15 | G/BHP-HR | 0.20 |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Firewater Pump 1 | 17.21 | Diesel | 282 | HP | Particulate matter, filterable < 10 Âµ (FPM10) | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of | 0.09 | LB/H | 0.20 |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Firewater Pump 1 | 17.21 | Diesel | 282 | HP | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | Compliance with NESHAP 40 CFR 63 Subpart ZZZZ and NSPS 40 CFR 60 Subpart IIII, and good combustion practices (use of | 0.09 | LB/H | 0.19 |
| LA-0314 | 08/03/2016  ACT | Diesel Firewater pump engines (6 units) | 17.21 | diesel | 425 | hp | Particulate matter, total < 10 Âµ (TPM10) | complying with 40 CFR 63 subpart ZZZZ | 0 | | |
| LA-0314 | 08/03/2016  ACT | Diesel Firewater pump engines (6 units) | 17.21 | diesel | 425 | hp | Particulate matter, total < 2.5 Âµ (TPM2.5) | complying with 40 CFR 63 subpart ZZZZ | 0 | | |
| LA-0314 | 08/03/2016  ACT | Diesel emergency generator engine - EGEN | 17.21 | diesel | 350 | hp | Particulate matter, total < 10 Âµ (TPM10) | complying with 40 CFR 63 subpart ZZZZ | 0 | | |
| LA-0314 | 08/03/2016  ACT | Diesel emergency generator engine - EGEN | 17.21 | diesel | 350 | hp | Particulate matter, total < 2.5 Âµ (TPM2.5) | complying with 40 CFR 63 subpart ZZZZ | 0 | | |
| LA-0316 | 02/17/2017  ACT | firewater pump engines (8 units) | 17.21 | diesel | 460 | hp | Particulate matter, total < 10 Âµ (TPM10) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0316 | 02/17/2017  ACT | firewater pump engines (8 units) | 17.21 | diesel | 460 | hp | Particulate matter, total < 2.5 Âµ (TPM2.5) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0323 | 01/09/2017  ACT | Standby Generator No. 9 Engine | 17.21 | Diesel Fuel | 400 | hp | Particulate matter, total < 10 Âµ (TPM10) | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0323 | 01/09/2017  ACT | Standby Generator No. 9 Engine | 17.21 | Diesel Fuel | 400 | hp | Particulate matter, total < 2.5 Âµ (TPM2.5) | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39A | 17.21 | Diesel Fuel | 375 | HP | Particulate matter, total < 10 Âµ (TPM10) | Compliance with 40 CFR 60 Subpart IIII. | 0.2 | | 0.20 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39A | 17.21 | Diesel Fuel | 375 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Compliance with 40 CFR 60 Subpart IIII | 0.2 | | 0.20 |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39B | 17.21 | Diesel Fuel | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | Compliance with 40 CFR 60 Subpart IIII | 0.2 | | 0.20 |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39B | 17.21 | Diesel Fuel | 300 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Compliance with 40 CFR 60 Subpart III | 0.2 | | 0.20 |
| LA-0345 | 06/13/2019  ACT | IC engines (14 units) | 17.21 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Comply with requirements of 40 CFR 60 Subpart IIII | 0 | | |
| LA-0345 | 06/13/2019  ACT | IC engines (14 units) | 17.21 | Diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | Comply with requirements of 40 CFR 60 Subpart IIII | 0 | | |
| LA-0349 | 07/10/2018  ACT | IC Engines (18) | 17.21 | diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Comply with 40 CFR 60 Subpart IIII and Good Combustion Practices | 0 | | |
| LA-0349 | 07/10/2018  ACT | IC Engines (18) | 17.21 | diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | Comply with 40 CFR 60 Subpart IIII and Good Combustion Practices | 0 | | |
| *LA-0370 | 04/27/2020  ACT | Emergency Fire Pump Engine (EQT0021, ENG-1) | 17.21 | Diesel | 1.1 | MM BTU/hr | Particulate matter, total < 2.5 Âµ (TPM2.5) | The use of low sulfur fuels and compliance with 40 CFR 60 Subpart IIII | 0.04 | LB/HR | |
| *LA-0370 | 04/27/2020  ACT | Emergency Fire Pump Engine (EQT0021, ENG-1) | 17.21 | Diesel | 1.1 | MM BTU/hr | Particulate matter, total < 10 Âµ (TPM10) | The use of low sulfur fuels and compliance with 40 CFR 60 Subpart IIII | 0.04 | LB/HR | |
| MA-0039 | 01/30/2014  ACT | Fire Pump Engine | 17.21 | ULSD | 2.7 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | | 0.15 | GM/BHP-H | 0.20 |
| MA-0039 | 01/30/2014  ACT | Fire Pump Engine | 17.21 | ULSD | 2.7 | MMBTU/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0.15 | GM/BHP-H | 0.20 |
| MD-0041 | 04/23/2014  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Particulate matter, filterable (FPM) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H | 0.20 |
| MD-0041 | 04/23/2014  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H | 0.20 |
| MD-0041 | 04/23/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Particulate matter, filterable (FPM) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H | 0.20 |
| MD-0041 | 04/23/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 0.15 | G/HP-H | 0.20 |
| MD-0042 | 04/08/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA LOW SULFUR DIESEL | 477 | HP | Particulate matter, filterable (FPM) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND DESIGNED | 0.15 | G/HP-H | 0.20 |
| MD-0042 | 04/08/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA LOW SULFUR DIESEL | 477 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND DESIGNED | 0.15 | G/HP-H | 0.23 |
| MD-0042 | 04/08/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA LOW SULFUR DIESEL | 477 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND DESIGNED | 0.15 | G/HP-H | 0.23 |
| MD-0043 | 07/01/2014  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRAL LOW SULFUR DIESEL | 350 | HP | Particulate matter, total < 10 Âµ (TPM10) | GOOD COMBUSTION PRACTICES, LIMITED HOURS OF OPERATION, AND EXCLUSIVE USE OF ULSD | 0.17 | G/HP-H | 0.23 |
| MD-0044 | 06/09/2014  ACT | 5 EMERGENCY FIRE WATER PUMP ENGINES | 17.21 | ULTRA LOW SULFUR DIESEL | 350 | HP | Particulate matter, filterable (FPM) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION | 0.15 | G/BHP-H | 0.20 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MD-0044 | 06/09/2014  ACT | 5 EMERGENCY FIRE WATER PUMP ENGINES | 17.21 | ULTRA LOW SULFUR DIESEL | 350 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION | 0.17 | G/BHP-H | 0.23 |
| MD-0044 | 06/09/2014  ACT | 5 EMERGENCY FIRE WATER PUMP ENGINES | 17.21 | ULTRA LOW SULFUR DIESEL | 350 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES AND DESIGNED TO ACHIEVE EMISSION | 0.17 | G/BHP-H | 0.23 |
| MD-0045 | 11/13/2015  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1490 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES. | 0.18 | G/HP-H | 0.24 |
| MD-0045 | 11/13/2015  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1490 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AN DGOOD COMBUSTION PRACTICES | 0.18 | G/HP-H | 0.24 |
| MD-0045 | 11/13/2015  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1490 | HP | Particulate matter, filterable (FPM) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 0.2 | G/KW-H | 0.20 |
| MD-0045 | 11/13/2015  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 305 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES. | 0.18 | G/HP-H | 0.24 |
| MD-0045 | 11/13/2015  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 305 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 0.18 | G/HP-H | 0.24 |
| MD-0045 | 11/13/2015  ACT | EMERGENCY DIESEL ENGINE FOR FIRE WATER PUMP | 17.21 | ULTRA-LOW SULFUR DIESEL | 305 | HP | Particulate matter, filterable (FPM) | EXCLUSIVE USE OF ULTRA LOW SULFUR FUEL AND GOOD COMBUSTION PRACTICES | 0.2 | G/KW-H | 0.20 |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED AUXILIARY (EMERGENCY) ENGINES | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Particulate matter, filterable (FPM) | USE OF ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 0.2 | G/KW-H | 0.20 |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED AUXILIARY (EMERGENCY) ENGINES | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Particulate matter, total < 10 Âµ (TPM10) | USE OF ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES. | 0.18 | G/HP-H | 0.24 |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED FIRE PUMP ENGINE | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Particulate matter, filterable (FPM) | EXCLUSIVE USE OF ULTRA LOW SULFUR DIESEL FUEL AND GOOD COMBUSTION PRACTICES | 0.2 | G/KW-H | 0.20 |
| MD-0046 | 10/31/2014  ACT | DIESEL-FIRED FIRE PUMP ENGINE | 17.21 | ULTRA-LOW SULFUR DIESEL | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | EXCLUSIVE USE OF ULTRA LOW SULFUR DIESEL FUEL AND GOOD COMBUSTION PRACTICES | 0.18 | G/HP-H | 0.24 |
| MI-0400 | 06/29/2011  ACT | Fire Pump | 17.21 | Diesel | 420 | HP | Particulate matter, filterable (FPM) | | 0.15 | G/HP-H | 0.20 |
| MI-0400 | 06/29/2011  ACT | Fire Pump | 17.21 | Diesel | 420 | HP | Particulate matter, total < 10 Âµ (TPM10) | | 0.14 | LB/H | 0.20 |
| MI-0400 | 06/29/2011  ACT | Fire Pump | 17.21 | Diesel | 420 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0.14 | LB/H | 0.20 |
| MI-0410 | 07/25/2013  ACT | EU-FPENGINE: Diesel fuel fired emergency backup fire pump | 17.21 | diesel fuel | 315 | hp nameplate | Particulate matter, filterable (FPM) | Proper combustion design and ultra low sulfur diesel fuel. | 0.15 | G/HP-H | 0.20 |
| MI-0410 | 07/25/2013  ACT | EU-FPENGINE: Diesel fuel fired emergency backup fire pump | 17.21 | diesel fuel | 315 | hp nameplate | Particulate matter, total < 10 Âµ (TPM10) | Proper combustion design and ultra low sulfur diesel fuel | 0.6 | LB/H | 1.16 |
| MI-0410 | 07/25/2013  ACT | EU-FPENGINE: Diesel fuel fired emergency backup fire pump | 17.21 | diesel fuel | 315 | hp nameplate | Particulate matter, total < 2.5 Âµ (TPM2.5) | Proper combustion design and ultra low sulfur diesel fuel. | 0.6 | LB/H | 1.16 |
| MI-0412 | 12/04/2013  ACT | Emergency Engine -- Diesel Fire Pump (EUFPENGINE) | 17.21 | Diesel | 165 | HP | Particulate matter, filterable (FPM) | Good combustion practices | 0.22 | G/HP-H | 0.30 |
| MI-0412 | 12/04/2013  ACT | Emergency Engine -- Diesel Fire Pump (EUFPENGINE) | 17.21 | Diesel | 165 | HP | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 0.09 | LB/MMBTU | |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MI-0412 | 12/04/2013  ACT | Emergency Engine -- Diesel Fire Pump (EUFPENGINE) | 17.21 | Diesel | 165 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good combustion practices | 0.09 | LB/MMBTU | |
| MI-0423 | 01/04/2017  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | Diesel | 1.66 | MMBTU/H | Particulate matter, filterable (FPM) | Good combustion practices and meeting NSPS Subpart IIII requirements. | 0.15 | G/BHP-H | 0.20 |
| MI-0423 | 01/04/2017  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | Diesel | 1.66 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 0.57 | LB/H | |
| MI-0423 | 01/04/2017  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | Diesel | 1.66 | MMBTU/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good combustion practices | 0.57 | LB/H | |
| MI-0424 | 12/05/2016  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | diesel | 500 | H/YR | Particulate matter, filterable (FPM) | Good combustion practices. | 0.22 | G/HP-H | 0.30 |
| MI-0424 | 12/05/2016  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | diesel | 500 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices. | 0.09 | LB/MMBTU | |
| MI-0424 | 12/05/2016  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | diesel | 500 | H/YR | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good combustion practices. | 0.09 | LB/MMBTU | |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (South Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Particulate matter, filterable (FPM) | Diesel particulate filter, good combustion practices and meeting NSPS Subpart IIII requirements. | 0.15 | G/BHP-H | 0.20 |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (South Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | Diesel particulate filter, good combustion practices and meeting NSPS Subpart IIII requirements. | 0.66 | LB/H | 1.34 |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (South Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Diesel particulate filter, good combustion practices and meeting NSPS Subpart IIII requirements. | 0.66 | LB/H | 1.34 |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (North Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Particulate matter, filterable (FPM) | Diesel particulate filter, good combustion practices and meeting NSPS Subpart IIII requirements. | 0.15 | G/BHP-H | 0.20 |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (North Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | Diesel particulate filter, good combustion practices and meeting NSPS Subpart IIII requirements. | 0.66 | LB/H | 1.34 |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (North Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Diesel particulate filter, good combustion practices and meeting NSPS Subpart IIII requirements. | 0.66 | LB/H | 1.34 |
| MI-0435 | 07/16/2018  ACT | EUFPENGINE: Fire pump engine | 17.21 | Diesel | 399 | BHP | Particulate matter, filterable (FPM) | State of the art combustion design | 0.2 | G/KW-H | 0.20 |
| MI-0435 | 07/16/2018  ACT | EUFPENGINE: Fire pump engine | 17.21 | Diesel | 399 | BHP | Particulate matter, total < 10 Âµ (TPM10) | State of the art combustion design. | 0.13 | LB/H | 0.20 |
| MI-0435 | 07/16/2018  ACT | EUFPENGINE: Fire pump engine | 17.21 | Diesel | 399 | BHP | Particulate matter, total < 2.5 Âµ (TPM2.5) | State of the art combustion design. | 0.13 | LB/H | 0.20 |
| MI-0441 | 12/21/2018  ACT | EUFPRICE--A 315 HP diesel fueled emergency engine | 17.21 | Diesel | 2.5 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Ultra low sulfur diesel fuel and good combustion practices. | 0.12 | LB/H | |
| MI-0441 | 12/21/2018  ACT | EUFPRICE--A 315 HP diesel fueled emergency engine | 17.21 | Diesel | 2.5 | MMBTU/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | Ultra low sulfur diesel fuel and good combustion practices. | 0.12 | LB/H | |
| *MI-0445 | 11/26/2019  ACT | EUFPENGINE (Emergency engine-diesel fire pump | 17.21 | diesel fuel | 1.66 | MMBTU/H | Particulate matter, filterable (FPM) | Good Combustion Practices and meeting NSPS Subpart IIII requirements | 0.15 | G/BHP-H | 0.20 |
| *MI-0445 | 11/26/2019  ACT | EUFPENGINE (Emergency engine-diesel fire pump | 17.21 | diesel fuel | 1.66 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices | 0.57 | LB/H | |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *MI-0445 | 11/26/2019  ACT | EUFPENGINE (Emergency engine-diesel fire pump | 17.21 | diesel fuel | 1.66 | MMBTU/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good combustion practices | 0.57 | LB/H | |
| MI-0447 | 01/07/2021  ACT | EUFPRICE--A 315 HP diesel fueled emergency engine | 17.21 | Diesel | 2.5 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Ultra low sulfur diesel fuel and good combustion practices | 0.12 | LB/H | |
| MI-0447 | 01/07/2021  ACT | EUFPRICE--A 315 HP diesel fueled emergency engine | 17.21 | Diesel | 2.5 | MMBTU/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | Ultra low sulfur diesel fuel and good combustion practices. | 0.12 | LB/H | |
| MO-0089 | 05/12/2016  ACT | emergency engines | 17.21 | ULSD | 0 | | Particulate matter, filterable (FPM) | good operating practices | 0 | G/KW | |
| MS-0092 | 05/08/2014  ACT | firewater pumps, diesel | 17.21 | diesel | 325 | HP, EACH | Particulate matter, total (TPM) | | 0 | | |
| MS-0092 | 05/08/2014  ACT | firewater pumps, diesel | 17.21 | diesel | 325 | HP, EACH | Particulate matter, total < 10 Âµ (TPM10) | | 0 | | |
| MS-0092 | 05/08/2014  ACT | firewater pumps, diesel | 17.21 | diesel | 325 | HP, EACH | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0 | | |
| NJ-0081 | 03/07/2014  ACT | Emergency diesel fire pump | 17.21 | Ultra Low Sulfur Distillate oil | 0 | | Particulate matter, filterable (FPM) | Use of Ultra low sulfur distillate oil | 0.15 | G/B-HP-H | 0.20 |
| NJ-0081 | 03/07/2014  ACT | Emergency diesel fire pump | 17.21 | Ultra Low Sulfur Distillate oil | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Use of ultra low sulfur distillate oil | 0.15 | G/B-HP-H | 0.20 |
| NJ-0081 | 03/07/2014  ACT | Emergency diesel fire pump | 17.21 | Ultra Low Sulfur Distillate oil | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | Use of Ultra low sulfur distillate oil | 0.15 | G/B-HP-H | 0.20 |
| NJ-0084 | 03/10/2016  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD | 100 | H/YR | Particulate matter, filterable (FPM) | use of ULSD a clean burning fuel, and limited hours of operation | 0.1 | LB/H | |
| NJ-0084 | 03/10/2016  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD | 100 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | use of ULSD a clean burning fuel, and limited hours of operation | 0.1 | LB/H | |
| NJ-0084 | 03/10/2016  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD | 100 | H/YR | Particulate matter, total < 2.5 Âµ (TPM2.5) | use of ULSD a clean burning fuel, and limited hours of operation | 0.1 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY GENERATOR DIESEL | 17.21 | DIESEL OIL | 0 | 100 H/YR | Particulate matter, filterable (FPM) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 0.661 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY GENERATOR DIESEL | 17.21 | DIESEL OIL | 0 | 100 H/YR | Particulate matter, total < 10 Âµ (TPM10) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 0.661 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY GENERATOR DIESEL | 17.21 | DIESEL OIL | 0 | 100 H/YR | Particulate matter, total < 2.5 Âµ (TPM2.5) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 0.661 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY DIESEL FIRE PUMP | 17.21 | ULSD | 100 | H/YR | Particulate matter, filterable (FPM) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 0.108 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY DIESEL FIRE PUMP | 17.21 | ULSD | 100 | H/YR | Particulate matter, total < 10 Âµ (TPM10) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 0.108 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY DIESEL FIRE PUMP | 17.21 | ULSD | 100 | H/YR | Particulate matter, total < 2.5 Âµ (TPM2.5) | Use of ULSD a clean burning fuel and limited hours of operation | 0.108 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Emergency fire pump | 17.21 | ultra low sulfur diesel | 460 | hp | Particulate matter, filterable (FPM) | Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance | 0.087 | G/BHP-H | 0.12 |

## BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NY-0104 | 08/01/2013  ACT | Fire pump | 17.21 | ultra low sulfur diesel | 0 | | Particulate matter, filterable (FPM) | Ultra low sulfur diesel with maximum sulfur content 0.0015 percent. | 0.043 | LB/MMBTU | |
| OH-0352 | 06/18/2013  ACT | Emergency fire pump engine | 17.21 | diesel | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | Purchased certified to the standards in NSPS Subpart IIII | 0.1 | LB/H | 0.20 |
| OH-0360 | 11/05/2013  ACT | Emergency fire pump engine (P004) | 17.21 | diesel | 400 | HP | Particulate matter, total < 10 Âµ (TPM10) | Purchased certified to the standards in NSPS Subpart IIII | 0.131 | LB/H | 0.20 |
| OH-0360 | 11/05/2013  ACT | Emergency fire pump engine (P004) | 17.21 | diesel | 400 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Purchased certified to the standards in NSPS Subpart IIII | 0.131 | LB/H | 0.20 |
| OH-0363 | 11/05/2014  ACT | Emergency Fire Pump Engine (P003) | 17.21 | Diesel fuel | 260 | HP | Particulate matter, total (TPM) | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 0.09 | LB/H | 0.20 |
| OH-0363 | 11/05/2014  ACT | Emergency Fire Pump Engine (P003) | 17.21 | Diesel fuel | 260 | HP | Particulate matter, total < 10 Âµ (TPM10) | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 0.09 | LB/H | 0.20 |
| OH-0363 | 11/05/2014  ACT | Emergency Fire Pump Engine (P003) | 17.21 | Diesel fuel | 260 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 0.09 | LB/H | 0.20 |
| OH-0366 | 08/25/2015  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 140 | HP | Particulate matter, total < 10 Âµ (TPM10) | State-of-the-art combustion design | 0.07 | LB/H | 0.30 |
| OH-0366 | 08/25/2015  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 140 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | State-of-the-art combustion design | 0.07 | LB/H | 0.30 |
| OH-0367 | 09/23/2016  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 311 | HP | Particulate matter, total < 10 Âµ (TPM10) | State-of-the-art combustion design | 0.1 | LB/H | 0.20 |
| OH-0367 | 09/23/2016  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 311 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | State-of-the-art combustion design | 0.1 | LB/H | 0.20 |
| OH-0368 | 04/19/2017  ACT | Emergency Fire Pump Diesel Engine (P008) | 17.21 | Diesel fuel | 460 | HP | Particulate matter, total < 10 Âµ (TPM10) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 0.02 | LB/H | 0.03 |
| OH-0368 | 04/19/2017  ACT | Emergency Fire Pump Diesel Engine (P008) | 17.21 | Diesel fuel | 460 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 0.02 | LB/H | 0.03 |
| OH-0370 | 09/07/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | Ultra low sulfur diesel fuel | 0.1 | LB/H | 0.20 |
| OH-0370 | 09/07/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Ultra low sulfur diesel fuel | 0.1 | LB/H | 0.20 |
| OH-0372 | 09/27/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Particulate matter, total < 10 Âµ (TPM10) | Ultra low sulfur diesel fuel | 0.1 | LB/H | 0.20 |
| OH-0372 | 09/27/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Ultra low sulfur diesel fuel | 0.1 | LB/H | 0.20 |
| OH-0374 | 10/23/2017  ACT | Emergency Fire Pump (P006) | 17.21 | Diesel fuel | 410 | HP | Particulate matter, total (TPM) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII. Good combustion practices per the | 0.13 | LB/H | 0.20 |
| OH-0374 | 10/23/2017  ACT | Emergency Fire Pump (P006) | 17.21 | Diesel fuel | 410 | HP | Particulate matter, total < 10 Âµ (TPM10) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII. Good combustion practices per the | 0.13 | LB/H | 0.20 |
| OH-0374 | 10/23/2017  ACT | Emergency Fire Pump (P006) | 17.21 | Diesel fuel | 410 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII. Good combustion practices per the | 0.13 | LB/H | 0.20 |

BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fueled fire pump (P006) | 17.21 | Diesel fuel | 250 | HP | Particulate matter, total < 10 Âµ (TPM10) | Comply with NSPS 40 CFR 60 Subpart IIII | 0.1 | LB/H | 0.24 |
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fueled fire pump (P006) | 17.21 | Diesel fuel | 250 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Comply with NSPS 40 CFR 60 Subpart IIII | 0.1 | LB/H | 0.24 |
| OH-0377 | 04/19/2018  ACT | Emergency Fire Pump (P004) | 17.21 | Diesel fuel | 320 | HP | Particulate matter, total (TPM) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 0.11 | LB/H | 0.20 |
| OH-0377 | 04/19/2018  ACT | Emergency Fire Pump (P004) | 17.21 | Diesel fuel | 320 | HP | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 0.11 | LB/H | 0.20 |
| OH-0377 | 04/19/2018  ACT | Emergency Fire Pump (P004) | 17.21 | Diesel fuel | 320 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 0.11 | LB/H | 0.02 |
| OH-0378 | 12/21/2018  ACT | Firewater Pumps (P005 and P006) | 17.21 | Diesel fuel | 402 | HP | Particulate matter, total (TPM) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII and employ good combustion practices per the | 0.13 | LB/H | 0.20 |
| OH-0378 | 12/21/2018  ACT | Firewater Pumps (P005 and P006) | 17.21 | Diesel fuel | 402 | HP | Particulate matter, total < 10 Âµ (TPM10) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII and employ good combustion practices per the | 0.13 | LB/H | 0.20 |
| OH-0378 | 12/21/2018  ACT | Firewater Pumps (P005 and P006) | 17.21 | Diesel fuel | 402 | HP | Particulate matter, total < 2.5 Âµ (TPM2.5) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII and employ good combustion practices per the | 0.13 | LB/H | 0.20 |
| OH-0379 | 02/06/2019  ACT | Black Start Generator (P007) | 17.21 | Diesel fuel | 158 | HP | Particulate matter, filterable < 10 Âµ (FPM10) | Tier IV engine Good combustion practices | 5.22 | X10-3 LB/H | 0.02 |
| OH-0379 | 02/06/2019  ACT | Black Start Generator (P007) | 17.21 | Diesel fuel | 158 | HP | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | Tier IV engine Good combustion practices | 5.22 | X10-3 LB/H | 0.02 |
| PA-0278 | 10/10/2012  ACT | Fire Pump | 17.21 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.09 | G/B-HP-H | 0.12 |
| PA-0278 | 10/10/2012  ACT | Fire Pump | 17.21 | Diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0.09 | G/B-HP-H | 0.12 |
| PA-0286 | 01/31/2013  ACT | Fire Pump Engine - 460 BHP | 17.21 | Diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.09 | G/HP-H | 0.12 |
| PA-0286 | 01/31/2013  ACT | Fire Pump Engine - 460 BHP | 17.21 | Diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0.09 | G/HP-H | 0.12 |
| PA-0291 | 04/23/2013  ACT | EMERGENCY FIREWATER PUMP | 17.21 | ULTRA LOW SULFUR DISTILLATE | 3.25 | MMBTU/H | Particulate matter, total (TPM) | | 0.15 | LB/H | |
| PA-0296 | 12/17/2013  ACT | Emergency Firewater Pump | 17.21 | Diesel | 16 | Gal/hr | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.005 | T/YR | |
| PA-0296 | 12/17/2013  ACT | Emergency Firewater Pump | 17.21 | Diesel | 16 | Gal/hr | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0.005 | T/YR | |
| PA-0309 | 12/23/2015  ACT | Fire pump engine | 17.21 | Ultra-low sulfur diesel | 15 | gal/hr | Particulate matter, filterable (FPM) | | 0.11 | GM/HP-HR | 0.15 |
| PA-0309 | 12/23/2015  ACT | Fire pump engine | 17.21 | Ultra-low sulfur diesel | 15 | gal/hr | Particulate matter, total < 10 Âµ (TPM10) | | 0.11 | GM/HP-HR | 0.15 |
| PA-0309 | 12/23/2015  ACT | Fire pump engine | 17.21 | Ultra-low sulfur diesel | 15 | gal/hr | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0.11 | GM/HP-HR | 0.15 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PA-0310 | 09/02/2016  ACT | Emergency Fire Pump Engine | 17.21 | ULSD | 0 | | Particulate matter, total (TPM) | | 0.15 | G/BHP-HR | 0.20 |
| *PA-0326 | 02/18/2021  ACT | Emergency Generator Parking Garage | 17.21 | Diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | LAER PM2.5 BACT PM/PM25 certified engines,include trubocharger and intercooler/aftercooler GCP ULSD | 0.06 | G | 0.08 |
| *PA-0326 | 02/18/2021  ACT | Emergency GeneratorTelecom Hut & Tower | 17.21 | diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | LAER PM2.5 BACT PM/PM25 certified engines,include trubocharger and intercooler/aftercooler GCP ULSD | 0.22 | G | 0.30 |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD Fuel Oil #2 | 0 | | Particulate matter, filterable (FPM) | | 0.15 | G/B-HP-H | 0.20 |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD Fuel Oil #2 | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.15 | G/B-HP-H | 0.20 |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD Fuel Oil #2 | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | | 0.15 | G/B-HP-H | 0.20 |
| SC-0182 | 10/31/2017  ACT | Emergency Fire Pumps | 17.21 | | 0 | | Particulate matter, total (TPM) | Use of Ultra Low Sulfur Diesel Fuel (15 ppm), good combustion, operation, and maintenance practices; compliance with | 200 | OPERATING HR/YR | |
| SC-0182 | 10/31/2017  ACT | Emergency Fire Pumps | 17.21 | | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Use of Ultra Low Sulfur Diesel Fuel (15 ppm), good combustion, operation, and maintenance practices; compliance with | 200 | OPERATING HR/YR | |
| SC-0182 | 10/31/2017  ACT | Emergency Fire Pumps | 17.21 | | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | Use of Ultra Low Sulfur Diesel Fuel (15 ppm), good combustion, operation, and maintenance practices; compliance with | 200 | OPERATING HR/YR | |
| TX-0846 | 09/23/2018  ACT | FIRE PUMP DIESEL ENGINE | 17.21 | NO 2 DIESEL | 214 | kW | Particulate matter, total < 10 Âµ (TPM10) | Meets EPA Tier 4 requirements | 0.02 | G/KW | 0.02 |
| TX-0846 | 09/23/2018  ACT | FIRE PUMP DIESEL ENGINE | 17.21 | NO 2 DIESEL | 214 | kW | Particulate matter, total < 2.5 Âµ (TPM2.5) | Meets EPA Tier 4 requirements | 0.02 | G/KW | 0.02 |
| TX-0864 | 09/09/2019  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Particulate matter, total (TPM) | Tier 4 exhaust emission standards specified at 40 CFR Â§ 1039.101(b) | 0 | | |
| TX-0864 | 09/09/2019  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Tier 4 exhaust emission standards specified at 40 CFR Â§ 1039.101(b) | 0 | | |
| TX-0864 | 09/09/2019  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | Tier 4 exhaust emission standards specified at 40 CFR Â§ 1039.101(b) | 0 | | |
| *TX-0908 | 08/27/2021  ACT | Emergency Engine | 17.21 | natural gas | 74 | KW | Particulate matter, filterable (FPM) | Meet the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low diesel fuel. Limited to 100 hrs/yr of non-emergency | 0 | | |
| *TX-0908 | 08/27/2021  ACT | Emergency Engine | 17.21 | natural gas | 74 | KW | Particulate matter, filterable < 10 Âµ (FPM10) | Meet the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low diesel fuel. Limited to 100 hrs/yr of non-emergency | 0 | | |
| *TX-0908 | 08/27/2021  ACT | Emergency Engine | 17.21 | natural gas | 74 | KW | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | Meet the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low diesel fuel. Limited to 100 hrs/yr of non-emergency | 0 | | |
| VA-0319 | 08/27/2012  ACT | FIRE WATER PUMP | 17.21 | diesel (ultra low sulfur) | 1.86 | MMBTU/H | Particulate matter, total < 10 Âµ (TPM10) | Clean burning ULSD fuel and good combustion practices | 0.15 | G/HP-H | 0.20 |
| VA-0319 | 08/27/2012  ACT | FIRE WATER PUMP | 17.21 | diesel (ultra low sulfur) | 1.86 | MMBTU/H | Particulate matter, total < 2.5 Âµ (TPM2.5) | Clean burning ULSD fuel and good combustion practices. | 0.15 | G/HP-H | 0.20 |
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED WATER PUMP 376 bph (1) | 17.21 | DIESEL FUEL | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Ultra Low Sulfur Diesel/Fuel (15 ppm max) | 0.3 | G/HP-H | 0.40 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - PM (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED WATER PUMP 376 bph (1) | 17.21 | DIESEL FUEL | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | Ultra Low Sulfur Diesel/Fuel (15 ppm max) | 0.3 | G/HP-H | 0.40 |
| VA-0328 | 04/26/2018  ACT | Emergency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Particulate matter, filterable (FPM) | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 15 | G/HP/HR | 20.12 |
| VA-0328 | 04/26/2018  ACT | Emergency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Particulate matter, total < 10 Âµ (TPM10) | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 0.15 | G/HP HR | 0.20 |
| VA-0328 | 04/26/2018  ACT | Emergency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Particulate matter, total < 2.5 Âµ (TPM2.5) | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 0.15 | G/HP HR | 0.20 |
| VA-0332 | 06/24/2019  ACT | Emegency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Particulate matter, total < 2.5 Âµ (TPM2.5) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur | 0.15 | G/HP-HR | 0.20 |
| VA-0332 | 06/24/2019  ACT | Emegency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Particulate matter, total < 10 Âµ (TPM10) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur | 0.15 | G/HP-HR | 0.20 |
| VA-0332 | 06/24/2019  ACT | Emegency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Particulate matter, filterable (FPM) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur | 0.15 | G/HP-HR | 0.20 |
| WI-0263 | 02/15/2016  ACT | Fire pump (process P05) | 17.21 | Diesel | 1.27 | mmBtu/hr | Particulate matter, total (TPM) | Good combustion practices, use diesel fuel with sulfur content < 15 ppm, and operate <500 hr/yr | 0 | | |
| WI-0263 | 02/15/2016  ACT | Fire pump (process P05) | 17.21 | Diesel | 1.27 | mmBtu/hr | Particulate matter, total < 10 Âµ (TPM10) | Good combustion practices, use diesel fuel with sulfur content < 15 ppm, and operate <500 hr/yr | 0 | | |
| WI-0263 | 02/15/2016  ACT | Fire pump (process P05) | 17.21 | Diesel | 1.27 | mmBtu/hr | Particulate matter, total < 2.5 Âµ (TPM2.5) | Good combustion practices, use diesel fuel with sulfur content < 15 ppm, and operate <500 hr/yr | 0 | | |
| *WI-0271 | 06/05/2015  ACT | P10K â€“ Diesel Powered Emergency Generator | 17.21 | Distillate Fuel | 0 | | Particulate matter, total (TPM) | BACT is the use of ultra-low sulfur distillate in the generator. Compliance with this requirement will be determined using sulfur | 0.29 | LB/HR | |
| *WI-0271 | 06/05/2015  ACT | P10K â€“ Diesel Powered Emergency Generator | 17.21 | Distillate Fuel | 0 | | Particulate matter, total < 10 Âµ (TPM10) | BACT is the use of ultra-low sulfur distillate in the generator. Compliance with this requirement will be determined using sulfur | 0.29 | ;B/HR | |
| *WI-0271 | 06/05/2015  ACT | P10K â€“ Diesel Powered Emergency Generator | 17.21 | Distillate Fuel | 0 | | Particulate matter, total < 2.5 Âµ (TPM2.5) | BACT is the use of ultra-low sulfur distillate in the generator. Compliance with this requirement will be determined using sulfur | 0.29 | LB/HR | |
| WV-0025 | 11/21/2014  ACT | Fire Pump Engine | 17.21 | Diesel | 251 | HP | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | | 0 | | 0.20 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Airstrip Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 490 | hp | Volatile Organic Compounds (VOC) | | 0.0025 | LB/HP-H | 1.5 |
| AK-0082 | 01/23/2015  ACT | Agitator Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 98 | hp | Volatile Organic Compounds (VOC) | | 0.0025 | LB/HP-H | 1.5 |
| AK-0082 | 01/23/2015  ACT | Incinerator Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 102 | hp | Volatile Organic Compounds (VOC) | | 0.0025 | LB/HP-H | 1.5 |
| AK-0083 | 01/06/2015  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBTU/H | Volatile Organic Compounds (VOC) | Limited Operation of 168 hr/yr. | 0.36 | LB/MMBTU | |
| *AK-0085 | 08/13/2020  ACT | Three (3) Firewater Pump Engines and two (2) Emergency Diesel Generators | 17.21 | ULSD | 19.4 | gph | Volatile Organic Compounds (VOC) | Good combustion practices, ULSD, and limit operation to 500 hours per year. | 0.19 | G/HP-HR | 0.3 |
| *AK-0086 | 03/26/2021  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBtu/hr | Volatile Organic Compounds (VOC) | Good Combustion Practices and Limited Use | 0.36 | LB/MMBTU | |
| AR-0168 | 03/17/2021  ACT | Emergency Engines | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Good Operating Practices, limited hours of operation, Compliance with NSPS Subpart IIII | 1.55 | G/KW-HR | 1.6 |
| AR-0171 | 02/14/2019  ACT | SN-106 Cold Mill 1 Diesel Fired Emergency Generator | 17.21 | Diesel | 1073 | bhp | Volatile Organic Compounds (VOC) | Good operating practices. | 1 | G/KW-HR | 1.0 |
| FL-0338 | 05/30/2012  ACT | Wireline Unit Engines - C.R. Luigs | 17.21 | diesel | 300 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 1.17 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Fast Rescue Craft Diesel Engine - Development Driller 1 | 17.21 | Diesel | 142 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, and turbocharger | 0 | | |
| FL-0338 | 05/30/2012  ACT | Life Boat Diesel Engines - Development Driller 1 | 17.21 | Diesel | 110 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines and use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Port and Stb Fwd and Aft Crane Diesel Engines - C.R. Luigs | 17.21 | diesel | 305 | HP | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 6.72 | T/12MO ROLLING TOTAL | |
| FL-0338 | 05/30/2012  ACT | Seismic Operations Diesel Engines - Development Driller 1 | 17.21 | Diesel | 415 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, and turbocharger | 6.67 | TONS | |
| FL-0338 | 05/30/2012  ACT | Life Boat Diesel Engines - C.R. Luigs | 17.21 | diesel | 39 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - Development Driller 1 | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler | 0.57 | T/12MO ROLLING TOTAL | |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-0338 | 05/30/2012  ACT | Wireline Unit Diesel Engines - Development Driller 1 | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 1.17 | TONS | |
| FL-0338 | 05/30/2012  ACT | Black Start Air Compressor - C.R. Luigs | 17.21 | diesel | 6 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for the engine and the use of low sulfur diesel fuel | 0 | | |
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - C.R. Luigs | 17.21 | diesel | 0 | | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler | 0.38 | TONS | |
| FL-0347 | 09/16/2014  ACT | Diesel Powered Forklift Engine | 17.21 | Diesel | 30 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine | 0 | | |
| FL-0347 | 09/16/2014  ACT | Wireline Diesel Engines | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0347 | 09/16/2014  ACT | Water Blasting Diesel Engine | 17.21 | Diesel | 208 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0347 | 09/16/2014  ACT | Well Evaluation Diesel Engine | 17.21 | Diesel | 140 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine | 0 | | |
| FL-0347 | 09/16/2014  ACT | Fast Rescue Craft Diesel Engine | 17.21 | Diesel | 230 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| FL-0347 | 09/16/2014  ACT | Escape Capsule Diesel Engine | 17.21 | Diesel | 39 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engine | 0 | | |
| FL-0347 | 09/16/2014  ACT | Remotely Operated Vehicle Emergency Generator | 17.21 | Diesel | 427 | hp | Volatile Organic Compounds (VOC) | Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure | 0 | | |
| IA-0105 | 10/26/2012  ACT | Fire Pump | 17.21 | diesel fuel | 14 | GAL/H | Volatile Organic Compounds (VOC) | good combustion practices | 0.25 | G/KW-H | 0.3 |
| IL-0114 | 09/05/2014  ACT | Firewater Pump Engine | 17.21 | distillate fuel oil | 373 | hp | Volatile Organic Compounds (VOC) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 0.4 | G/KW-H | 0.4 |
| IN-0158 | 12/03/2012  ACT | TWO (2) FIREWATER PUMP DIESEL ENGINES | 17.21 | DIESEL | 371 | BHP, EACH | Volatile Organic Compounds (VOC) | COMBUSTION DESIGN CONTROLS AND USAGE LIMITS | 0.16 | LB/H | 0.3 |
| IN-0173 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.141 | G/BHP-H | 0.2 |
| IN-0173 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.141 | G/BHP-H | 0.2 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY WATER PUMP | 17.21 | NO. 2 FUEL OIL | 481 | BHP | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.141 | G/B-HP-H | 0.2 |
| IN-0180 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.141 | G/B-HP-H | 0.2 |
| IN-0180 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.141 | G/B-HP-H | 0.2 |
| IN-0234 | 12/08/2015  ACT | EMERGENCY FIRE PUMP ENGINE | 17.21 | DISTILLATE OIL | 0 | | Volatile Organic Compounds (VOC) | GOOD COMBUSTION PRACTICES | 0.05 | G/HP-H | 0.1 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Deisel | 150 | hp | Volatile Organic Compounds (VOC) | | 1.134 | G/HP-HR | 1.5 |
| IN-0295 | 02/23/2018  ACT | Emergency Diesel Generators | 17.21 | Diesel | 250 | hp | Volatile Organic Compounds (VOC) | | 1.134 | G/HP-HR | 1.5 |
| *KS-0030 | 03/31/2016  ACT | Compression ignition RICE emergency fire pump | 17.21 | Ultra-lowsulfur diesel (ULSD) | 197 | HP | Volatile Organic Compounds (VOC) | | 1.14 | G/HP-HR | 1.5 |
| *KS-0036 | 03/18/2013  ACT | Cummins 6BTA 5.9F-1 Diesel Engine Fire Pump | 17.21 | No. 2 Fuel Oil | 182 | BHP | Volatile Organic Compounds (VOC) | utilize efficient combustion/design technology | 0.77 | G/BHP-H | 1.0 |
| KY-0110 | 07/23/2020  ACT | EP 11-01 - Melt Shop Emergency Generator | 17.21 | Diesel | 260 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 11-02 - Reheat Furnace Emergency Generator | 17.21 | Diesel | 190 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 11-03 - Rolling Mill Emergency Generator | 17.21 | Diesel | 440 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 11-04 - IT Emergency Generator | 17.21 | Diesel | 190 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 11-05 - Radio Tower Emergency Generator | 17.21 | Diesel | 61 | HP | Volatile Organic Compounds (VOC) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | | |
| LA-0254 | 08/16/2011  ACT | EMERGENCY FIRE PUMP | 17.21 | DIESEL | 350 | HP | Volatile Organic Compounds (VOC) | ULTRA LOW SULFUR DIESEL AND GOOD COMBUSTION PRACTICES | 1 | G/HP-H | 1.3 |
| LA-0301 | 05/23/2014  ACT | Firewater Pump Nos. 1-3 (EQTs 997, 998, & 999) | 17.21 | Diesel | 500 | HP | Volatile Organic Compounds (VOC) | Compliance with 40 CFR 60 Subpart IIII and operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage | 0.1 | LB/HR | 0.1 |
| LA-0309 | 06/04/2015  ACT | Firewater Pump Engines | 17.21 | Diesel | 288 | hp (each) | Volatile Organic Compounds (VOC) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Firewater Pump 1 | 17.21 | Diesel | 282 | HP | Volatile Organic Compounds (VOC) | Good combustion practices | 1.87 | LB/H | 4.0 |
| LA-0314 | 08/03/2016  ACT | Diesel Firewater pump engines (6 units) | 17.21 | diesel | 425 | hp | Volatile Organic Compounds (VOC) | complying with 40 CFR 63 subpart ZZZZ | 0 | | |
| LA-0314 | 08/03/2016  ACT | Diesel emergency generator engine - EGEN | 17.21 | diesel | 350 | hp | Volatile Organic Compounds (VOC) | complying with 40 CFR 63 subpart ZZZZ | 0 | | |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0316 | 02/17/2017  ACT | firewater pump engines (8 units) | 17.21 | diesel | 460 | hp | Volatile Organic Compounds (VOC) | Complying with 40 CFR 60 Subpart IIII | 0 | | |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39A | 17.21 | Diesel Fuel | 375 | HP | Volatile Organic Compounds (VOC) | Good combustion practices and NSPS Subpart IIII | 4 | G/KW-H | 4.0 |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39B | 17.21 | Diesel Fuel | 300 | HP | Volatile Organic Compounds (VOC) | Good combustion practices and NSPS Subpart IIII | 4 | G/KW-H | 4.0 |
| LA-0349 | 07/10/2018  ACT | IC Engines (18) | 17.21 | diesel | 0 | | Volatile Organic Compounds (VOC) | Comply with 40 CFR 60 Subpart IIII and Good Combustion Practices | 0 | | |
| LA-0366 | 02/03/2021  ACT | Fire Pump, Sawmill Emergency, and Planer Mill Emergency Generator Engines | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Good Combustion Practices and Compliance with NSPS 40 CFR 60 Subpart IIII | 804.6 | HP | |
| MD-0041 | 04/23/2014  ACT | EMERGENCY GENERATOR | 17.21 | ULTRA-LOW SULFUR DIESEL | 1500 | KW | Volatile Organic Compounds (VOC) | EXCLUSIVE USE OF ULSD FUEL, GOOD COMBUSTION PRACTICES, AND LIMITING THE HOURS OF OPERATION | 4.8 | LB/MMBTU | |
| MD-0044 | 06/09/2014  ACT | 5 EMERGENCY FIRE WATER PUMP ENGINES | 17.21 | ULTRA LOW SULFUR DIESEL | 350 | HP | Volatile Organic Compounds (VOC) | USE ONLY ULSD, GOOD COMBUSTION PRACTICES, AND DESIGNED TO ACHIEVE EMISSION LIMIT | 3 | G/HP-H | 4.0 |
| MI-0410 | 07/25/2013  ACT | EU-FPENGINE: Diesel fuel fired emergency backup fire pump | 17.21 | diesel fuel | 315 | hp nameplate | Volatile Organic Compounds (VOC) | Proper combustion design and ultra low sulfur diesel fuel. | 0 | | |
| MI-0412 | 12/04/2013  ACT | Emergency Engine -- Diesel Fire Pump (EUFPENGINE) | 17.21 | Diesel | 165 | HP | Volatile Organic Compounds (VOC) | Good combustion practices | 0.001 | LB/H | |
| MI-0423 | 01/04/2017  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | Diesel | 1.66 | MMBTU/H | Volatile Organic Compounds (VOC) | Good combustion practices | 0.64 | LB/H | |
| MI-0424 | 12/05/2016  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | diesel | 500 | H/YR | Volatile Organic Compounds (VOC) | Good combustion practices | 0.47 | LB/H | |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (South Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Volatile Organic Compounds (VOC) | Good combustion practices. | 0.75 | LB/H | 1.5 |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (North Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Volatile Organic Compounds (VOC) | Good combustion practices | 0.75 | LB/H | 1.5 |
| MI-0435 | 07/16/2018  ACT | EUFPENGINE: Fire pump engine | 17.21 | Diesel | 399 | BHP | Volatile Organic Compounds (VOC) | State of the art combustion design. | 0.13 | LB/H | 0.2 |
| MI-0443 | 04/26/2019  ACT | EUFIREPUMP1 | 17.21 | Diesel | 500 | h/yr | Volatile Organic Compounds (VOC) | | 0.1 | G/B-HP-H | 0.1 |
| MI-0443 | 04/26/2019  ACT | EUFIREPUMP2 | 17.21 | Diesel | 500 | h/yr | Volatile Organic Compounds (VOC) | | 0.1 | G/B-HP-H | 0.1 |
| MI-0443 | 04/26/2019  ACT | EUFIREPUMP3 | 17.21 | Diesel | 500 | h/yr | Volatile Organic Compounds (VOC) | | 0.1 | G/B-HP-H | 0.1 |
| *MI-0446 | 10/30/2020  ACT | EUFIREPUMP1 | 17.21 | diesel fuel | 500 | h/yr | Volatile Organic Compounds (VOC) | | 0.1 | G/B-HP-H | 0.1 |
| *MI-0446 | 10/30/2020  ACT | EUFIREPUMP2 | 17.21 | diesel fuel | 500 | h/yr | Volatile Organic Compounds (VOC) | | 0.1 | G/B-HP-H | 0.1 |
| MS-0092 | 05/08/2014  ACT | firewater pumps, diesel | 17.21 | diesel | 325 | HP, EACH | Volatile Organic Compounds (VOC) | | 0 | | |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NJ-0081 | 03/07/2014  ACT | Emergency diesel fire pump | 17.21 | Ultra Low Sulfur Distillate oil | 0 | | Volatile Organic Compounds (VOC) | | 0.119 | LB/H | |
| NJ-0084 | 03/10/2016  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD | 100 | H/YR | Volatile Organic Compounds (VOC) | use of ULSD a clean burning fuel, and limited hours of operation | 0.1 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY GENERATOR DIESEL | 17.21 | DIESEL OIL | 0 | 100 H/YR | Volatile Organic Compounds (VOC) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 0.557 | LB/H | |
| NJ-0085 | 07/19/2016  ACT | EMERGENCY DIESEL FIRE PUMP | 17.21 | ULSD | 100 | H/YR | Volatile Organic Compounds (VOC) | Use of Ultra Low Sulfur Diesel (ULSD) Oil a clean burning fuel and limited hours of operation | 0.117 | LB/H | |
| NY-0103 | 02/03/2016  ACT | Emergency fire pump | 17.21 | ultra low sulfur diesel | 460 | hp | Volatile Organic Compounds (VOC) | Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations. | 0.1 | G/BHP-H | 0.1 |
| NY-0104 | 08/01/2013  ACT | Fire pump | 17.21 | ultra low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | Good combustion practice. | 0.3612 | LB/MMBTU | |
| OH-0352 | 06/18/2013  ACT | Emergency fire pump engine | 17.21 | diesel | 300 | HP | Volatile Organic Compounds (VOC) | Purchased certified to the standards in NSPS Subpart IIII | 0.25 | LB/H | 0.5 |
| OH-0360 | 11/05/2013  ACT | Emergency fire pump engine (P004) | 17.21 | diesel | 400 | HP | Volatile Organic Compounds (VOC) | Purchased certified to the standards in NSPS Subpart IIII | 0.325 | LB/H | 0.5 |
| OH-0366 | 08/25/2015  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 140 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 0.11 | LB/H | 0.5 |
| OH-0367 | 09/23/2016  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 311 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 0.25 | LB/H | 0.5 |
| OH-0368 | 04/19/2017  ACT | Emergency Fire Pump Diesel Engine (P008) | 17.21 | Diesel fuel | 460 | HP | Volatile Organic Compounds (VOC) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 0.14 | LB/H | 0.2 |
| OH-0370 | 09/07/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 0.24 | LB/H | 0.5 |
| OH-0372 | 09/27/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Volatile Organic Compounds (VOC) | State-of-the-art combustion design | 0.24 | LB/H | 0.5 |
| OH-0374 | 10/23/2017  ACT | Emergency Fire Pump (P006) | 17.21 | Diesel fuel | 410 | HP | Volatile Organic Compounds (VOC) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII. Good combustion practices per the manufacturerâ€™s operating manual. | 2.7 | LB/H | 4.0 |
| OH-0377 | 04/19/2018  ACT | Emergency Fire Pump (P004) | 17.21 | Diesel fuel | 320 | HP | Volatile Organic Compounds (VOC) | Good combustion practices (ULSD) and compliance with 40 CFR Part 60, Subpart IIII | 2.12 | LB/H | 4.0 |
| OH-0378 | 12/21/2018  ACT | Firewater Pumps (P005 and P006) | 17.21 | Diesel fuel | 402 | HP | Volatile Organic Compounds (VOC) | Certified to the meet the emissions standards in Table 4 of 40 CFR Part 60, Subpart IIII and employ good combustion practices per the manufacturerâ€™s operating manual | 2.64 | LB/H | 4.0 |
| OK-0164 | 01/08/2015  ACT | Diesel-Fueled Fire Pump Engines | 17.21 | Ultra-Low Sulfur Distillate Fuel | 300 | HP | Volatile Organic Compounds (VOC) | 1. Good Combustion Practices. | 0.15 | GRAMS PER HP-HR | 0.2 |
| OK-0175 | 06/29/2017  ACT | Emergency Use Engine less than or equal to 500 HP | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Good combustion practices, certified to meet EPA Tier 3 engine standards. Gen-1, FP-1, and FP-2 shall be limited to operate no more than 500 hr/yr. | 3 | GM/HP-HR | 4.0 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OK-0176 | 07/19/2017  ACT | Emergency Generator | 17.21 | Diesel | 400 | HP | Volatile Organic Compounds (VOC) | Equipped with non-resettable hour meter. Fired with ultra-low sulfur diesel fuel (0.015 % or less by wt. sulfur. | 217.24 | TONS/YEAR/FACILITY | |
| OK-0181 | 09/11/2019  ACT | EMERGENCY USE ENGINES < 500 HP | 17.21 | DIESEL | 0 | | Volatile Organic Compounds (VOC) | Good Combustion Practices. Certified to meet EPA Tier 3 engine standards. Gen-1 and FP-1 shall be limited to operate not more than 500 hours per year. SP-1 shall be limited to operate not more than 876 hours per year. | 3 | GM/HP-HR | 4.0 |
| PA-0278 | 10/10/2012  ACT | Fire Pump | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.1 | G/B-HP-H | 0.1 |
| PA-0286 | 01/31/2013  ACT | Fire Pump Engine - 460 BHP | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.1 | G/HP-H | 0.1 |
| PA-0291 | 04/23/2013  ACT | EMERGENCY FIREWATER PUMP | 17.21 | ULTRA LOW SULFUR DISTILLATE | 3.25 | MMBTU/H | Volatile Organic Compounds (VOC) | | 1.11 | LB/H | |
| PA-0296 | 12/17/2013  ACT | Emergency Firewater Pump | 17.21 | Diesel | 16 | Gal/hr | Volatile Organic Compounds (VOC) | | 0.013 | T/YR | |
| PA-0309 | 12/23/2015  ACT | Fire pump engine | 17.21 | Ultra-low sulfur diesel | 15 | gal/hr | Volatile Organic Compounds (VOC) | | 0.12 | GM/HP-HR | 0.2 |
| *PA-0326 | 02/18/2021  ACT | Emergency Generator Parking Garage | 17.21 | Diesel | 0 | | Volatile Organic Compounds (VOC) | The use of certified engines, design of engines to include turbocharger and an intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards | 2.37 | GRAM | 3.2 |
| *PA-0326 | 02/18/2021  ACT | Emergency GeneratorTelecom Hut & Tower | 17.21 | diesel | 0 | | Volatile Organic Compounds (VOC) | The use of certified engines, design of engines to include turbocharger and an intercooler/aftercooler, good combustion practices and proper operation and maintenance including certification to applicable federal emission standards | 2.83 | G | 3.8 |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD Fuel Oil #2 | 0 | | Volatile Organic Compounds (VOC) | | 0.15 | G/B-HP-H | 0.2 |
| SC-0113 | 02/08/2012  ACT | EMERGENCY ENGINE 1 THRU 8 | 17.21 | DIESEL | 29 | HP | Volatile Organic Compounds (VOC) | PURCHASE OF CERTIFIED ENGINES. HOURS OF OPERATION LIMITED TO 100 HOURS FOR MAINTENANCE AND TESTING. | 7.5 | GR/KW-H | 7.5 |
| SC-0113 | 02/08/2012  ACT | FIRE PUMP | 17.21 | DIESEL | 500 | HP | Volatile Organic Compounds (VOC) | CERTIFIED ENGINES THAT COMPLY WITH NSPS, SUBPART IIII. HOURS OF OPERATION LIMITED TO 100 HOURS PER YEAR FOR MAINTENANCE AND TESTING. | 4 | GR/KW-H | 4.0 |
| SC-0159 | 07/09/2012  ACT | FIRE PUMPS, FIRE1, FIRE2, FIRE3 | 17.21 | DIESEL | 211 | KW | Volatile Organic Compounds (VOC) | BACT HAS BEEN DETERMINED TO BE COMPLIANCE WITH NSPS, SUBPART IIII, 40 CFR60.4202 AND 40 CFR60.4205. | 4 | GKW-H | 4.0 |
| SC-0182 | 10/31/2017  ACT | Emergency Fire Pumps | 17.21 | | 0 | | Volatile Organic Compounds (VOC) | Use of Ultra Low Sulfur Diesel Fuel (15 ppm), good combustion, operation, and maintenance practices; compliance with NESHAP Subpart ZZZZ | 200 | OPERATING HR/YR | |
| TX-0706 | 01/23/2014  ACT | Emergency Engines | 17.21 | Ultra-low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | | 0.03 | TPY | |
| TX-0799 | 06/08/2016  ACT | EMERGENCY ENGINES | 17.21 | diesel | 0 | | Volatile Organic Compounds (VOC) | Equipment specifications and good combustion practices. Operation limited to 100 hours per year. | 0.0025 | LB/HP-HR | 1.5 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - VOC (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit g/kW-hr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0846 | 09/23/2018  ACT | FIRE PUMP DIESEL ENGINE | 17.21 | NO 2 DIESEL | 214 | kW | Volatile Organic Compounds (VOC) | Meets EPA Tier 4 requirements | 0.19 | G/KW | 0.2 |
| TX-0864 | 09/09/2019  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | Tier 4 exhaust emission standards specified at 40 CFR Â§ 1039.101(b), 100 HR / YR | 0 | | |
| TX-0886 | 03/31/2020  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Volatile Organic Compounds (VOC) | Limited operating hours, good combustion practices meets NSPS IIII Tier 3 engine | 0 | | |
| *TX-0908 | 08/27/2021  ACT | Emergency Engine | 17.21 | natural gas | 74 | KW | Volatile Organic Compounds (VOC) | Meet the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low diesel fuel. Limited to 100 hrs/yr of non-emergency operation. | 0 | | |
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED WATER PUMP 376 bph (1) | 17.21 | DIESEL FUEL | 0 | | Volatile Organic Compounds (VOC) | Good Combustion Practices/Maintenance | 3 | G/HP-H | 4.0 |
| VA-0328 | 04/26/2018  ACT | Emergency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Volatile Organic Compounds (VOC) | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 0 | | 4.0 |
| VA-0332 | 06/24/2019  ACT | Emegency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Volatile Organic Compounds (VOC) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 0.11 | G/HP-HR | 0.1 |
| *WI-0261 | 06/12/2014  ACT | EG7 - Diesel Emergency Electric Generator w/ tank | 17.21 | Diesel fuel oil | 197 | BHP | Volatile Organic Compounds (VOC) | NSPS engine [Tier 3 emergency engine]. EG7<br>Storage tank, conventional fuel oil storage tank, good operating practices; limiting leakage, spills. (FT01). Engine limited to 200 hours / year (total) and NSPS requirements. | 3.75 | GRAM / HP-HR | 5.0 |
| WI-0263 | 02/15/2016  ACT | Fire pump (process P05) | 17.21 | Diesel | 1.27 | mmBtu/hr | Volatile Organic Compounds (VOC) | Good combustion practices, use diesel fuel, and operate <500 hr/yr | 0 | | |
| *WI-0279 | 10/02/2017  ACT | EG8 â€“ Diesel Emergency Generator | 17.21 | Diesel Fuel | 0 | | Volatile Organic Compounds (VOC) | Complying with NSPS Standards under 40 CFR Part 60 Subpart IIII | 0 | | |
| *WI-0292 | 04/01/2019  ACT | P37 Diesel-Fired Emergency Fire Pump | 17.21 | Diesel Fuel | 0 | | Volatile Organic Compounds (VOC) | Hours of Operation | 200 | HOURS | |
| WV-0025 | 11/21/2014  ACT | Fire Pump Engine | 17.21 | Diesel | 251 | HP | Volatile Organic Compounds (VOC) | | 0.17 | LB/H | 0.4 |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - GHG (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Airstrip Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 490 | hp | Carbon Dioxide Equivalent (CO2e) | | 163 | TONS/YEAR |
| AK-0082 | 01/23/2015  ACT | Agitator Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 98 | hp | Carbon Dioxide Equivalent (CO2e) | | 356 | TONS/YEAR |
| AK-0082 | 01/23/2015  ACT | Incinerator Generator Engine | 17.21 | Ultra Low Sulfur Diesel | 102 | hp | Carbon Dioxide Equivalent (CO2e) | | 516 | TONS/YEAR |
| AK-0083 | 01/06/2015  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Limited Operation of 168 hr/yr. | 37.2 | TONS/YEAR |
| AK-0084 | 06/30/2017  ACT | Fire Pump Diesel Internal Combustion Engines | 17.21 | Diesel | 252 | hp | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices | 216 | TPY (COMBINED) |
| *AK-0085 | 08/13/2020  ACT | Three (3) Firewater Pump Engines and two (2) Emergency Diesel Generators | 17.21 | ULSD | 19.4 | gph | Carbon Dioxide Equivalent (CO2e) | Good combustion practices and limit operation to 500 hours per year per engine | 163.6 | LB/MMBTU |
| *AK-0086 | 03/26/2021  ACT | Diesel Fired Well Pump | 17.21 | Diesel | 2.7 | MMBtu/hr | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices and Limited Use | 164 | LB/MMBTU |
| AR-0168 | 03/17/2021  ACT | Emergency Engines | 17.21 | Diesel | 0 | | Carbon Dioxide | Good Combustion Practices | 163 | LB/MMBTU |
| AR-0171 | 02/14/2019  ACT | SN-106 Cold Mill 1 Diesel Fired Emergency Generator | 17.21 | Diesel | 1073 | bhp | Carbon Dioxide Equivalent (CO2e) | Good operating practices. | 163 | LB/MMBTU |
| FL-0338 | 05/30/2012  ACT | Wireline Unit Engines - C.R. Luigs | 17.21 | diesel | 300 | hp | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 536.6 | T/12MO ROLLING TOTAL |
| FL-0338 | 05/30/2012  ACT | Fast Rescue Craft Diesel Engine - Development Driller 1 | 17.21 | Diesel | 142 | hp | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, and turbocharger | 0 | |
| FL-0338 | 05/30/2012  ACT | Life Boat Diesel Engines - Development Driller 1 | 17.21 | Diesel | 110 | hp | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines and use of low sulfur diesel fuel | 0 | |
| FL-0338 | 05/30/2012  ACT | Port and Stb Fwd and Aft Crane Diesel Engines - C.R. Luigs | 17.21 | diesel | 305 | HP | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 3083 | TONS |
| FL-0338 | 05/30/2012  ACT | Life Boat Diesel Engines - C.R. Luigs | 17.21 | diesel | 39 | hp | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel | 0 | |
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - Development Driller 1 | 17.21 | Diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler | 715.5 | T/12MO ROLLING TOTAL |
| FL-0338 | 05/30/2012  ACT | Wireline Unit Diesel Engines - Development Driller 1 | 17.21 | Diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, turbocharger with aftercooler, high pressure fuel injection with aftercooler | 536.6 | TONS |
| FL-0338 | 05/30/2012  ACT | Black Start Air Compressor - C.R. Luigs | 17.21 | diesel | 6 | hp | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for the engine and the use of low sulfur diesel fuel | 0 | |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - GHG (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| FL-0338 | 05/30/2012  ACT | Cementing and Nitrogen Pump Diesel Engines - C.R. Luigs | 17.21 | diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler | 628.9 | TONS |
| FL-0354 | 08/25/2015  ACT | Emergency fire pump engine, 300 HP | 17.21 | Diesel | 29 | MMBTU/H | Carbon Dioxide | Lowest-emitting available fuel | 0 | |
| IA-0105 | 10/26/2012  ACT | Fire Pump | 17.21 | diesel fuel | 14 | GAL/H | Carbon Dioxide | good combustion practices | 1.55 | G/KW-H |
| IA-0105 | 10/26/2012  ACT | Fire Pump | 17.21 | diesel fuel | 14 | GAL/H | Carbon Dioxide Equivalent (CO2e) | good combustion practices | 91 | TONS/YR |
| ID-0021 | 04/21/2014  ACT | EMERGENCY GENERATOR ENGINE | 17.21 | #2 Distillate w/sulfur content <= 15ppmw | 2000 | kW | Carbon Dioxide Equivalent (CO2e) | | 22.6 | LBS |
| ID-0021 | 04/21/2014  ACT | FIRE WATER PUMP ENGINE | 17.21 | #2 Distillate w/sulfur content <= 15ppmw | 500 | brake horsepower | Carbon Dioxide Equivalent (CO2e) | | 22.6 | LBS. |
| IL-0114 | 09/05/2014  ACT | Firewater Pump Engine | 17.21 | distillate fuel oil | 373 | hp | Carbon Dioxide Equivalent (CO2e) | Tier IV standards for non-road engines at 40 CFR 1039.102, Table 7. | 72 | TPY |
| IL-0129 | 07/30/2018  ACT | Firewater Pump Engine | 17.21 | Ultra-low sulfur diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | | 0 | |
| IL-0130 | 12/31/2018  ACT | Firewater Pump Engine | 17.21 | Ultra-Low Sulfur Diesel | 420 | horsepower | Carbon Dioxide Equivalent (CO2e) | | 241 | TONS/YEAR |
| IN-0158 | 12/03/2012  ACT | TWO (2) FIREWATER PUMP DIESEL ENGINES | 17.21 | DIESEL | 371 | BHP, EACH | Carbon Dioxide Equivalent (CO2e) | GOOD ENGINEERING DESIGN AND FUEL EFFICIENT DESIGN | 172 | TONS |
| IN-0173 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Carbon Dioxide | GOOD COMBUSTION PRACTICES | 527.4 | G/BHP-H |
| IN-0173 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Carbon Dioxide | GOOD COMBUSTION PRACTICES | 527.4 | G/BHP-H |
| IN-0179 | 09/25/2013  ACT | DIESEL-FIRED EMERGENCY WATER PUMP | 17.21 | NO. 2 FUEL OIL | 481 | BHP | Carbon Dioxide | GOOD COMBUSTION PRACTICES | 527.4 | G/B-HP-H |
| IN-0180 | 06/04/2014  ACT | FIRE PUMP | 17.21 | | 500 | HP | Carbon Dioxide | GOOD COMBUSTION PRACTICES | 527.4 | G/B-HP-H |
| IN-0180 | 06/04/2014  ACT | RAW WATER PUMP | 17.21 | DIESEL, NO. 2 | 500 | HP | Carbon Dioxide | GOOD COMBUSTION PRACTICES | 527.4 | G/B-HP-H |
| KS-0029 | 07/14/2015  ACT | Emergency diesel engine | 17.21 | diesel | 750 | KW | Carbon Dioxide Equivalent (CO2e) | | 59.5 | TONS PER YEAR |
| *KS-0030 | 03/31/2016  ACT | Compression ignition RICE emergency fire pump | 17.21 | Ultra-lowsulfur diesel (ULSD) | 197 | HP | Carbon Dioxide | | 2.6 | G/HP-HR |
| KY-0110 | 07/23/2020  ACT | EP 11-01 - Melt Shop Emergency Generator | 17.21 | Diesel | 260 | HP | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | |
| KY-0110 | 07/23/2020  ACT | EP 11-02 - Reheat Furnace Emergency Generator | 17.21 | Diesel | 190 | HP | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | |
| KY-0110 | 07/23/2020  ACT | EP 11-03 - Rolling Mill Emergency Generator | 17.21 | Diesel | 440 | HP | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | |
| KY-0110 | 07/23/2020  ACT | EP 11-04 - IT Emergency Generator | 17.21 | Diesel | 190 | HP | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | |
| KY-0110 | 07/23/2020  ACT | EP 11-05 - Radio Tower Emergency Generator | 17.21 | Diesel | 61 | HP | Carbon Dioxide Equivalent (CO2e) | This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan. | 0 | |
| LA-0254 | 08/16/2011  ACT | EMERGENCY FIRE PUMP | 17.21 | DIESEL | 350 | HP | Carbon Dioxide | PROPER OPERATION AND GOOD COMBUSTION PRACTICES | 163 | LB/MMBTU |
| LA-0301 | 05/23/2014  ACT | Firewater Pump Nos. 1-3 (EQTs 997, 998, & 999) | 17.21 | Diesel | 500 | HP | Carbon Dioxide Equivalent (CO2e) | Compliance with 40 CFR 60 Subpart IIII and operating the engine in accordance with the engine manufacturerâ€™s instructions and/or written procedures (consistent with safe operation) designed to maximize combustion efficiency and minimize fuel usage | 10 | TPY |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - GHG (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| *LA-0306 | 12/20/2016  ACT | Genenerator Engine DEG-16-1 (EQT035) | 17.21 | Diesel | 460 | horsepower | Carbon Dioxide Equivalent (CO2e) | Meet NSPS Subpart IIII Limitations and Good Combustion Practices | 26 | Y/YR |
| *LA-0306 | 12/20/2016  ACT | Pump Engines DFP-16-1 (EQT036) | 17.21 | Diesel | 225 | horsepower | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices | 13 | T/YR |
| *LA-0306 | 12/20/2016  ACT | Pump Engine DFP-16-2 (EQT037) | 17.21 | Diesel | 225 | horsepower | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices | 13 | T/YR |
| LA-0308 | 09/26/2013  ACT | 380 HP Diesel Fired Pump Engine | 17.21 | Diesel | 2.3 | MMBTU/hr | Carbon Dioxide | Good combustion practices | 0 | |
| LA-0309 | 06/04/2015  ACT | Firewater Pump Engines | 17.21 | Diesel | 288 | hp (each) | Carbon Dioxide Equivalent (CO2e) | | 0 | |
| LA-0313 | 08/31/2016  ACT | SCPS Emergency Diesel Firewater Pump 1 | 17.21 | Diesel | 282 | HP | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 0 | |
| LA-0314 | 08/03/2016  ACT | Diesel Firewater pump engines (6 units) | 17.21 | diesel | 425 | hp | Carbon Dioxide Equivalent (CO2e) | | 0 | |
| LA-0314 | 08/03/2016  ACT | Diesel emergency generator engine - EGEN | 17.21 | diesel | 350 | hp | Carbon Dioxide Equivalent (CO2e) | | 0 | |
| LA-0316 | 02/17/2017  ACT | firewater pump engines (8 units) | 17.21 | diesel | 460 | hp | Carbon Dioxide Equivalent (CO2e) | good combustion practices | 0 | |
| LA-0323 | 01/09/2017  ACT | Standby Generator No. 9 Engine | 17.21 | Diesel Fuel | 400 | hp | Carbon Dioxide Equivalent (CO2e) | Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII | 0 | |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39A | 17.21 | Diesel Fuel | 375 | HP | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices | 28 | T/YR |
| LA-0328 | 05/02/2018  ACT | Emergency Diesel Engine Pump P-39B | 17.21 | Diesel Fuel | 300 | HP | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices | 28 | T/YR |
| *LA-0370 | 04/27/2020  ACT | Emergency Fire Pump Engine (EQT0021, ENG-1) | 17.21 | Diesel | 1.1 | MM BTU/hr | Carbon Dioxide Equivalent (CO2e) | Good combustion practices in order to comply with 40 CFR 60 Subpart IIII | 9 | TPY |
| MA-0039 | 01/30/2014  ACT | Fire Pump Engine | 17.21 | ULSD | 2.7 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 162.85 | LB/MMBTU |
| MI-0410 | 07/25/2013  ACT | EU-FPENGINE: Diesel fuel fired emergency backup fire pump | 17.21 | diesel fuel | 315 | hp nameplate | Carbon Dioxide Equivalent (CO2e) | Proper combustion design and ultra low sulfur diesel fuel. | 15.6 | T/YR |
| MI-0412 | 12/04/2013  ACT | Emergency Engine --Diesel Fire Pump (EUFPENGINE) | 17.21 | Diesel | 165 | HP | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 0.29 | T/YR |
| MI-0423 | 01/04/2017  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | Diesel | 1.66 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 13.58 | T/YR |
| MI-0424 | 12/05/2016  ACT | EUFPENGINE (Emergency engine--diesel fire pump) | 17.21 | diesel | 500 | H/YR | Carbon Dioxide Equivalent (CO2e) | Good combustion practices. | 55.6 | T/YR |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (South Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Carbon Dioxide Equivalent (CO2e) | Good combustion practices. | 85.6 | T/YR |
| MI-0433 | 06/29/2018  ACT | EUFPENGINE (North Plant): Fire pump engine | 17.21 | Diesel | 300 | HP | Carbon Dioxide Equivalent (CO2e) | Good combustion practices. | 85.6 | T/YR |
| MI-0435 | 07/16/2018  ACT | EUFPENGINE: Fire pump engine | 17.21 | Diesel | 399 | BHP | Carbon Dioxide Equivalent (CO2e) | Energy efficient design | 86 | T/YR |
| MI-0441 | 12/21/2018  ACT | EUFPRICE--A 315 HP diesel fueled emergency engine | 17.21 | Diesel | 2.5 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices and energy efficiency measures. | 20 | T/YR |
| *MI-0445 | 11/26/2019  ACT | EUFPENGINE (Emergency engine-diesel fire pump | 17.21 | diesel fuel | 1.66 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Good combustion practices | 13.58 | T/YR |
| MI-0447 | 01/07/2021  ACT | EUFPRICE--A 315 HP diesel fueled emergency engine | 17.21 | Diesel | 2.5 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Low carbon fuel (pipeline quality natural gas), good combustion practices and energy efficiency measures. | 20 | T/YR |
| NY-0103 | 02/03/2016  ACT | Emergency fire pump | 17.21 | ultra low sulfur diesel | 460 | hp | Carbon Dioxide Equivalent (CO2e) | Good combustion practice and efficient engine design. | 115 | TPY |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - GHG (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| OH-0352 | 06/18/2013  ACT | Emergency fire pump engine | 17.21 | diesel | 300 | HP | Carbon Dioxide Equivalent (CO2e) | | 87 | T/YR |
| OH-0360 | 11/05/2013  ACT | Emergency fire pump engine (P004) | 17.21 | diesel | 400 | HP | Carbon Dioxide Equivalent (CO2e) | | 115.75 | T/YR |
| OH-0363 | 11/05/2014  ACT | Emergency Fire Pump Engine (P003) | 17.21 | Diesel fuel | 260 | HP | Carbon Dioxide Equivalent (CO2e) | Emergency operation only, < 500 hours/year each for maintenance checks and readiness testing designed to meet NSPS Subpart IIII | 75 | T/YR |
| OH-0366 | 08/25/2015  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 140 | HP | Carbon Dioxide Equivalent (CO2e) | Efficient design | 41 | T/YR |
| OH-0367 | 09/23/2016  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 311 | HP | Carbon Dioxide Equivalent (CO2e) | Efficient design | 90 | T/YR |
| OH-0368 | 04/19/2017  ACT | Emergency Fire Pump Diesel Engine (P008) | 17.21 | Diesel fuel | 460 | HP | Carbon Dioxide Equivalent (CO2e) | good combustion control and operating practices and engines designed to meet the stands of 40 CFR Part 60, Subpart IIII | 123 | T/YR |
| OH-0370 | 09/07/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Carbon Dioxide Equivalent (CO2e) | Efficient design | 87 | T/YR |
| OH-0372 | 09/27/2017  ACT | Emergency fire pump engine (P004) | 17.21 | Diesel fuel | 300 | HP | Carbon Dioxide Equivalent (CO2e) | State-of-the-art combustion design | 87 | T/YR |
| OH-0374 | 10/23/2017  ACT | Emergency Fire Pump (P006) | 17.21 | Diesel fuel | 410 | HP | Carbon Dioxide Equivalent (CO2e) | good operating practices (proper maintenance and operation) | 29 | T/YR |
| OH-0376 | 02/09/2018  ACT | Emergency diesel-fueled fire pump (P006) | 17.21 | Diesel fuel | 250 | HP | Carbon Dioxide Equivalent (CO2e) | Equipment design and maintenance requirements | 163.6 | LB/MMBTU |
| OH-0377 | 04/19/2018  ACT | Emergency Fire Pump (P004) | 17.21 | Diesel fuel | 320 | HP | Carbon Dioxide Equivalent (CO2e) | Efficient design and proper maintenance and operation | 18.67 | T/YR |
| OH-0378 | 12/21/2018  ACT | Firewater Pumps (P005 and P006) | 17.21 | Diesel fuel | 402 | HP | Carbon Dioxide Equivalent (CO2e) | good operating practices (proper maintenance and operation) | 23 | T/YR |
| OH-0379 | 02/06/2019  ACT | Black Start Generator (P007) | 17.21 | Diesel fuel | 158 | HP | Carbon Dioxide Equivalent (CO2e) | Tier IV engine<br>Good combustion practices | 181.7 | LB/H |
| OK-0164 | 01/08/2015  ACT | Diesel-Fueled Fire Pump Engines | 17.21 | Ultra-Low Sulfur Distillate Fuel | 300 | HP | Carbon Dioxide Equivalent (CO2e) | 1. Good Combustion Practices.<br>2. Efficient Design. | 44 | TONS PER YEAR |
| PA-0291 | 04/23/2013  ACT | EMERGENCY FIREWATER PUMP | 17.21 | ULTRA LOW SULFUR DISTILLATE | 3.25 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 33.8 | TPY |
| PA-0296 | 12/17/2013  ACT | Emergency Firewater Pump | 17.21 | Diesel | 16 | Gal/hr | Carbon Dioxide Equivalent (CO2e) | | 19 | T/YR |
| PA-0309 | 12/23/2015  ACT | Fire pump engine | 17.21 | Ultra-low sulfur diesel | 15 | gal/hr | Carbon Dioxide Equivalent (CO2e) | | 9 | TON |
| *PA-0326 | 02/18/2021  ACT | Emergency Generator Parking Garage | 17.21 | Diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices - no feasible control technologies, 10 tons CO2e Year 12 month rolling basis for Parking Garage and Telecom emergency generators combined | 10 | TONS |
| *PA-0326 | 02/18/2021  ACT | Emergency GeneratorTelecom Hut & Tower | 17.21 | diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices - no feasible control technologies, 10 tons CO2e Year 12 month rolling basis for Parking Garage and Telecom emergency generators combined | 10 | TONS |
| PR-0009 | 04/10/2014  ACT | Emergency Diesel Fire Pump | 17.21 | ULSD Fuel Oil #2 | 0 | | Carbon Dioxide Equivalent (CO2e) | | 91.3 | T/YR |
| SC-0182 | 10/31/2017  ACT | Emergency Fire Pumps | 17.21 | | 0 | | Carbon Dioxide Equivalent (CO2e) | Use of Ultra Low Sulfur Diesel Fuel (15 ppm), good combustion, operation, and maintenance practices; compliance with NESHAP Subpart ZZZZ | 200 | OPERATING HR/YR |
| TX-0612 | 11/10/2011  ACT | FWP1-STK DIESEL FIRED FIRE WATER PUMP | 17.21 | DIESEL | 617 | HP | Carbon Dioxide Equivalent (CO2e) | Best Work practice | 7027.8 | LB/H |
| TX-0753 | 12/02/2014  ACT | Fire Water Pump Engine | 17.21 | ULSD | 1.92 | MMBtu/hr (HHV) | Carbon Dioxide Equivalent (CO2e) | | 15.71 | TPY CO2E |
| TX-0757 | 05/12/2014  ACT | Firewater Pump Engine | 17.21 | ULSD | 175 | hp | Carbon Dioxide Equivalent (CO2e) | | 5.34 | TPY CO2E |

**BACT Determinations for Small Internal Combustion Engine (< 500 HP) - GHG (Oil-Fired)**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| TX-0758 | 08/01/2014  ACT | Firewater Pump Engine | 17.21 | Diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | | 5 | TPY CO2E |
| TX-0799 | 06/08/2016  ACT | EMERGENCY ENGINES | 17.21 | diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | Equipment specifications and good combustion practices. Operation limited to 100 hours per year. | 6.79 | T/YR |
| TX-0824 | 06/30/2017  ACT | Emergency Diesel-Fired Equipment | 17.21 | DIESEL | 160 | HP | Carbon Dioxide Equivalent (CO2e) | Good operating and maintenance practices, efficient design, and low annual capacity | 13 | T/YR |
| TX-0846 | 09/23/2018  ACT | FIRE PUMP DIESEL ENGINE | 17.21 | NO 2 DIESEL | 214 | kW | Carbon Dioxide Equivalent (CO2e) | Meets EPA Tier 4 requirements . Fuels with a low carbon density, regular equipment maintenance, the use of efficient equipment and operation limited to less than 100 hr/yr | 0 | |
| TX-0864 | 09/09/2019  ACT | EMERGENCY DIESEL ENGINE | 17.21 | Ultra-low sulfur diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | Tier 4 exhaust emission standards specified at 40 CFR Â§ 1039.101(b) | 0 | |
| TX-0889 | 08/08/2020  ACT | Emergency Generator Engines | 17.21 | Ultra-low sulfur diesel | 0 | | Carbon Dioxide Equivalent (CO2e) | Good combustion practices and limited hours of operation | 0 | |
| *TX-0908 | 08/27/2021  ACT | Emergency Engine | 17.21 | natural gas | 74 | KW | Carbon Dioxide Equivalent (CO2e) | Meet the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low diesel fuel. Limited to 100 hrs/yr of non-emergency operation. | 0 | |
| VA-0319 | 08/27/2012  ACT | FIRE WATER PUMP | 17.21 | diesel (ultra low sulfur) | 1.86 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | Fuel-efficient design | 30.5 | T/YR |
| VA-0325 | 06/17/2016  ACT | DIESEL-FIRED WATER PUMP 376 bph (1) | 17.21 | DIESEL FUEL | 0 | | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices/Maintenance | 104 | T/YR |
| VA-0328 | 04/26/2018  ACT | Emergency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Carbon Dioxide Equivalent (CO2e) | good combustion practices and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 1040 | T/YR |
| VA-0332 | 06/24/2019  ACT | Emegency Fire Water Pump | 17.21 | Ultra Low Sulfur Diesel | 500 | HR/YR | Carbon Dioxide Equivalent (CO2e) | good combustion practices, high efficiency design, and the use of ultra low sulfur diesel (S15 ULSD) fuel oil with a maximum sulfur content of 15 ppmw. | 106 | T/YR |
| *WI-0292 | 04/01/2019  ACT | P37 Diesel-Fired Emergency Fire Pump | 17.21 | Diesel Fuel | 0 | | Carbon Dioxide Equivalent (CO2e) | Hours of Operation | 200 | HOURS |
| WV-0025 | 11/21/2014  ACT | Fire Pump Engine | 17.21 | Diesel | 251 | HP | Carbon Dioxide Equivalent (CO2e) | | 309 | LB/H |
| WY-0076 | 07/01/2014  ACT | Fire Water Pump Engine | 17.21 | Diesel | 200 | HP | Carbon Dioxide Equivalent (CO2e) | limited to 500 hours of operation per year | 58 | T/YR |

## BACT Determinations for Furnaces - Particulates

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit gr/dscf |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0084 | 06/30/2017  ACT | Induction Smelting Furnace | 90.021 | electricity | 0 | | Particulate matter, total (TPM) | Dust Collector | 0.005 | GR/DSCF | 0.01 |
| AL-0275 | 07/22/2014  ACT | Electric Arc Furnace | 81.21 | | 0 | | Particulate matter, filterable (FPM) | Baghouse | 0.0018 | GR | 0.00 |
| AL-0301 | 07/22/2014  ACT | ELECTRIC ARC FURNACE BAGHOUSE # 2 | 81.21 | | 600000 | LB/H | Particulate matter, total < 10 Âµ (TPM10) | Agency did not provide any information. | 0.0052 | GR/DSCF | 0.01 |
| AL-0309 | 03/02/2016  ACT | TWO (2) ELECTRIC ARC FURNACES WITH TWO (2) MELTSHOP BAGHOUSES | 81.21 | ELECTRICTY | 0 | | Particulate matter, total (TPM) | BAGHOUSE | 0.0052 | GR/DSCF | 0.01 |
| AL-0319 | 03/09/2017  ACT | Electric Arc Furnace | 81.21 | | 0 | | Particulate matter, total < 10 Âµ (TPM10) | | 0.0052 | GR/DSCF | 0.01 |
| AL-0327 | 08/14/2019  ACT | Electric Arc Furnaces | 81.21 | | 0 | | Particulate matter, total (TPM) | Baghouse | 0.0052 | GR/DSCF | 0.01 |
| CO-0066 | 11/30/2011  ACT | Electric Arc Furnace (EAF 5) | 81.21 | Electric | 185 | ton/hour | Particulate matter, total (TPM) | Baghouse | 0.0018 | GRAIN PER DSCF | 0.00 |
| MI-0429 | 04/27/2017  ACT | FGMELTING (flexible group includes 4 electric induction furnaces) | 81.42 | | 0 | | Particulate matter, total < 10 Âµ (TPM10) | Baghouses A and B | 0.002 | GR/DSCF | 0.00 |
| NE-0055 | 10/09/2013  ACT | ELECTRIC ARC FURNACE | 81.31 | Electric | 206 | tons of scrap processed pe | Particulate matter, total < 10 Âµ (TPM10) | The EAF and melthshop will be controlled by two baghouse. The existing positive pressure baghouse has a maximum design value of 965,000 acfm. The project will require Nucor to add a second negative pressure baghouse rated at 630,000 acfm. The source will also use Direct Evacuation Control to capture emissions. | 0.0052 | GRAIN/DSCF | 0.01 |
| OH-0350 | 07/18/2012  ACT | Electric Arc Furnace | 81.21 | electric | 150 | T/H | Particulate matter, total < 10 Âµ (TPM10) | Direct-Shell Evacuation Control system with adjustable air gap and water-cooled elbow and duct to Baghouse | 0.0034 | GR/DSCF | 0.00 |
| OH-0379 | 02/06/2019  ACT | Electric Arc Furnace (EAF) (P901) | 81.9 | | 0 | | Particulate matter, total < 10 Âµ (TPM10) | The baghouse is designed with a control efficiency of ninety-nine and nine tenths (99.9) percent for PM10/PM2.5 emissions. | 0.074 | LB/T | |
| OH-0381 | 09/27/2019  ACT | Electric Arc Furnace #2 (P905) | 81.21 | | 250 | T/H | Particulate matter, total < 10 Âµ (TPM10) | Operation of a baghouse control system a consisting of the following: (a)direct evacuation control (DEC) system for collection of emissions from EAF and LMF; (b)roof canopy hood system for collection of emissions fugitive to the inside of Meltshop #2 from casting operations (P907-Caster #2) and emissions not captured by the DEC control systems; | 26.57 | LB/H | 0.00 |
| OK-0173 | 01/19/2016  ACT | Electric Arc Furnace | 81.31 | | 0 | | Particulate matter, total < 10 Âµ (TPM10) | P2 - Pre-cleaned Scrap Add-on - Baghouse | 0.0024 | GR/DSCF | 0.00 |
| SC-0183 | 05/04/2018  ACT | Melt Shop Equipment (electric arc furnaces fugitives) | 81.21 | | 175 | 2 | Particulate matter, filterable (FPM) | Good work practice standards and proper operation and maintenance of baghouses. | 0 | | |
| TX-0651 | 10/02/2013  ACT | ELECTRIC ARC FURNACE | 81.21 | electricity | 316 | TPH | Particulate matter, total (TPM) | ENCLOSURE, CAPTURE, FABRIC FILTER | 0.0032 | GR/DSCF | 0.00 |
| TX-0651 | 10/02/2013  ACT | LADLE FURNACE | 81.34 | electricity | 316 | TPH | Particulate matter, total (TPM) | ENCLOSURE, CAPTURE, FABRIC FILTER | 0.0052 | GR/DSCF | 0.01 |
| TX-0882 | 01/17/2020  ACT | Electric Arc Furnaces (EAF) | 81.21 | ELECTRIC | 0 | | Particulate matter, filterable (FPM) | BAGHOUSE | 0.0052 | GR/DSCF | 0.01 |

**BACT Determinations for Lime Transfers - Particulates**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit gr/dscf |
|---|---|---|---|---|---|---|---|---|---|---|
| AK-0084 | 06/30/2017  ACT | Reagent Handling for Water Treatment | 90.019 | 1500 | scfm | Particulate matter, total (TPM) | Dust Collector | 0.02 | GR/DSCF | 0.020000 |
| AK-0084 | 06/30/2017  ACT | Mill Reagents Handling | 90.019 | 3002 | ACFM | Particulate matter, total (TPM) | Dust Collector | 0.02 | GR/DSCF | 0.020000 |
| AK-0084 | 06/30/2017  ACT | Mill Reagents Handling | 90.019 | 628 | ACFM | Particulate matter, total (TPM) | Wet Scrubber | 0.02 | GR/DSCF | 0.020000 |
| AL-0313 | 05/04/2016  ACT | LIMESTONE FEED SYSTEM | 90.019 | 110000 | LB/H | Particulate matter, fugitive | WET LIMESTONE | 7 | % OPACITY | |
| AL-0313 | 05/04/2016  ACT | PRODUCT HANDLING SYSTEM | 90.019 | 55000 | LB/H OF LIME | Particulate matter, filterable < 10 Âµ (FPM10) | FABRIC FILTER BAGHOUSE | 0.002 | GR/DSCF | 0.002000 |
| AL-0313 | 05/04/2016  ACT | CA-08 EAST LKD | 90.019 | 0 | | Particulate matter, filterable < 10 Âµ (FPM10) | FABRIC FILTER BAGHOUSE | 0.002 | GR/DSCF | 0.002000 |
| IL-0117 | 09/29/2015  ACT | Lime Barge Loadout | 90.019 | 0 | | Particulate matter, filterable (FPM) | Telescoping loading spout with suction or aspiration at discharge end and a filter system. | 0.004 | GR/SCF | 0.004000 |
| IL-0117 | 09/29/2015  ACT | Truck and Rail Loadout | 90.019 | 0 | | Particulate matter, filterable (FPM) | Partial enclosure; fabric filters to treat displaced air during loadout; and loadout practices to minimize spillage. | 0.004 | GR/SCF | 0.004000 |
| IL-0117 | 09/29/2015  ACT | Limestone Handling Operations (Stack Emissions) | 90.019 | 0 | | Particulate matter, filterable (FPM) | | 0.014 | GR/DSCF | 0.014000 |
| IL-0117 | 09/29/2015  ACT | Limestone Handling Operations (Fugitive Emissions) | 90.019 | 0 | | Particulate matter, filterable (FPM) | | 0 | | |
| IN-0167 | 04/16/2013  ACT | LIMESTONE UNLOADING (TRUCK) | 90.019 | 495 | T/H | Particulate matter, total < 10 Âµ (TPM10) | DEVELOPMENT, IMPLEMENTATION, AND MAINTENANCE OF SIRE-SPECIFIC FUGITIVE DUST CONTROL PLAN | 0.0011 | LB/H | |
| IN-0167 | 04/16/2013  ACT | LIMESTONE CONVEYOR & ENCLOSED STORAGE (PILE) | 90.019 | 495 | T/H | Particulate matter, total < 10 Âµ (TPM10) | DEVELOPMENT, MAINTENANCE, AND IMPLEMENTATION OF A SITE-SPECIFIC FUGITIVE DUST CONTROL PLAN AND ENCLOSURE | 0.02 | LB/H | |
| IN-0167 | 04/16/2013  ACT | WBE LIME STORAGE AREA | 90.019 | 7 | T/H | Particulate matter, total < 10 Âµ (TPM10) | BIN VENT CE020 | 0.002 | GR/DSCF | 0.002000 |
| IN-0167 | 04/16/2013  ACT | LIMESTONE/DOLOMITE HOPPER, BELT FEEDER, GRIZZLY FEEDER/SCREENER | 90.019 | 495 | T/H | Particulate matter, total < 10 Âµ (TPM10) | DEVELOPMENT, IMPLEMENTATION, AND MAINTENANCE OF A SITE-SPECIFIC FUGITIVE DUST CONTROL PLAN | 0.33 | LB/H | |
| IN-0167 | 04/16/2013  ACT | LIMESTONE/DOLOMITE HOPPER, BELT FEEDER, GRIZZLY FEEDER/SCREENER | 90.019 | 495 | T/H | Particulate matter, filterable (FPM) | THROUGH THE DEVELOPMENT, MAINTENANCE, AND IMPLEMENTATION OF A SITE-SPECIFIC FUGITIVE DUST CONTROL PLAN | 0.9 | LB/H | |
| IN-0167 | 04/16/2013  ACT | LIMESTONE/DOLOMITE GRINDING MILL BIN AREA | 90.019 | 495 | T/H | Particulate matter, total < 10 Âµ (TPM10) | BAGHOUSE CE023 | 0.002 | GR/DSCF | 0.002000 |
| IN-0167 | 04/16/2013  ACT | GROUND LIMESTONE/DOLOMITE ADDITIVE SYSTEM | 90.019 | 132 | T/H | Particulate matter, total < 10 Âµ (TPM10) | BAGHOUSE CE010 | 0.002 | GR/DSCF | 0.002000 |
| IN-0185 | 04/24/2014  ACT | LIMESTONE AND DOLOMITE GRINDING MILL BIN AREA | 90.019 | 0 | | Particulate matter, filterable < 10 Âµ (FPM10) | BAGHOUSE | 0.002 | GR/DSCF | 0.002000 |
| IN-0185 | 04/24/2014  ACT | LIMESTONE UNLOADING & STORAGE AREA | 90.019 | 495 | T/H | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.07 | LB/H | |

**BACT Determinations for Lime Transfers - Particulates**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit gr/dscf |
|---|---|---|---|---|---|---|---|---|---|---|
| IN-0185 | 04/24/2014  ACT | LIMESTONE/DOLOMITE HOPPER, BELT FEEDER & GRIZZLY FEEDER/SCREENER | 90.019 | 495 | T/H | Particulate matter, filterable < 10 Âµ (FPM10) | | 0.22 | LB/H | |
| IN-0317 | 06/11/2019  ACT | Lime silo EU-6501 | 90.019 | 20 | TONS/H | Particulate matter, total < 10 Âµ (TPM10) | Filter EU-6501 | 0.002 | GR/DSCF | 0.002000 |
| KY-0110 | 07/23/2020  ACT | EP 06-01 - Lime Handling System (dump station & material transfer) | 90.019 | 70000 | ton/yr | Particulate matter, total < 2.5 Âµ (TPM2.5) | For the Lime Handling System (dump station & material transfer) (EP 06-01): The permittee shall install, operate, and maintain a dust collector designed to control particulate grain loading to 0.005 grain/dscf and the flow rate to 2000 dscf/min. | 0.005 | GR/DSCF | 0.005000 |
| KY-0110 | 07/23/2020  ACT | EP 06-02 A & B - Lime Silos A & B | 90.019 | 70000 | ton/yr | Particulate matter, total < 2.5 Âµ (TPM2.5) | For Lime Silos A & B (EP 06-02A & B): The permittee shall install, operate, and maintain a bin vent filter on each silo designed to control particulate grain loading to 0.005 grain/dscf and the flow rate to 900 dscf/min. | 0.005 | GR/DSCF | 0.005000 |
| TX-0869 | 11/06/2019  ACT | Material Handling (Conveyors and Feeders) | 90.019 | 0 | | Particulate matter, filterable < 10 Âµ (FPM10) | BAGHOUSE | 0.005 | GR/DSCF | 0.005000 |
| TX-0869 | 11/06/2019  ACT | Stone Handling Area Crusher | 90.019 | 1428 | TON/H | Particulate matter, total (TPM) | WATER SPRAYS | 0 | | |
| TX-0869 | 11/06/2019  ACT | Product Loadout | 90.019 | 240900 | TON/YR | Particulate matter, filterable < 10 Âµ (FPM10) | BAGHOUSE | 0.005 | GR/DSCF | 0.005000 |
| TX-0869 | 11/06/2019  ACT | Product Loadout | 90.019 | 240900 | TON/YR | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | BAGHOUSE | 0.005 | GR/DSCF | 0.005000 |
| WI-0252 | 07/22/2011  ACT | P10 - LIME SILO | 90.019 | 0 | | Particulate Matter (PM) | PNEUMATIC CONVEYING, TOTAL ENCLOSURE AND BIN VENT FABRIC FILTER. | 0.13 | LB/H | 0.005000 |

**BACT Determinations for Fuel Tanks Greater than 10,000 Gallons - VOC**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit tpy |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0084 | 06/30/2017  ACT | Fuel Tanks | 42.005 | Diesel | 0 | | Volatile Organic Compounds (VOC) | Submerged Fill | 1.7 | TPY | 1.70 |
| *AK-0085 | 08/13/2020  ACT | Fuel Tanks | 42.005 | ULSD | 0 | | Volatile Organic Compounds (VOC) | Submerged Fill | 0.59 | TPY | 0.59 |
| CA-1180 | 08/24/2011  ACT | Recovered oil storage tank, external floating roof with dome | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | Requires domes on external floating roof tanks. | 0 | | |
| CA-1236 | 03/30/2014  ACT | Internal floating roof storage tank | 42.006 | GASOLINE | 0 | | Volatile Organic Compounds (VOC) | Dual rim seals | 1763.25 | LB | 0.88 |
| FL-0346 | 04/22/2014  ACT | Three ULSD fuel oil storage tanks | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | The Department sets BACT for these storage tanks to minimize VOC emissions as the use of pressure relief valves/vapor condensers. In lieu of pressure relief valves/vapor condensers, FPL as an alternative, can use tanks with internal floating roofs or the equivalent to minimize VOC emissions. | 0 | | |
| FL-0354 | 08/25/2015  ACT | Two 3-million gallon ULSD storage tanks | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | Low vapor pressure prevents evaporative losses | 0 | | |
| IL-0115 | 01/23/2015  ACT | STORAGE TANKS A-033-1 AND A-037-1 | 42.006 | | 83000 | BBL, EACH | Volatile Organic Compounds (VOC) | IFR; PRIMARY LIQUID-MOUNTED SEAL AND SECONDARY RIM-MOUNTED SEAL. | 4.7 | TONS/YEAR | 4.70 |
| IL-0118 | 01/23/2015  ACT | Product Storage Tank (Tank 2003) | 42.006 | | 200000 | bbl | Volatile Organic Compounds (VOC) | Internal Floating Roof; primary mechanical shoe seal; secondary rim-mounted seal. | 0 | | |
| IL-0119 | 01/23/2015  ACT | Gasoline Storage Tank (Tank 2002) | 42.006 | | 200000 | bbl | Volatile Organic Compounds (VOC) | IFR | 0 | | |
| IL-0119 | 01/23/2015  ACT | Distillate Storage Tank (Tank 2001) | 42.005 | | 200000 | bbl | Volatile Organic Compounds (VOC) | low vapor pressure material | 0.1 | PSIA | |
| *IL-0131 | 11/20/2020  ACT | New Storage Tank | 42.006 | | 360000 | Barrels | Volatile Organic Compounds (VOC) | The storage tank will be equipped with an external welded floating roof with rim seals and fittings on the deck of floating roof that are designed meet applicable requirements for floating roof tanks in the NSPS Subpart Kb. A sloped, drain floor. An exterior shell that is painted white. For degassing of the tank, the forced ventilation of exhaust air through manways and other openings on the side of tank shall be controlled by flare or another control device with at least 98 % control of VOM emission | 0 | | |
| *IL-0131 | 11/20/2020  ACT | Existing Storage Tanks | 42.006 | | 360000 | barrels | Volatile Organic Compounds (VOC) | The storage tank will be equipped with an external welded floating roof with rim seals and fittings on the deck of floating roof that are designed meet applicable requirements for floating roof tanks in the NSPS Subpart Kb. A sloped, drain floor. An exterior shell that is painted white. For degassing of the tank, the forced ventilation of exhaust air through manways and other openings on the side of tank shall be controlled by flare or another control device with at least 98 % control of VOM emission | 0 | | |
| IN-0158 | 12/03/2012  ACT | EMERGENCY GENERATOR ULSD TANKS | 42.005 | | 550 | GALLONS EACH | Volatile Organic Compounds (VOC) | GOOD DESIGN AND OPERATING PRACTICES | 0 | | |
| IN-0158 | 12/03/2012  ACT | FIRE PUMP ENGINE ULSD TANKS | 42.005 | | 70 | GALLONS EACH | Volatile Organic Compounds (VOC) | GOOD CUMBUSTION PRACTICE AND FUEL SPECIFICATION | 0 | | |
| IN-0158 | 12/03/2012  ACT | VEHICLE GASOLINE DISPENSING TANK | 42.005 | | 650 | GALLONS | Volatile Organic Compounds (VOC) | SUBMERGED FILL PIPES AND STAGE 1 VAPOR CONTROL | 0 | | |
| IN-0158 | 12/03/2012  ACT | VEHICLE DIESEL TANK | 42.005 | | 650 | GALLONS | Volatile Organic Compounds (VOC) | GOOD CUMBUSTION PRACTICE AND FUEL SPECIFICATION | 0 | | |
| IN-0158 | 12/03/2012  ACT | EMERGENCY GENERATOR ULSD TANK | 42.005 | | 300 | GALLONS | Volatile Organic Compounds (VOC) | GOOD CUMBUSTION PRACTICE AND FUEL SPECIFICATION | 0 | | |

**BACT Determinations for Fuel Tanks Greater than 10,000 Gallons - VOC**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit tpy |
|---|---|---|---|---|---|---|---|---|---|---|---|
| IN-0273 | 06/22/2017  ACT | DIESEL STORAGE TANK TK11 | 42.005 | DIESEL | 650 | GALLONS | Volatile Organic Compounds (VOC) | THE USE OF GOOD DESIGN AND OPERATING PRACTICES. EACH TANK SHALL UTILIZE A FIXED ROOF. | 0 | | |
| IN-0273 | 06/22/2017  ACT | DIESEL STORAGE TANK TK50 | 42.005 | DIESEL | 5000 | GALLONS | Volatile Organic Compounds (VOC) | THE USE OF GOOD DESIGN AND OPERATING PRACTICES. EACH TANK SHALL UTILIZE A FIXED ROOF. | 0 | | |
| IN-0318 | 06/11/2019  ACT | Naphtha product tanks | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | Tanks shall have an internal floating roof.<br>Tanks shall use a white shell.<br>Tanks shall use submerged filling.<br>Tanks shall use good maintenance practices as described in the permit. | 1.15 | TONS | 1.15 |
| IN-0318 | 06/11/2019  ACT | Diesel product tanks | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | Tanks shall use a white shell.<br>Tanks shall use submerged filling.<br>Tanks shall use good maintenance practices as described in the permit. | 2.29 | TONS | 2.29 |
| IN-0318 | 06/11/2019  ACT | Swing product tank T6 | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | Tank shall have an internal floating roof.<br>Tank shall use a white shell.<br>Tank shall use submerged filling.<br>Tank shall use good maintenance practices as described in the permit. | 1.15 | TONS | 1.15 |
| IN-0318 | 06/11/2019  ACT | Residue tanks | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | Tanks shall use a white shell.<br>Tanks shall use submerged filling.<br>Tanks shall use good maintenance practices as described in the permit. | 0.0001 | TONS | 0.00 |
| IN-0318 | 06/11/2019  ACT | Vacuum Gas Oil Tanks | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | Tanks shall use a white shell.<br>Tanks shall use submerged filling.<br>Tanks shall use good maintenance practices as described in the permit. | 0.175 | TONS | 0.18 |
| IN-0318 | 06/11/2019  ACT | Diesel fuel tank T17 | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | Tanks shall use a white shell.<br>Tanks shall use submerged filling.<br>Tanks shall use good maintenance practices as described in the permit. | 0.0114 | TONS | 0.01 |
| IN-0318 | 06/11/2019  ACT | Emergency engine fuel tanks | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | Tanks shall use a white shell.<br>Tanks shall use submerged filling.<br>Tanks shall use good maintenance practices as described in the permit. | 0.0114 | TONS | 0.01 |
| KY-0109 | 10/24/2016  ACT | Diesel Storage Tank (EU76) | 42.005 | | 2000 | gallons | Volatile Organic Compounds (VOC) | The diesel storage tank (EU76) shall be equipped with a permanent submerged fill pipe. | 0 | | |
| KY-0109 | 10/24/2016  ACT | Gasoline Storage Tank (EU75) | 42.005 | | 2000 | Gallon (Capacity) | Volatile Organic Compounds (VOC) | The permittee shall not allow gasoline to be handled in a manner that would result in vapor releases to the atmosphere for extended periods of time. Measures to be taken include, but are not limited to, the following:<br>i. Minimize gasoline spills;<br>ii. Clean up spills as expeditiously as practicable;<br>iii. Cover all open gasoline containers and all gasoline storage tank fill-pipes with a gasketed seal when not in use;<br>iv. Minimize gasoline sent to open waste collection systems that collect and transport gasoline to reclamation and recycling devices, such as oil/water separators.<br>The gasoline storage tank (EU75) shall be equipped with a permanent submerged fill pipe. | 0 | | |
| KY-0110 | 07/23/2020  ACT | EP 15-02 - Gasoline Storage Tanks #1 & #2 | 42.005 | | 2000 | gal combined | Volatile Organic Compounds (VOC) | The gasoline storage tanks (EP 15-02) shall be equipped with a permanent submerged fill pipe. | 0 | | |

**BACT Determinations for Fuel Tanks Greater than 10,000 Gallons - VOC**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit tpy |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LA-0265 | 10/02/2012  ACT | FR Storage Tanks EQT0087 and EQT0088 | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | Comply with 40 CFR 63 Subpart CC (Group 2) | 0 | | |
| LA-0265 | 10/02/2012  ACT | EFR Storage Tank EQT0169 | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | Comply with 40 CFR 60 Subpart Kb using an EFR | 0 | | |
| LA-0276 | 12/15/2016  ACT | Tank 190 (EQT0036 - IFR) | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | Internal floating roof and submerged fill pipe | 0 | | |
| LA-0276 | 12/15/2016  ACT | Vertical Fixed Roof Tanks 174, 175, 176 | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | Submerged fill pipes and pressure/vacuum vents | 0 | | |
| LA-0286 | 07/30/2015  ACT | TANK 6413 (22-14, EQT 48) | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | EXTERNAL FLOATING ROOF | 0 | | |
| LA-0286 | 07/30/2015  ACT | TANK 6415 (23-14, EQT 49) | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | EXTERNAL FLOATING ROOF | 0 | | |
| LA-0286 | 07/30/2015  ACT | TANK 6418 (24-14, EQT 50) | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | EXTERNAL FLOATING ROOF | 0 | | |
| LA-0286 | 07/30/2015  ACT | TANK 6419 (25-14, EQT 51) | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | EXTERNAL FLOATING ROOF | 0 | | |
| LA-0286 | 07/30/2015  ACT | TANK 6420 (26-14, EQT 52) | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | EXTERNAL FLOATING ROOF | 0 | | |
| LA-0286 | 07/30/2015  ACT | TANK 6421 (27-14, EQT 53) | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | EXTERNAL FLOATING ROOF | 0 | | |
| LA-0304 | 11/21/2016  ACT | Tanks 6413, 6415, 6418, 6419, 6420, 6421, & 6422 (EQTs 48, 49, 50, 51, 52, 53, & 54) | 42.006 | | 26093 | BBL/D | Volatile Organic Compounds (VOC) | External floating roof; complying with 40 CFR 60.112b(a)(2)(iii) during roof landings; limiting the amount of time between the cessation of pumping out product and the start of liquid heel and sludge removal from the tank floor; using a portable thermal oxidizer to control emissions from tank cleaning operations | 0 | | |
| LA-0304 | 11/21/2016  ACT | Tanks 6423, 6424, 6425, & 6426 (EQTs 55, 56, 57, & 58) | 42.006 | | 27397 | BBL/D | Volatile Organic Compounds (VOC) | External floating roof; complying with 40 CFR 60.112b(a)(2)(iii) during roof landings; limiting the amount of time between the cessation of pumping out product and the start of liquid heel and sludge removal from the tank floor; using a portable thermal oxidizer to control emissions from tank cleaning operations | 0 | | |
| LA-0309 | 06/04/2015  ACT | Gasoline Tank S16 | 42.005 | | 600 | gallons | Volatile Organic Compounds (VOC) | Submerged fill pipe | 0 | | |
| LA-0314 | 08/03/2016  ACT | Unleaded Gasoline Tank TK-33 | 42.005 | | 1000 | gallons | Volatile Organic Compounds (VOC) | Submerged fill pipe and LAC 33:III.2103 | 0 | | |
| *LA-0315 | 05/23/2014  ACT | Gasoline Day Shift Tank 1 | 42.006 | | 104.9 | MM GALS/YR | Volatile Organic Compounds (VOC) | Internal Floating Roof (IFR) Tank and compliance with NSPS 40 CFR 60 Subpart Kb | 0.48 | LB/H | 2.08 |
| *LA-0315 | 05/23/2014  ACT | Gasoline Day Shift Tank 1 | 42.006 | | 104.9 | MM GALS/YR | Volatile Organic Compounds (VOC) | Internal Floating Roof (IFR) Tank and compliance with NSPS 40 CFR 60 Subpart Kb | 0.48 | LB/H | 2.08 |
| *LA-0315 | 05/23/2014  ACT | Gasoline Day Shift Tank 2 | 42.006 | | 104.9 | MM GALS/YR | Volatile Organic Compounds (VOC) | Internal Floating Roof (IFR) Tank and compliance with NSPS 40 CFR 60 Subpart Kb | 0.48 | LB/H | 2.08 |
| *LA-0315 | 05/23/2014  ACT | Product Gasoline Tank 1 | 42.006 | | 104.9 | MM GALS/YR | Volatile Organic Compounds (VOC) | Internal Floating Roof (IFR) Tank and compliance with NSPS 40 CFR 60 Subpart Kb | 1.08 | LB/H | 4.72 |
| *LA-0315 | 05/23/2014  ACT | Product Gasoline Tank 2 | 42.006 | | 104.9 | MM GALS/YR | Volatile Organic Compounds (VOC) | Internal Floating Roof (IFR) Tank and compliance with NSPS 40 CFR 60 Subpart Kb | 1.08 | LB/H | 4.72 |
| LA-0316 | 02/17/2017  ACT | condensate tanks (3 units) | 42.006 | | 965000 | gallons (each) | Volatile Organic Compounds (VOC) | closed vent system and control devices that meet 40 CFR 60 Subpart Kb | 0 | | |
| LA-0316 | 02/17/2017  ACT | diesel tanks (2 units) | 42.006 | | 54144 | gallons (each) | Volatile Organic Compounds (VOC) | equipped with fixed roofs | 0 | | |
| LA-0320 | 03/05/2014  ACT | Equilization Tank 2013-16 | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | Comply with 40 CFR 63 Subpart CC | 0 | | |
| *LA-0344 | 05/29/2019  ACT | Tank 174 | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | Internal floating roof (IFR) | 0 | | |
| *LA-0356 | 09/27/2019  ACT | Lt. Sour Naphtha Surge Tank and Sour Water Storage Tank | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | IFR | 0 | | |

**BACT Determinations for Fuel Tanks Greater than 10,000 Gallons - VOC**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit tpy |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *LA-0376 | 07/17/2020  ACT | Natural Gasoline Tank | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | An EFR to comply with 40 CFR 63 Subpart CC | 0 | | |
| NJ-0083 | 03/11/2014  ACT | 26 Internal floating roof storage tanks for materials with RVP <= 15 | 42.006 | Material with RVP <= 15 | 2072718 | MGAL/YR | Volatile Organic Compounds (VOC) | Vapor combustion unit for cleaning & roof landings | 0 | | |
| OK-0148 | 09/12/2012  ACT | Condensate Tanks (Petroleum Storage-Fixed Roof Tanks) | 42.005 | N/A | 1.46 | MMBPY | Volatile Organic Compounds (VOC) | Flare. | 0 | | |
| OK-0153 | 03/01/2013  ACT | CONDENSATE TANKS | 42.005 | NA | 9198000 | GAL/YR | Volatile Organic Compounds (VOC) | FLARE | 0.82 | TPY | 0.82 |
| OK-0154 | 07/02/2013  ACT | DIESEL TANK (2800 GALLON) | 42.005 | NA | 2800 | GALLONS | Volatile Organic Compounds (VOC) | FIXED-ROOF TANK | 0 | | |
| OK-0175 | 06/29/2017  ACT | 250,000 BBL EFR TANKS | 42.006 | NA | 10.5 | MMBBL/YR/TANK | Volatile Organic Compounds (VOC) | Equipped with EFRs, primary mechanical shoe seals, secondary seals, and drain-dry design. | 6.43 | TONS/YR/TANK | 6.43 |
| OK-0175 | 06/29/2017  ACT | 350,000 BBL EFR TANKS | 42.006 | NA | 14.7 | MMBBL/YR/TANK | Volatile Organic Compounds (VOC) | Equipped with EFRs, primary mechanical shoe seals, and drain-dry design. | 7.47 | TON/YR/TANK | 7.47 |
| OK-0175 | 06/29/2017  ACT | 500,000 BBL EFR TANKS | 42.006 | NA | 21 | MMBBL/YR/TANK | Volatile Organic Compounds (VOC) | Equipped with EFR, primary mechanical shoe seals, secondary seals, and drain-dry design. | 8.78 | TON/YR/TANK | 8.78 |
| OK-0175 | 06/29/2017  ACT | 20,000 BBL EFR TANK | 42.006 | NA | 840 | MMBBL/YR | Volatile Organic Compounds (VOC) | Equipped with EFR, primary mechanical shoe seal, secondary seal, and drain-dry design. | 2.16 | TON/YR | 2.16 |
| OK-0176 | 07/19/2017  ACT | 250,000 BBL EFR TANKS | 42.006 | NA | 54450000 | BBL/TANK/YEAR | Volatile Organic Compounds (VOC) | Equipped with EFR, primary mechanical shoe seals, secondary seals, and drain-dry design. | 217.24 | TONS/YEAR/FACILITY | 217.24 |
| *OK-0180 | 08/27/2019  ACT | Thirty (30) 270,000-bbl EFR Crude Oil Storage Tanks | 42.006 | NA | 6445918 | BBL/TANK/YR | Volatile Organic Compounds (VOC) | EFR tanks equipped with primary mechanical shoe seal and a secondary seal. Drain-dry design. | 109.5 | TPY | 109.50 |
| *OK-0180 | 08/27/2019  ACT | Seventeen (17) 270,000-bbl EFR Crude Oil Storage Tanks | 42.006 | NA | 6445918 | BBL/TANK/YR | Volatile Organic Compounds (VOC) | EFR tanks equipped with primary mechanical seal and secondary seal. Drain-dry design. | 64.2 | TPY | 64.20 |
| *OK-0181 | 09/11/2019  ACT | 20000 bbl IFR TANK | 42.006 | NA | 1000000 | BBL PER YR | Volatile Organic Compounds (VOC) | Equipped with IFR, primary mechanical shoe seal, and drain-dry design. Normal operations limited to 2.16 tpy. Landings limited to 0.09 tons per event, 0.2 tpy, and 21.15 tpy facility-wide. Cleanings limited to 0.79 tons per event, 0.8 tpy, and 18.90 tpy facility-wide. | 2.16 | TPY | 2.16 |
| OR-0050 | 03/05/2014  ACT | Storage tank | 42.005 | ULSD | 0 | | Volatile Organic Compounds (VOC) | Submerged fill line;<br>Vapor balancing during tank filling. | 0 | | |
| *PA-0326 | 02/18/2021  ACT | Diesel Fuel Storage Tanks 18,000 gal | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | tank vents controlled by carbon canisters designed to reduce VOC emissions by a minimum 95% | 0 | | |
| *SC-0193 | 04/15/2016  ACT | Storage Tank | 42.005 | Gasoline | 5000 | gal | Volatile Organic Compounds (VOC) | Stage 1 Vapor Control | 0 | | |
| TX-0637 | 10/15/2013  ACT | Petroleum Liquid Storage in loating Roof Tanks | 42.006 | not applicable | 1300000 | bbl | Volatile Organic Compounds (VOC) | Welded decks, mechanical shoe primary and rim-mounted secondary seal for stock with VP>0.10 psia. Control is required during loading of marine vessels and during roof landings for VP>0.10 psia. | 14.37 | TPY | 14.37 |
| TX-0653 | 02/18/2014  ACT | Petroleum Liquid Marketing; Petroleum Liquid Storage in Floating Roof Tanks | 42.006 | natural gas as pilot fuel for VCU | 250 | Mbbl | Volatile Organic Compounds (VOC) | For storage of VOC in floating roof tanks, the tanks will have welded decks, mechanical shoe primary and rim-mounted secondary seal for VOC with a vapor pressure >0.5 psia. Floating roof tank landings are limited in frequency and duration. | 11.23 | TPY | 11.23 |
| TX-0656 | 05/16/2014  ACT | Fixed Roof Tanks (3) | 42.005 | | 800000 | GAL/YR | Volatile Organic Compounds (VOC) | WATER SCRUBBER | 1.65 | T/YR | 1.65 |
| TX-0728 | 04/01/2015  ACT | Diesel and lube oil tanks | 42.005 | | 10708 | gallons/yr | Volatile Organic Compounds (VOC) | low vapor pressure fuel, submerged fill, white tank | 0.02 | LB/H | 0.01 |
| TX-0731 | 04/10/2015  ACT | Petroleum Liquids Storage in Fixed Roof Tanks | 42.005 | | 3.4 | MMBbl/yr/tank | Volatile Organic Compounds (VOC) | Temperature reduced to maintain volatile organic compound (VOC) vapor pressure < 0.5 pounds per square inch actual (psia) at all times. | 15.78 | TONS/YR/TANK | 15.78 |

**BACT Determinations for Fuel Tanks Greater than 10,000 Gallons - VOC**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit tpy |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0731 | 04/10/2015  ACT | Petroleum Liquids Storage in Floating Roof Tanks | 42.006 | | 8 | MMBbl/yr/tank | Volatile Organic Compounds (VOC) | Required floating roof with welded deck seams if the tank will store products with VOC vapor pressure of 0.5 psia or greater. Proper fitting and seal integrity for the floating roof is ensured through visual inspections and any seal gap measurements specified in 40 CFR Â§ 60.113b.<br><br>The vapor space under the floating roof must be routed to a control device during standing idle periods until the vapor space VOC concentration is 10,000 ppmv or less. The tank roof must be landed on its lowest legs unless tank entry is planned. Refilling must also be controlled if the product stored has a VOC vapor pressure of 0.5 psia or greater. | 5.09 | TONS/YR/TANK | 5.09 |
| TX-0745 | 06/03/2015  ACT | Petroleum Liquids Storage in Floating Roof Tanks - 45 MMbbl | 42.006 | | 48 | turnovers/yr/tank | Volatile Organic Compounds (VOC) | Required floating roof with welded deck seams if the tank will store products with VOC vapor pressure of 0.5 psia or greater. Proper fitting and seal integrity for the floating roof is ensured through visual inspections and any seal gap measurements specified in 40 CFR Â§ 60.113b.<br><br>The vapor space under the floating roof must be routed to a control device during standing idle periods until the vapor space VOC concentration is 10,000 ppmv or less. The tank roof must be landed on its lowest legs unless tank entry is planned. Refilling must also be controlled if the product stored has a VOC vapor pressure of 0.5 psia or greater. | 2.06 | TONS/YR/TANK | 2.06 |
| TX-0745 | 06/03/2015  ACT | Petroleum Liquids Storage in Floating Roof Tanks - 50 MMBbl | 42.006 | | 60 | turnovers/yr/tank | Volatile Organic Compounds (VOC) | Required floating roof with welded deck seams if the tank will store products with VOC vapor pressure of 0.5 psia or greater. Proper fitting and seal integrity for the floating roof is ensured through visual inspections and any seal gap measurements specified in 40 CFR Â§ 60.113b.<br><br>The vapor space under the floating roof must be routed to a control device during standing idle periods until the vapor space VOC concentration is 10,000 ppmv or less. The tank roof must be landed on its lowest legs unless tank entry is planned. Refilling must also be controlled if the product stored has a VOC vapor pressure of 0.5 psia or greater. | 4.18 | TONS/YR/TANK | 4.18 |

**BACT Determinations for Fuel Tanks Greater than 10,000 Gallons - VOC**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit tpy |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0745 | 06/03/2015  ACT | Petroleum Liquids Storage in Floating Roof Tanks -115 MMBbl | 42.006 | | 60 | turnovers/yr/tank | Volatile Organic Compounds (VOC) | Required floating roof with welded deck seams if the tank will store products with VOC vapor pressure of 0.5 psia or greater. Proper fitting and seal integrity for the floating roof is ensured through visual inspections and any seal gap measurements specified in 40 CFR Â§ 60.113b.<br><br>The vapor space under the floating roof must be routed to a control device during standing idle periods until the vapor space VOC concentration is 10,000 ppmv or less. The tank roof must be landed on its lowest legs unless tank entry is planned. Refilling must also be controlled if the product stored has a VOC vapor pressure of 0.5 psia or greater. | 3.71 | TONS/YR/TANK | 3.71 |
| TX-0745 | 06/03/2015  ACT | Petroleum Liquids Storage in Floating Roof Tanks - 285 MMBbl | 42.006 | | 36 | turnovers/yr/tank | Volatile Organic Compounds (VOC) | Required floating roof with welded deck seams if the tank will store products with VOC vapor pressure of 0.5 psia or greater. Proper fitting and seal integrity for the floating roof is ensured through visual inspections and any seal gap measurements specified in 40 CFR Â§ 60.113b.<br><br>The vapor space under the floating roof must be routed to a control device during standing idle periods until the vapor space VOC concentration is 10,000 ppmv or less. The tank roof must be landed on its lowest legs unless tank entry is planned. Refilling must also be controlled if the product stored has a VOC vapor pressure of 0.5 psia or greater. | 7.32 | TONS/YR/TANK | 7.32 |
| TX-0752 | 06/22/2015  ACT | Storage Tanks | 42.006 | | 110 | MBBL/YR | Volatile Organic Compounds (VOC) | | 81.57 | T/YR | 81.57 |
| TX-0756 | 06/19/2015  ACT | Storage Tanks, TK-101, TK-102, TK-103, TK-104 | 42.006 | | 383000000 | gal/yr/tank | Volatile Organic Compounds (VOC) | | 6.44 | LB/HR | 2.62 |
| TX-0756 | 06/19/2015  ACT | Storage Tanks, TK-105, TK-106 | 42.006 | | 300000000 | gal/yr/tank | Volatile Organic Compounds (VOC) | | 2.35 | LB/R | 3.95 |
| TX-0756 | 06/19/2015  ACT | Storage Tanks 116, TK-117, TK-118, and TK-119 | 42.006 | | 744282000 | gal/yr/tank | Volatile Organic Compounds (VOC) | | 6.38 | LB/HR | 3.48 |
| TX-0756 | 06/19/2015  ACT | Storage Tanks, TK-107, TK-108, TK-109, 42.005 | 42.006 | | 60300 | gal/hr | Volatile Organic Compounds (VOC) | | 4.2 | LB/HR | 3.26 |
| TX-0756 | 06/19/2015  ACT | Storage Tanks, TK-110, TK-111, TK-112 | 42.005 | | 57960 | gal/hr | Volatile Organic Compounds (VOC) | | 3.07 | LB/HR | 2.63 |
| TX-0756 | 06/19/2015  ACT | Storage Tanks, TK-113, TK-114, and TK-115 | 42.005 | | 47000000 | gal/yr/tank | Volatile Organic Compounds (VOC) | | 0.85 | LB/HR | 1.15 |
| TX-0756 | 06/19/2015  ACT | Storage Tanks, TK-120 and TK-121 | 42.006 | | 1437817500 | gal/yr/tank | Volatile Organic Compounds (VOC) | | 5.43 | LB/HR | 7.33 |
| TX-0756 | 06/19/2015  ACT | Floating Roof Storage Tanks - Controlled Maintenance, Startup and Shutdown (MSS) | 42.006 | | 5000 | scf/hr | Volatile Organic Compounds (VOC) | | 10000 | PPMV | 7.82 |
| TX-0772 | 11/06/2015  ACT | Petroleum Liquids Storage in Floating Roof Tanks | 42.006 | | 276565714 | BBL/YR | Volatile Organic Compounds (VOC) | | 289.13 | T/YR | 289.13 |
| TX-0772 | 11/06/2015  ACT | Petroleum Liquids Storage in Fixed Roof Tanks | 42.005 | | 47.62 | BBL/YR | Volatile Organic Compounds (VOC) | | 0.01 | T/YR | 0.01 |

**BACT Determinations for Fuel Tanks Greater than 10,000 Gallons - VOC**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit tpy |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0797 | 05/04/2016  ACT | Petroleum Liquid Storage in Floating Roof Tanks | 42.006 | | 146 | MM BBL / YR | Volatile Organic Compounds (VOC) | | 24.37 | T/YR | 24.37 |
| TX-0799 | 06/08/2016  ACT | Storage Tanks -IFR | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 109.17 | T/YR | 109.17 |
| TX-0799 | 06/08/2016  ACT | Storage Tanks - EFR | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 384.37 | T/YR | 384.37 |
| TX-0799 | 06/08/2016  ACT | Storage Tanks - fixed roof | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 72.5 | T/YR | 72.50 |
| TX-0799 | 06/08/2016  ACT | Storage Tanks Floating Roof MSS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 28.83 | T/YR | 28.83 |
| TX-0800 | 06/22/2016  ACT | Storage Tanks | 42.006 | | 3655000 | BBL/YR | Volatile Organic Compounds (VOC) | | 57.42 | T/YR | 57.42 |
| TX-0800 | 06/22/2016  ACT | Floating Roof Storage Tanks - Controlled Maintenance, Startup and Shutdown (MSS) | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0.8 | T/YR | 0.80 |
| TX-0808 | 09/02/2016  ACT | Storage Tank | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 0.1 | T/YR | 0.10 |
| TX-0808 | 09/02/2016  ACT | Storage Tanks | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 6.43 | T/YR | 6.43 |
| TX-0812 | 10/31/2016  ACT | Petroleum Liquid Storage in Floating Roof tanks | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 3.04 | T/YR | 3.04 |
| TX-0813 | 11/22/2016  ACT | Petroleum Liquid Storage in Fixed Roof tanks | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 0.01 | T/YR | 0.01 |
| TX-0818 | 04/26/2017  ACT | Storage Tanks | 42.006 | | 45000 | BBL/H | Volatile Organic Compounds (VOC) | | 90.36 | T/YR | 90.36 |
| TX-0818 | 04/26/2017  ACT | STORAGE TANKS MSS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 19.37 | T/YR | 19.37 |
| TX-0825 | 07/14/2017  ACT | Internal floating roof storage tanks maintenance, startup, and shutdown | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 26.28 | T/YR | 26.28 |
| TX-0825 | 07/14/2017  ACT | Horizontal fixed roof storage tanks | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 0.37 | T/YR | 0.37 |
| TX-0825 | 07/14/2017  ACT | Horizontal fixed roof storage tanks maintenance, start up, and shutdown | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 26.28 | T/YR | 26.28 |
| TX-0835 | 04/13/2018  ACT | IFR STORAGE TANK | 42.006 | | 31830071 | BBL/YR | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0836 | 05/11/2018  ACT | FIXED ROOF STORAGE TANKS | 42.005 | POLYALPHA OLEFINS | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0836 | 05/11/2018  ACT | IFR STORAGE TANKS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0840 | 10/31/2018  ACT | Heavy oil storage | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0840 | 10/31/2018  ACT | TANK MSS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0844 | 07/25/2018  ACT | STORAGE TANKS MSS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0844 | 07/25/2018  ACT | STORAGE TANKS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 14 | T/YR | 14.00 |
| TX-0847 | 09/16/2018  ACT | External Floating roof storage tanks | 42.006 | | 45000 | BBL/HR | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0847 | 09/16/2018  ACT | Coker sludge feed tanks | 42.005 | | 12000 | GAL/HR | Volatile Organic Compounds (VOC) | | 100 | PPM | |
| TX-0850 | 07/15/2018  ACT | Heavy oil storage in fixed roof tank | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |

**BACT Determinations for Fuel Tanks Greater than 10,000 Gallons - VOC**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit tpy |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0850 | 07/15/2018  ACT | IFR & EFR MSS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0852 | 01/02/2019  ACT | IFR TANKS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0855 | 03/13/2019  ACT | Internal Floatin Roof Storage Tanks | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0855 | 03/13/2019  ACT | Fixed Roof Tanks | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0855 | 03/13/2019  ACT | Storage Tanks MSS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0861 | 08/29/2019  ACT | FIXED ROOF TANKS | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0861 | 08/29/2019  ACT | FIXED ROOF TANKS | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0861 | 08/29/2019  ACT | IFR TANKS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0861 | 08/29/2019  ACT | IFR TANKS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0861 | 08/29/2019  ACT | IFR ROOF LANDINGS (MSS) | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0862 | 09/27/2019  ACT | IFR | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0862 | 09/27/2019  ACT | IFR MSS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0864 | 09/09/2019  ACT | Fixed Roof Storage Tanks | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0871 | 01/31/2020  ACT | Floating roof tanks | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0872 | 10/31/2019  ACT | IFR tanks with equal or greater than 0.5 psia VP (Routine) | 42.006 | | 9 | MBBL/YR | Volatile Organic Compounds (VOC) | | 5.65 | LB/H | 24.75 |
| TX-0872 | 10/31/2019  ACT | IFR Storage Tank MSS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0873 | 02/04/2020  ACT | IFR TANKS STORING < 0.5 PSIA | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0873 | 02/04/2020  ACT | IFR TANKS VP . 0.5 PSIA | 42.006 | | 509589 | BBL/MO | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0873 | 02/04/2020  ACT | EFR TANKS VP< 0.5 PSIA | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0873 | 02/04/2020  ACT | EFR TANKS > 0.5 PSIA < 11 PSIA | 42.006 | | 14737040 | BBL/MO | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0873 | 02/04/2020  ACT | HEATED VFR TANK < 0.5 PSIA | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0873 | 02/04/2020  ACT | FLOATING ROOF TANK DEGASSING | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0874 | 02/04/2020  ACT | EFR Storage Tanks1 â€“ Materials with a VP equal or less than 0.5 psia | 42.006 | | 3.4 | MMGAL/YR | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0874 | 02/04/2020  ACT | EFR Storage Tanks1 â€“ Materials with a VP greater than 0.5 psia and less than 11.0 psia | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0874 | 02/04/2020  ACT | VFR Storage Tanks1 â€“ Materials with a VP equal or less than 0.5 psia | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0879 | 02/19/2020  ACT | BALLAST TANK | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0887 | 04/07/2020  ACT | External Floating Roof Storage Tanks | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |

**BACT Determinations for Fuel Tanks Greater than 10,000 Gallons - VOC**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit tpy |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TX-0888 | 04/23/2020  ACT | FIXED ROOF STORAGE TANKS | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0888 | 04/23/2020  ACT | Internal Floating Roof Storage Tanks | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0891 | 07/13/2020  ACT | EFR Storage Tanks | 42.006 | | 572 | GAL/DAY/TANK | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0891 | 07/13/2020  ACT | Uncontrolled Floating Roof Storage Tanks â€“ Standing Idle | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0891 | 07/13/2020  ACT | IFR Storage Tanks | 42.006 | | 312 | GAL/DAY/TANK | Volatile Organic Compounds (VOC) | | 0 | | |
| TX-0891 | 07/13/2020  ACT | Controlled Floating Roof Degassing | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| *TX-0899 | 03/05/2021  ACT | STORAGE TANK MSS | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| *TX-0903 | 09/09/2020  ACT | External Floating roof storage tank (EPN 68-95-91A) | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| *WI-0261 | 06/12/2014  ACT | Crude Oil Storage Tanks (T43 - T45) | 42.006 | | 0 | | Volatile Organic Compounds (VOC) | | 0.88 | TONS VOC / MONTH | 10.56 |
| *WI-0279 | 10/02/2017  ACT | FT02 â€“ Diesel Fuel Tank Storage | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| *WI-0284 | 04/24/2018  ACT | T01, T02, & T03 Diesel Storage Tank | 42.005 | | 0 | | Volatile Organic Compounds (VOC) | | 0 | | |
| WY-0071 | 10/15/2012  ACT | Storage Tank | 42.006 | | 100 | MMbbls | Volatile Organic Compounds (VOC) | | 0 | | |

## BACT Determinations for Waste and Sewage Sludge Incinerators - CO

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit ppmvd |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Waste Incinerator | 21.4 | Gas, ULSD, or Trash | 4.9 | MMBTU/H | Carbon Monoxide | | 13 | PPMV | 13 |
| AK-0082 | 01/23/2015  ACT | Remote Incinerator Generator Engine | 21.4 | Ultra Low Sulfur Diesel | 102 | hp | Carbon Monoxide | | 10 | LB/TON | |
| AK-0084 | 06/30/2017  ACT | Incinerator (Camp Waste) | 21.4 | | 990 | lb/hr | Carbon Monoxide | Good Combustion Practices | 13 | PPMVD AT 7% 02 | 13 |
| AK-0084 | 06/30/2017  ACT | Incinerator (Sewage Sludge) | 21.5 | | 0.06 | ton/day | Carbon Monoxide | Good Combustion Practices | 52 | PPMVD AT 7% 02 | 52 |
| *PA-0280 | 08/24/2011  ACT | SEWAGE SLUDGE INCINERATOR 1 & 2 | 21.5 | sewage sludge | 0 | | Carbon Monoxide | | 11.81 | LB/H | |
| PR-0009 | 04/10/2014  ACT | Two Identical Municipal Solid Waste Combustors Units | 21.4 | municipal solid waste | 2106 | tons per day | Carbon Monoxide | Oxidation Catalyst. The Regenerative Selective Catalytic Reduction System has two modules: an Selective Catalytic Reduction System moduel, for NOx emissions control; and an Oxidation Catalyst module, for CO and VOC emissions control. | 75 | PPMVD@7%O2 | 75 |

**BACT Determinations for Waste and Sewage Sludge Incinerators - $NO_X$**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit ppmvd |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Waste Incinerator | 21.4 | Gas, ULSD, or Trash | 4.9 | MMBTU/H | Nitrogen Oxides (NOx) | | 170 | PPMV | 170 |
| AK-0082 | 01/23/2015  ACT | Remote Incinerator Generator Engine | 21.4 | Ultra Low Sulfur Diesel | 102 | hp | Nitrogen Oxides (NOx) | | 3 | LB/TON | |
| AK-0084 | 06/30/2017  ACT | Incinerator (Camp Waste) | 21.4 | | 990 | lb/hr | Nitrogen Oxides (NOx) | Good Combustion Practices | 170 | PPMVD AT 7% 02 | 170 |
| AK-0084 | 06/30/2017  ACT | Incinerator (Sewage Sludge) | 21.5 | | 0.06 | ton/day | Nitrogen Oxides (NOx) | Good Combustion Practices | 210 | PPMVD AT 7% 02 | 210 |
| *PA-0280 | 08/24/2011  ACT | SEWAGE SLUDGE INCINERATOR 1 & 2 | 21.5 | sewage sludge | 0 | | Nitrogen Oxides (NOx) | | 17.63 | LB/H | |
| PR-0009 | 04/10/2014  ACT | Two Identical Municipal Solid Waste Combustors Units | 21.4 | municipal solid waste | 2106 | tons per day | Nitrogen Oxides (NOx) | Regenerative Selective Catalytic Reduction System | 45 | PPMVD@7%O2 | 45 |
| VA-0329 | 02/08/2019  ACT | three (3) municipal waste combusters | 21.4 | | 121.8 | MMBtu | Nitrogen Oxides (NOx) | Emissions will be controlled by furnace design, proper operation, good combustion practices, ammonia injection (selective non-catalytic reduction (SNCR), and the Covanta proprietary low NOX combustion system (LNTM). | 110 | PPMVD @ 7% O2 | 110 |
| VA-0330 | 02/08/2019  ACT | Four (4) municipal waste combustors | 21.4 | | 750 | T | Nitrogen Oxides (NOx) | Controlled by furnace design, proper operation, ammonia injection (selective non-catalytic reduction (SNCR)), and the Covanta proprietary low NOX combustion system (LNTM). | 110 | PPMVD @ 7% O2 | 110 |

**BACT Determinations for Waste and Sewage Sludge Incinerators - Particulates**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit mg/dscm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Waste Incinerator | 21.4 | Gas, ULSD, or Trash | 4.9 | MMBTU/H | Particulate matter, filterable < 10 Âµ (FPM10) | | 270 | MG/DSCM | 270 |
| AK-0082 | 01/23/2015  ACT | Remote Incinerator Generator Engine | 21.4 | Ultra Low Sulfur Diesel | 102 | hp | Particulate matter, filterable < 10 Âµ (FPM10) | | 7 | LB/TON | |
| AK-0084 | 06/30/2017  ACT | Incinerator (Camp Waste) | 21.4 | | 990 | lb/hr | Particulate matter, total (TPM) | Good Combustion Practices | 270 | MG/DSCM AT 7% O2 | 270 |
| AK-0084 | 06/30/2017  ACT | Incinerator (Sewage Sludge) | 21.5 | | 0.06 | ton/day | Particulate matter, total (TPM) | Good Combustion Practices | 60 | MG/DSCM AT 7% O2 | 60 |
| *PA-0280 | 08/24/2011  ACT | SEWAGE SLUDGE INCINERATOR 1 & 2 | 21.5 | sewage sludge | 0 | | Total Suspended Particulates | VENTURI & IMPINGEMENT TRAY SCRUBBER | 0.1 | GR/DRY FT3 | |
| PR-0009 | 04/10/2014  ACT | Two Identical Municipal Solid Waste Combustors Units | 21.4 | municipal solid waste | 2106 | tons per day | Particulate matter, total < 10 Âµ (TPM10) | Fabric Filters | 24 | MG/DSCM@7%O2 | 24 |

**BACT Determinations for Waste and Sewage Sludge Incinerators - GHG**

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | PRIMARY_FUEL | THROUGHPUT | THROUGHPUT_UNIT | POLLUTANT | CONTROL_METHOD_DESCRIPTION | EMISSION_LIMIT_1 | EMISSION_LIMIT_1_UNIT | Std Units Limit ppmvd |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Waste Incinerator | 21.4 | Gas, ULSD, or Trash | 4.9 | MMBTU/H | Carbon Dioxide Equivalent (CO2e) | | 981 | TONS/YEAR | 981 |
| AK-0082 | 01/23/2015  ACT | Remote Incinerator Generator Engine | 21.4 | Ultra Low Sulfur Diesel | 102 | hp | Carbon Dioxide Equivalent (CO2e) | | 892 | TONS/YEAR | 892 |
| AK-0084 | 06/30/2017  ACT | Incinerator (Camp Waste) | 21.4 | | 990 | lb/hr | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices | 3934 | TPY | 3934 |
| AK-0084 | 06/30/2017  ACT | Incinerator (Sewage Sludge) | 21.5 | | 0.06 | ton/day | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices | 3934 | TPY | 3934 |
| PR-0009 | 04/10/2014  ACT | Two Identical Municipal Solid Waste Combustors Units | 21.4 | municipal solid waste | 2106 | tons per day | Carbon Dioxide Equivalent (CO2e) | Thermal efficiency of 13.25 MMBTU/MWh based on 30-day rolling average | 0.29 | LB CO2E/ LB OF STEAM | |

## BACT Determinations for Fugitive Dust from Unpaved Roads - Particulates

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | POLLUTANT | CONTROL_METHOD_DESCRIPTION | PERCENT_EFFICIENCY |
|---|---|---|---|---|---|---|
| AK-0084 | 06/30/2017  ACT | Fugitive Dust from Unpaved Roads | 99.15 | Particulate matter, total (TPM) | Water and Chemical Suppressant Spray | 90 |
| AR-0124 | 08/03/2015  ACT | HAUL ROADS SN-09 | 99.15 | Particulate matter, total (TPM) | ROAD WATERING PLAN + 0% OFF-SITE OPACITY | 90 |
| *AR-0172 | 09/01/2021  ACT | SN-121 SN-211 Unpaved Roads | 99.15 | Particulate matter, total < 10 Âµ (TPM10) | Water Sprays, low silt surface | 85 |
| CO-0074 | 07/09/2012  ACT | Haul roads | 99.15 | Particulate matter, filterable < 10 Âµ (FPM10) | Plant roads â€“ since almost all plant roads are already paved and are actively swept, BACT was determined to be paved and swept roads. Emissions from unpaved roads shall be controlled by applying water as needed.<br><br>Quarry roads â€“ The combination of inherent moisture content supplemented by water application as needed was determined to be BACT for the quarry roads. | |
| *FL-0368 | 02/14/2019  ACT | Roads | 99.15 | Particulate matter, fugitive | Fugitive Dust Control Plan | |
| *KS-0034 | 05/27/2014  ACT | Biomass Laydown Roads (Unpaved) | 99.15 | Particulate matter, total (TPM) | Truck traffic fugitive control strategy and monitoring plan, including sweeping and speed limits | |
| KY-0110 | 07/23/2020  ACT | EP 14-02 - Unpaved Roadways | 99.15 | Particulate matter, fugitive | use of dust suppressants | |
| KY-0115 | 04/19/2021  ACT | Unpaved Roads (EP 04-02) | 99.15 | Particulate matter, total < 10 Âµ (TPM10) | Wetting/Dust suppressants | 70 |
| OH-0344 | 01/27/2011  ACT | Paver and unpaved roadways and parking areas | 99.15 | Particulate matter, fugitive | Employ best available control measures: watering, sweeping, chemical stabilization, or suppressants applied at sufficient frequencies. | |

## BACT Determinations for Fugitive Dust from Unpaved Roads - Particulates

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | POLLUTANT | CONTROL_METHOD_DESCRIPTION | PERCENT_EFFICIENCY |
|---|---|---|---|---|---|---|
| OH-0379 | 02/06/2019  ACT | Plant Roadways (F001) | 99.15 | Particulate matter, total < 10 Âµ (TPM10) | Use of wet suppression and commercial dust suppressants.<br><br>Develop and implement a site-specific work practice plan designed as described to minimize or eliminate fugitive dust emissions. | |
| OK-0173 | 01/19/2016  ACT | Unpaved Roads | 99.15 | Particulate matter, total < 10 Âµ (TPM10) | BACT for PM emissions from roads is selected as work-practice standards of paving roads, sweeping them when needed, and setting of speed limits to minimize fugitive dust emissions. Since the PM emissions are fugitive, no numerical limitation is practical. | |

## BACT Determinations for Fugitive Dust from Material Loading and Unloading - Particulates

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | POLLUTANT | CONTROL_METHOD_DESCRIPTION | PERCENT_EFFICIENCY |
|---|---|---|---|---|---|---|
| AK-0084 | 06/30/2017  ACT | Material Loading and Unloading | 99.19 | Particulate matter, total (TPM) | Best Practical Methods/Fugitive Dust Control Plan (includes water spray) | 90 |
| IN-0166 | 06/27/2012  ACT | TWO (2) STORAGE PILES | 99.19 | Particulate matter, total < 10 Âµ (TPM10) | WET SUPPRESSION WITH PILE COMPACTION | 90 |
| IN-0167 | 04/16/2013  ACT | RECYCLED DUST STORAGE AREA | 99.19 | Particulate matter, total < 10 Âµ (TPM10) | BAGHOUSE CE024 | 99 |
| IN-0185 | 04/24/2014  ACT | RECYCLED DUST STORAGE AREA | 99.19 | Particulate matter, filterable < 2.5 Âµ (FPM2.5) | BAGHOUSE | |
| KY-0110 | 07/23/2020  ACT | EP 12-02 - Slag Processing Piles | 99.19 | Particulate matter, fugitive | Use of dust suppressants | |
| LA-0248 | 01/27/2011  ACT | DRI-118 - DRI Barge Loading Dock | 99.19 | Particulate matter, filterable < 10 Âµ (FPM10) | High-energy wet scrubber. Additionally, hooded conveyors and enclosed transfer stations will be installed to limit emissions from material handling. | 99 |
| LA-0305 | 06/30/2016  ACT | Coke Handling | 99.19 | Particulate matter, total < 10 Âµ (TPM10) | baghouses | |
| *LA-0356 | 09/27/2019  ACT | Coke Handling | 99.19 | Particulate matter, total < 10 Âµ (TPM10) | Enclosure and maintaining a minimum moisture content of 8% | |
| MI-0401 | 12/21/2011  ACT | Biomass feedstock handling | 99.19 | Particulate matter, total < 10 Âµ (TPM10) | Enclosed systems plus fabric filter dust collectors for each of three buildings. Fugitive dust control plan and dust suppression as needed for outdoor emissions. | |
| OH-0350 | 07/18/2012  ACT | Flux and Carbon storage material handling | 99.19 | Particulate matter, total < 10 Âµ (TPM10) | Enclosures and baghouse | |
| SC-0183 | 05/04/2018  ACT | Raw Material Handling and Processing (carbon dump fugitives) | 99.19 | Particulate matter, filterable (FPM) | Good Work Practice Standards and Proper Operation and Maintenance. | |
| SC-0183 | 05/04/2018  ACT | Raw Material Handling and Processing (lime dump fugitives) | 99.19 | Particulate matter, filterable (FPM) | Good Work Practice Standards and Proper Operation and Maintenance | |

## BACT Determinations for Fugitive Dust from Material Loading and Unloading - Particulates

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | POLLUTANT | CONTROL_METHOD_DESCRIPTION | PERCENT_EFFICIENCY |
|---|---|---|---|---|---|---|
| SC-0183 | 05/04/2018  ACT | Raw Material Handling and Processing (alloy grizzly fugitives) | 99.19 | Particulate matter, filterable (FPM) | Good Work Practice Standards and Proper Operation and Maintenance. | |
| SC-0196 | 04/29/2019  ACT | Raw Material Handling and Maintenance Activities | 99.19 | Particulate matter, filterable (FPM) | Good work practices and follow dust minimization plan. | |
| SC-0196 | 09/09/2019  ACT | PRODUCT HANDLING | 99.19 | Particulate matter, filterable < 10 Âµ (FPM10) | BAGHOUSE | |

## BACT Determinations for Fugitive Dust from Wind Erosion - Particulates

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | POLLUTANT | CONTROL_METHOD_DESCRIPTION | PERCENT_EFFICIENCY |
|---|---|---|---|---|---|---|
| AK-0084 | 06/30/2017  ACT | Fugitive Dust from Wind Erosion | 99.19 | Particulate matter, total (TPM) | Best Practical Methods / Fugitive Dust Control Plan (includes applying water) | 90 |
| CO-0074 | 07/09/2012  ACT | Storage Piles | 99.19 | Particulate matter, filterable < 10 Âµ (FPM10) | Plant storage â€“ BACT is determined to be use of enclosure (covering the storage pile with tarps)<br><br>Quarry storage â€“ BACT is determined to be use of the inherent moisture content supplemented with water application as needed. | |

## BACT Determinations for Drilling and Blasting - All BACT Pollutants

| RBLCID | PERMIT_ISSUANCE_DATE | PROCESS_NAME | PROCESS_TYPE | POLLUTANT | CONTROL_METHOD_DESCRIPTION | PERCENT_EFFICIENCY |
|---|---|---|---|---|---|---|
| AK-0082 | 01/23/2015  ACT | Drilling, HP, and LP Flares | 19.31 | Volatile Organic Compounds (VOC) | | 0 |
| AK-0082 | 01/23/2015  ACT | Drilling, HP, and LP Flares | 19.31 | Carbon Monoxide | | 0 |
| AK-0082 | 01/23/2015  ACT | Drilling, HP, and LP Flares | 19.31 | Carbon Dioxide | | 0 |
| AK-0082 | 01/23/2015  ACT | Drilling, HP, and LP Flares | 19.31 | Nitrogen Oxides (NOx) | | 0 |
| AK-0082 | 01/23/2015  ACT | Drilling, HP, and LP Flares | 19.31 | Particulate matter, filterable < 10 Âµ (FPM10) | | 0 |
| AK-0084 | 06/30/2017  ACT | Drilling and Blasting | 99.19 | Particulate matter, total (TPM) | Best Practical Methods | 0 |
| AK-0084 | 06/30/2017  ACT | Drilling and Blasting | 99.19 | Carbon Dioxide Equivalent (CO2e) | Good Combustion Practices | 0 |
| AK-0084 | 06/30/2017  ACT | Drilling and Blasting | 99.19 | Carbon Monoxide | Good Combustion Practices | 0 |
| AK-0084 | 06/30/2017  ACT | Drilling and Blasting | 99.19 | Nitrogen Oxides (NOx) | Good Combustion Practices | 0 |

# Attachment C3 – BACT Cost Calculations

| Air Sciences Inc. | PROJECT TITLE: Donlin | | | BY: K. LEWIS |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 1 | OF: 2 | SHEET: Boil-Ox |
| CALCULATIONS | SUBJECT: Boilers/Heater - Ox. Cat. | DATE: October 13, 2021 | | |

**Process Heaters**

**Boiler/Heater**
**POX Boiler No. 1 - 17-BLR-301** A
Make and Model Clayton Industries, E704
Rating 29.29 *MMBtu/hr* *Man. Spec. Sheet*

**Boiler/Heater**
**POX Boiler No. 2 - 17-BLR-302** B
Make and Model Clayton Industries, E704
Rating 29.29 *MMBtu/hr* *Man. Spec. Sheet*

**Boiler/Heater**
**Oxygen Plant Boiler - 33-BLR-001** C
Make and Model Clayton Industries, E504
Rating 20.66 *MMBtu/hr* *Man. Spec. Sheet*

**Boiler/Heater**
**Power Plant Aux. Heater No. 1&2 - PP-HEU-100&200 (each)** D
Rating 16.5 *MMBtu/hr* *Man. Spec. Sheet*

**Boiler/Heater**
**Carbon Elution Heater - 56-BLR-200** E
Make and Model Sigma Thermal, HC2-12.5-H-SF
Rating 16 *MMBtu/hr* *Man. Spec. Sheet*

**Boiler/Heater**
**Air Handlers** F
Make and Model Bousquet, HDG(H)-400
Rating 5 *MMBtu/hr*

EPA Method 19

| | A | B | C | D | E | F | |
|---|---|---|---|---|---|---|---|
| F = | 8,710 | 8,710 | 8,710 | 8,710 | 8,710 | 8,710 | dscf/MMBtu |
| $O_2$%dry = | 3 | 3 | 3 | 3 | 3 | 3 | % |
| H = | 29.29 | 29.29 | 20.66 | 16.50 | 16.00 | 5.00 | MMBtu/hr |
| standard exhaust flow = | 297,879 | 297,879 | 210,108 | 167,801 | 162,716 | 50,849 | dscf/hr |
| | 4,965 | 4,965 | 3,502 | 2,797 | 2,712 | 847 | dscfm |

| Air Sciences Inc. | PROJECT TITLE: Donlin | | BY: K. LEWIS | |
|---|---|---|---|---|
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| CALCULATIONS | SUBJECT: Boilers/Heater - Ox. Cat. | | DATE: October 13, 2021 | |

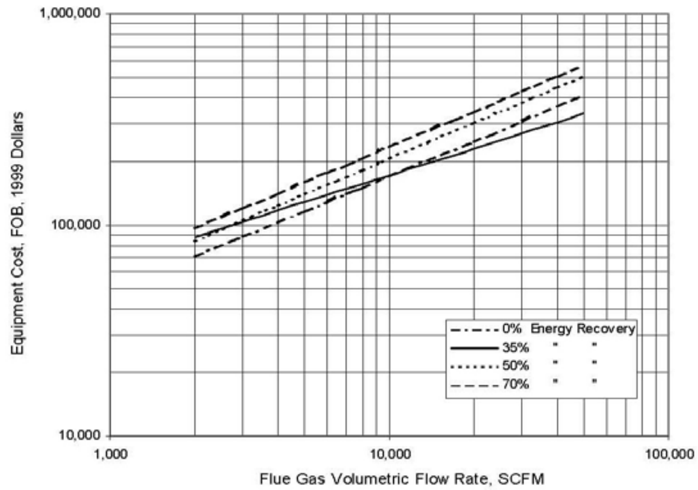


**Figure 2.6:** Equipment Cost of Catalytic Incinerators, Fixed-Bed

EPA. 2002. *Air Pollution Control Cost Manual, Sixth Edition* . EPA/454/B-02-001. January 2002. Sec. 3.2, Ch. 2, p. 2-39

| | | 1.59(EC) | 1.18(EC) | 0.3(PEC) | | 0.3(PEC) | 1.9(EC) | 0.182(TCI) | 0.04(TCI) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1999 | 2021 | | | | | | Annual Costs | | | |
| dscfm | EC | EC | PEC | DIC | Total DC | Total IC | TCI | DAC+OH | IDAC | Cap. Recov. | TAC |
| 5,000 | $160,000 | $254,400 | $300,192 | $90,058 | $390,250 | $93,060 | $483,309 | $88,181 | $19,332 | $44,784 | $152,297 |
| 3,500 | $131,000 | $208,290 | $245,782 | $73,735 | $319,517 | $76,192 | $395,709 | $72,198 | $15,828 | $36,667 | $124,693 |
| 2,000 | $96,000 | $152,640 | $180,115 | $54,035 | $234,150 | $55,836 | $289,985 | $52,908 | $11,599 | $26,870 | $91,378 |
| 850 | $60,000 | $95,400 | $112,572 | $33,772 | $146,344 | $34,897 | $181,241 | $33,068 | $7,250 | $16,794 | $57,111 |

$$CRF = \frac{i}{(1 - (1 + i)^{-n})} = 0.0944 \qquad i = 7\% \qquad n = 20$$

EPA. 2002. *Air Pollution Control Cost Manual, Sixth Edition* . EPA/454/B-02-001. January 2002.

| | | | |
|---|---|---|---|
| Sec. 3.2, CH. 2, Table 2.9, p. 2-44 | TCI | $889,000 | |
| Sec. 3.2, CH. 2, Table 2.10, p. 2-45 | DAC+OH | $162,200 per year | 0.182 (TCI) |
| | IDAC | 0.04 (TCI) | |
| | Capital Recovery | CRF*[TCI-1.08(cat. Cost)] | |
| | Catalyst Cost | $15,100 | 0.017 (TCI) |

Process Heater

| Unit | CO ton/yr | Ox. Cat $/yr | Cost Eff. $/ton |
|---|---|---|---|
| A | 10.57 | $152,297 | $14,415 |
| B | 10.57 | $152,297 | $14,415 |
| C | 7.45 | $124,693 | $16,730 |
| D | 5.95 | $91,378 | $15,353 |
| E | 5.77 | $91,378 | $15,833 |
| F | 1.80 | $57,111 | $31,667 |

CPI Inflation Calculator 1/1999 to 1/2021:
1.59 https://data.bls.gov/cgi-bin/cpicalc.pl

| Air Sciences Inc. | PROJECT TITLE: Donlin | BY: K. LEWIS | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 1 | OF: 4 | SHEET: Boil-SCR |
| CALCULATIONS | SUBJECT: POX Boiler - SCR | DATE: October 13, 2021 | | |

**I. NOx Emission**

Boiler/Heater
POX Boiler No. 1 - 17-BLR-301

| | | | |
|---|---|---|---|
| Make and Model | Clayton Industries, E704 | | |
| Rating | 29.29 | MMBtu/hr | Man. Spec. Sheet |

| | lb/MMBtu | lb/hr | ton/yr | |
|---|---|---|---|---|
| $NO_X$ | 0.098 | 2.870 | 12.57 | Based in primary fuel; NG |

EPA Method 19

| | | |
|---|---|---|
| F = | 10,610 | wscf/MMBtu |
| B = | 0.027 | default value |
| $O_2$%wet = | 3 | % |
| H = | 29.29 | MMBtu/hr |
| standard exhaust flow = | 374,670 | SCF/hr (wet) |
| | 6,245 | SCFM (wet) |
| T = | 400 | °F |
| P = | 1 | atm |
| actual exhaust flow = | 10,171 | ACFM (wet) |

| Air Sciences Inc. | PROJECT TITLE: Donlin | BY: K. LEWIS | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 2 | OF: 4 | SHEET: Boil-SCR |
| CALCULATIONS | SUBJECT: POX Boiler - SCR | DATE: October 13, 2021 | | |

## II. SCR Control Cost

### Calculation Assumptions

| | | | Reference |
|---|---|---|---|
| Maximum Heat Input ($Q_B$) | 29.3 | MMBtu/hr, HHV | Man. Spec. Sheet |
| Exhaust Flow Rate ($q_{flue\ gas}$) | 10,171 | acfm | EPA Method 19 for natural gas |
| Number of SCR Operating Hours | 8,760 | hr/yr | |
| Uncontrolled $NO_X$ Emissions | 0.0980 | lb/MMBtu, HHV | Page 1 |
| Ammonia Slip | 2 | ppm | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Fuel Sulfur Content | 0.0007% | | Estimate |
| ASR | 1.05 | | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| NSR for ammonia | 1.05 | | Manual, Sec. 4.2, Ch. 1, Eq. 1.12 |
| $NH_3$ sol'n concentration | 29% | | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| No. of Days of Storage for Ammonia | 14 | days | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Pressure Drop for Ductwork | 3 | inches w.g. | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Pressure Drop for each Catalyst Layer | 1 | inch w.g. | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Temperature at SCR inlet | 650 | F | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Equipment Life | 20 | years | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Annual Interest Rate | 7% | | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Catalyst Cost, Initial | 240 | $\$/ft^3$ | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Catalyst Cost, Replacement | 290 | $\$/ft^3$ | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Electrical Power Cost | 0.05 | $/kWh | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| 29% Ammonia Solution Cost | 0.101 | $/lb | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Operating Life of Catalyst | 24,000 | hr | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Catalyst Layers | 3 | | Calculated |

### Calculations

$h_{NOx}$ = 85% — Manual, Sec. 4.2, Ch. 2, p. 2-52

| | | | Reference |
|---|---|---|---|
| $Vol_{catalyst}$ | = | 2.81 x 29.3 | Manual, Sec. 4.2, Ch. 2, Eq. 2.19 |
| $h_{adj}$ | x | [0.2869 + (1.058 x 0.85)] | Manual, Sec. 4.2, Ch. 2, Eq. 2.20 |
| $NO_{X\ adj}$ | x | [0.8524 + (0.3208 x 0.098)] | Manual, Sec. 4.2, Ch. 2, Eq. 2.21 |
| $Slip_{adj}$ | x | [1.2835 - (0.0567 x 2)] | Manual, Sec. 4.2, Ch. 2, Eq. 2.22 |
| $S_{adj}$ | x | [0.9636 + (0.0455 x 7.E-04)] | Manual, Sec. 4.2, Ch. 2, Eq. 2.23 |
| $T_{adj}$ | x | [15.16 - (0.0394 x 650) + (2.74E-05 x 650^2)] | Manual, Sec. 4.2, Ch. 2, Eq. 2.24 |
| | = | 112 $ft^3$ | |

$$A_{catalyst} = \frac{10{,}171}{16 \times 60} = 10.6\ ft^2$$ Manual, Sec. 4.2, Ch. 2, Eq. 2.25

$$n_{layer} = \frac{112}{3.1 \times 10.6} = 3.39 = 3\ \text{layer}$$ Manual, Sec. 4.2, Ch. 2, Eq. 2.28

$$h_{layer} = \frac{112}{3 \times 10.6} + 1 = 4.5\ ft$$ Manual, Sec. 4.2, Ch. 2, Eq. 2.29

$$h_{SCR} = 4 \times (7 + 4.5) + 9 = 55.0\ ft$$ Manual, Sec. 4.2, Ch. 2, Eq. 2.31

$$m_{reagent} = \frac{0.0980\ lb\ NO_x}{MMBtu} \cdot \frac{29.3\ MMBtu}{hr} \cdot 1.05 \cdot 85\% \cdot \frac{17.03\ MW\ NH_3}{46.01\ MW\ NO_x}$$

$= 0.95$ lb/hr $NH_3$ — Manual, Sec. 4.2, Ch. 2, Eq. 2.32

$$m_{sol} = \frac{0.95\ lb\text{-}NH_3}{hr} \cdot \frac{1\ NH3\ sol'n}{29\%\ NH_3} = 3.27\ lb/hr\ NH_3\ sol$$ Manual, Sec. 4.2, Ch. 2, Eq. 2.33

| Air Sciences Inc. | PROJECT TITLE: Donlin | BY: K. LEWIS | | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 3 | OF: 4 | SHEET: Boil-SCR |
| CALCULATIONS | SUBJECT: POX Boiler - SCR | DATE: October 13, 2021 | | |

**Direct Capital Costs**

$DC = Q_B\ [\$3{,}380 + f(h_{SCR}) + f(NH3_{rate}) + f(new) + f(bypass)]*(3500/Q_B)^{0.35} + f(Vol_{catalyst})$

Manual, Sec. 4.2, Ch. 2, Eq. 2.36

| | | | | | |
|---|---|---|---|---|---|
| $f(h_{SCR})$ | = | (6.12 x 55.0) - 187.9 | = | $148.9 | Manual, Sec. 4.2, Ch. 2, Eq. 2.37 |
| $f(NH3_{rate})$ | = | $\frac{(411 \times 0.95)}{29.3} - 47.3$ | = | -$34.0 | Manual, Sec. 4.2, Ch. 2, Eq. 2.38 |
| $f(new)$ | = | -$728 | | | Manual, Sec. 4.2, Ch. 2, Eq. 2.40 |
| $f(bypass)$ | = | 0 | | | Manual, Sec. 4.2, Ch. 2, Eq. 2.41 |
| $f(Vol_{catalyst})$ | = | 112 x 240 | = | $26,761 | Manual, Sec. 4.2, Ch. 2, Eq. 2.43 |
| Scaling Factor | = | $(3500 / 29.3)^{0.35}$ | = | 5.33 | Manual, Sec. 4.2, Ch. 2, Eq. 2.36 |
| DC (A) | = | $459,067 | | | Manual, Sec. 4.2, Ch. 2, Eq. 2.36 |

**Indirect Capital Costs**

Indirect Installation Costs — Manual, Sec. 4.2, Ch. 2, Table 2.5

| | | | | |
|---|---|---|---|---|
| General Facilities | 0.05 x A | | | |
| Engineering and Home Office | 0.10 x A | | | |
| Process Contingency | 0.05 x A | | | |
| Total Indirect Installation Costs (B) | B = A x (0.05 + 0.1 + 0.05) | | = | $91,813 |
| Project Contingency | C = (A + B) x 0.15 | | = | $82,632 |
| Total Plant Cost | D = (A + B + C) | | = | $633,512 |
| Preproduction Cost | G = D x 0.02 | | = | $12,670 |
| Inventory Capital 3.3 lb/hr x | 0.101 $/lb x | 14 days | = | $111 |

**Total Capital Investment (TCI)** **$646,293 per unit, 1998 dollars**

CPI Inflation Calculator 1/1998 to 1/2021: **$1,046,995 per unit, 2021 dollars**

1.62 https://data.bls.gov/cgi-bin/cpicalc.pl

**Direct Annual Costs**

DAC = (Annual Maintenance Cost) + (Annual Reagent Cost) + (Annual Electric Cost) + (Annual Catalyst Cost)

Annual Maintenance Cost 0.015 x TCI = **$15,705** Manual, Sec. 4.2, Ch. 2, Eq. 2.46

Annual Reagent Cost 28,644 lb/yr sol 0.101 $/lb = **$2,893** See reagent use calc. below

$m_{sol\text{-}annual} = \frac{3.27 \text{ lb } NH_3}{\text{hr}} \times \frac{8{,}760 \text{ hr}}{\text{yr}}$ = 28,644 lb/yr $NH_3$ sol

Power Requirements = $0.105\, Q_B\, [NOx_{in}\; h_{NOx} + 0.5\, (P_{duct} + n_{total} \times P_{catalyst})$ Manual, Sec. 4.2, Ch. 2, Eq. 2.48

ammonia vap. = $0.105\, Q_B\, (NOx_{in}\; h_{NOx}) \times t_{op}$ Manual, Sec. 4.2, Ch. 2, Eq. 2.48 & 2.49
= 0.105 x 29.3 x 0.098 x 0.85 x 8,760 = 2,244 kWh/yr

pressure drop = $0.105\, Q_B\, (0.5\, (P_{duct} + n_{total} \times P_{catalyst}) \times t_{op}$ Manual, Sec. 4.2, Ch. 2, Eq. 2.48 & 2.49
= 0.105 x 29.3 x 0.5 x (3 + 4 x 1) x 8,760 = 94,295 kWh/yr

Total Power Loss = 96,540 kWh/yr

Annual Electrical Cost 96,540 kWh/yr x 0.05 $/kWh = **$4,827**

Catalyst Replacement Cost 112 $ft^3$ x 290 $/$ft^3$ / 3 layers = $10,779
Manual, Sec. 4.2, Ch. 2, Eq. 2.50

FWF = $i\,[1/((1+i)^Y - 1)$ = 0.311 Manual, Sec. 4.2, Ch. 2, Eq. 2.52

Y = $\frac{24000}{8{,}760}$ = 2.7 = 3 years Manual, Sec. 4.2, Ch. 2, Eq. 2.53

Annual Catalyst Replacement Cost $10,779 x 0.311 = **$3,353** Manual, Sec. 4.2, Ch. 2, Eq. 2.51

**Total Direct Annual Cost** **$26,778** **per unit**

**Indirect Annual Costs**

CRF = $\frac{i}{(1 - (1 + i)\text{-}n)}$ = 0.0944 Manual, Sec. 4.2, Ch. 2, Eq. 2.55

Annual Capital Recovery Cost $1,046,995 x 0.0944 = **$98,829** Manual, Sec. 4.2, Ch. 2, Eq. 2.54

**Total Indirect Cost** **$98,829**

**Total Annual Cost** **$125,607**

**Cost Effectiveness** $125,607 / 10.7 tons = **$11,753**
Manual, Sec. 4.2, Ch. 2, Eq. 2.58

**I. $NO_X$ Emission**

Boiler/Heater
Carbon Elution Heater - 56-BLR-200

| | | | | |
|---|---|---|---|---|
| Make and Model | Sigma Thermal, HC2-10.0-H-SF | | | |
| Rating | 16.00 MMBtu/hr | | Man. Spec. Sheet | |

| | lb/MMBtu | lb/hr | ton/yr | |
|---|---|---|---|---|
| $NO_X$ | 0.098 | 1.568 | 6.87 | Based in primary fuel; NG |

EPA Method 19

| | | |
|---|---|---|
| F = | 10,610 | wscf/MMBtu |
| B = | 0.027 | default value |
| $O_2$%wet = | 3 | % |
| H = | 16.00 | MMBtu/hr |
| standard exhaust flow = | 204,663 | SCF/hr (wet) |
| | 3,411 | SCFM (wet) |
| T = | 414 | °F |
| P = | 1 | atm |
| actual exhaust flow = | 5,646.3 | ACFM (wet) |

## II. SCR Control Cost

| Calculation Assumptions | | | Reference |
|---|---|---|---|
| Maximum Heat Input ($Q_B$) | 16.0 | MMBtu/hr, HHV | Man. Spec. Sheet |
| Exhaust Flow Rate ($q_{flue\ gas}$) | 5,646 | acfm | EPA Method 19 for natural gas |
| Number of SCR Operating Hours | 8,760 | hr/yr | |
| Uncontrolled $NO_X$ Emissions | 0.0980 | lb/MMBtu, HHV | Page 1 |
| Ammonia Slip | 2 | ppm | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Fuel Sulfur Content | 0.0007% | | Estimate |
| ASR | 1.05 | | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| NSR for ammonia | 1.05 | | Manual, Sec. 4.2, Ch. 1, Eq. 1.12 |
| $NH_3$ sol'n concentration | 29% | | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| No. of Days of Storage for Ammonia | 14 | days | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Pressure Drop for Ductwork | 3 | inches w.g. | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Pressure Drop for each Catalyst Layer | 1 | inch w.g. | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Temperature at SCR inlet | 414 | F | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Equipment Life | 20 | years | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Annual Interest Rate | 7% | | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Catalyst Cost, Initial | 240 | $\$/ft^3$ | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Catalyst Cost, Replacement | 290 | $\$/ft^3$ | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Electrical Power Cost | 0.05 | $/kWh | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| 29% Ammonia Solution Cost | 0.101 | $/lb | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Operating Life of Catalyst | 24,000 | hr | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Catalyst Layers | 10 | | Calculated |

### Calculations

$h_{NOx}$ = 85% — Manual, Sec. 4.2, Ch. 2, p. 2-52

$Vol_{catalyst}$ = 2.81 x 16.0 — Manual, Sec. 4.2, Ch. 2, Eq. 2.19
$h_{adj}$ x [0.2869 + (1.058 x 0.85)] — Manual, Sec. 4.2, Ch. 2, Eq. 2.20
$NO_{X\ adj}$ x [0.8524 + (0.3208 x 0.098)] — Manual, Sec. 4.2, Ch. 2, Eq. 2.21
$Slip_{adj}$ x [1.2835 - (0.0567 x 2)] — Manual, Sec. 4.2, Ch. 2, Eq. 2.22
$S_{adj}$ x [0.9636 + (0.0455 x 7.E-04)] — Manual, Sec. 4.2, Ch. 2, Eq. 2.23
$T_{adj}$ x [15.16 - (0.03937 x 414) + (2.74E-05 x 414^2)] — Manual, Sec. 4.2, Ch. 2, Eq. 2.24
= 189 $ft^3$

$$A_{catalyst} = \frac{5{,}646}{16 \times 60} = 5.9\ ft^2$$ Manual, Sec. 4.2, Ch. 2, Eq. 2.25

$$n_{layer} = \frac{189}{3.1 \times 5.9} = 10.37 = 10\ layer$$ Manual, Sec. 4.2, Ch. 2, Eq. 2.28

$$h_{layer} = \frac{189}{10 \times 5.9} + 1 = 4.2\ ft$$ Manual, Sec. 4.2, Ch. 2, Eq. 2.29

$$h_{SCR} = 11 \times (7 + 4.2) + 9 = 132.4\ ft$$ Manual, Sec. 4.2, Ch. 2, Eq. 2.31

$$m_{reagent} = \frac{0.0980\ lb\ NO_x}{MMBtu} \left| \frac{16.0\ MMBtu}{hr} \right| 1.05 \left| 85\% \right| \frac{17.03\ MW\ NH_3}{46.01\ MW\ NO_x}$$

= 0.52 lb/hr $NH_3$ — Manual, Sec. 4.2, Ch. 2, Eq. 2.32

$$m_{sol} = \frac{0.52\ lb\text{-}NH_3}{hr} \left| \frac{1\ NH3\ sol'n}{29\%\ NH_3} \right. = 1.79\ lb/hr\ NH_3\ sol$$ Manual, Sec. 4.2, Ch. 2, Eq. 2.33

**Direct Capital Costs**

DC = $Q_B$ [\$3,380 + f(h $_{SCR}$) + f(NH3*rate*) + f(*new*) + f(*bypass*)]*(3500/$Q_B$)$^{0.35}$ + f(Vol $_{catalyst}$)

Manual, Sec. 4.2, Ch. 2, Eq. 2.36

| | | | |
|---|---|---|---|
| f(h $_{SCR}$) | = (6.12 x 132.4) - 187.9 | = \$622.1 | Manual, Sec. 4.2, Ch. 2, Eq. 2.37 |
| f(NH3*rate*) | = (411 x 0.52) / 16.0 - 47.3 | = -\$34.0 | Manual, Sec. 4.2, Ch. 2, Eq. 2.38 |
| f(*new*) | = -\$728 | | Manual, Sec. 4.2, Ch. 2, Eq. 2.40 |
| f(*bypass*) | = 0 | | Manual, Sec. 4.2, Ch. 2, Eq. 2.41 |
| f(Vol $_{catalyst}$) | = 189 x 240 = \$45,373 | | Manual, Sec. 4.2, Ch. 2, Eq. 2.43 |
| Scaling Factor | = (3500 / 16.0) $^{0.35}$ | = 6.59 | Manual, Sec. 4.2, Ch. 2, Eq. 2.36 |
| DC (A) = \$387,089 | | | Manual, Sec. 4.2, Ch. 2, Eq. 2.36 |

**Indirect Capital Costs**

Indirect Installation Costs — Manual, Sec. 4.2, Ch. 2, Table 2.5

| | | | |
|---|---|---|---|
| General Facilities | 0.05 x A | | |
| Engineering and Home Office | 0.10 x A | | |
| Process Contingency | 0.05 x A | | |
| Total Indirect Installation Costs (B) | B = A x (0.05 + 0.1 + 0.05) | = | \$77,418 |
| Project Contingency | C = (A + B) x 0.15 | = | \$69,676 |
| Total Plant Cost | D = (A + B + C) | = | \$534,183 |
| Preproduction Cost | G = D x 0.02 | = | \$10,684 |
| Inventory Capital | 1.8 lb/hr x 0.101 \$/lb x 14 days | = | \$61 |

**Total Capital Investment (TCI)** — **\$544,928 per unit, 1998 dollars**

CPI Inflation Calculator 1/1998 to 1/2021: — **\$882,783 per unit, 2021 dollars**

1.62 https://data.bls.gov/cgi-bin/cpicalc.pl

**Direct Annual Costs**

DAC = (Annual Maintenance Cost) + (Annual Reagent Cost) + (Annual Electric Cost) + (Annual Catalyst Cost)

| | | | | | |
|---|---|---|---|---|---|
| Annual Maintenance Cost | | 0.015 x TCI | = | **$13,242** | Manual, Sec. 4.2, Ch. 2, Eq. 2.46 |
| Annual Reagent Cost | 15,647 lb/yr sol | 0.101 $/lb | = | **$1,580** | See reagent use calc. below |

$$m_{sol\text{-}annual} = \frac{1.79 \text{ lb } NH_3}{\text{hr}} \times 8{,}760 \text{ hr} \times \frac{1}{29\% \ NH_3} = 15{,}647 \text{ lb/yr } NH_3 \text{ sol}$$

Power Requirements = $0.105\ Q_B\ [NOx_{in}\ h_{NOx} + 0.5\ (P_{duct} + n_{total} \times P_{catalyst})$ — Manual, Sec. 4.2, Ch. 2, Eq. 2.48

ammonia vap. = $0.105\ Q_B\ (NOx_{in}\ h_{NOx}) \times t_{op}$ — Manual, Sec. 4.2, Ch. 2, Eq. 2.48 & 2.49

= 0.105 x 16.0 x 0.098 x 0.85 x 8,760 = 1,226 kWh/yr

pressure drop = $0.105\ Q_B\ (0.5\ (P_{duct} + n_{total} \times P_{catalyst}) \times t_{op}$ — Manual, Sec. 4.2, Ch. 2, Eq. 2.48 & 2.49

= 0.105 x 16.0 x 0.5 x (3 + 11 x 1) x 8,760 = 103,018 kWh/yr

Total Power Loss = 104,244 kWh/yr

| | | | | | |
|---|---|---|---|---|---|
| Annual Electrical Cost | 104,244 kWh/yr | x 0.05 $/kWh | = | **$5,212** | |

Catalyst Replacement Cost 189 $ft^3$ x 290 $\$/ft^3$ / 10 layers = $5,483 — Manual, Sec. 4.2, Ch. 2, Eq. 2.50

FWF = $i\ [\ 1/((1 + i)^Y - 1)\ ]$ = 0.311 — Manual, Sec. 4.2, Ch. 2, Eq. 2.52

Y = $\frac{24000}{8{,}760}$ = 2.7 = 3 years — Manual, Sec. 4.2, Ch. 2, Eq. 2.53

| | | | | | |
|---|---|---|---|---|---|
| Annual Catalyst Replacement Cost | $5,483 | x 0.311 | = | **$1,705** | Manual, Sec. 4.2, Ch. 2, Eq. 2.51 |
| **Total Direct Annual Cost** | | | | **$21,739** | **per unit** |

**Indirect Annual Costs**

CRF = $\frac{i}{(1 - (1 + i)\text{-}n)}$ = 0.0944 — Manual, Sec. 4.2, Ch. 2, Eq. 2.55

| | | | | | |
|---|---|---|---|---|---|
| Annual Capital Recovery Cost | $882,783 | x 0.0944 | = | **$83,329** | Manual, Sec. 4.2, Ch. 2, Eq. 2.54 |
| **Total Indirect Cost** | | | | **$83,329** | |
| **Total Annual Cost** | | | | **$105,068** | |
| **Cost Effectiveness** | $105,068 | / 5.8 tons | = | **$17,998** | Manual, Sec. 4.2, Ch. 2, Eq. 2.58 |

| Air Sciences Inc. | PROJECT TITLE: Donlin | | BY: K. LEWIS | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 1 | OF: 4 | SHEET: Heat-SCR 2 |
| CALCULATIONS | SUBJECT: Air Handlers - SCR | | DATE: October 13, 2021 | |

**I. $NO_X$ Emission**

| | | | | |
|---|---|---|---|---|
| Boiler/Heater | | | | |
| Air Handlers | | | | |
| Make and Model | Bousquet, HDG(H)-400 | | | |
| Rating | 5.00 MMBtu/hr | | | Man. Spec. Sheet |

| | lb/MMBtu | lb/hr | ton/yr | |
|---|---|---|---|---|
| $NO_X$ | 0.098 | 0.490 | 2.15 | Based in primary fuel; NG |

EPA Method 19

| | | |
|---|---|---|
| F = | 10,610 | wscf/MMBtu |
| B = | 0.027 | default value |
| $O_2$%wet = | 3 | % |
| H = | 5.00 | MMBtu/hr |
| standard exhaust flow = | 63,957 | SCF/hr (wet) |
| | 1,066 | SCFM (wet) |
| T = | 414 | °F |
| P = | 1 | atm |
| actual exhaust flow = | 1,764.5 | ACFM (wet) |

## II. SCR Control Cost

### Calculation Assumptions

| | | | Reference |
|---|---|---|---|
| Maximum Heat Input ($Q_B$) | 5.0 | MMBtu/hr, HHV | Man. Spec. Sheet |
| Exhaust Flow Rate ($q_{flue\ gas}$) | 1,764 | acfm | EPA Method 19 for natural gas |
| Number of SCR Operating Hours | 8,760 | hr/yr | |
| Uncontrolled $NO_X$ Emissions | 0.0980 | lb/MMBtu, HHV | Page 1 |
| Ammonia Slip | 2 | ppm | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Fuel Sulfur Content | 0.0007% | | Estimate |
| ASR | 1.05 | | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| NSR for ammonia | 1.05 | | Manual, Sec. 4.2, Ch. 1, Eq. 1.12 |
| $NH_3$ sol'n concentration | 29% | | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| No. of Days of Storage for Ammonia | 14 | days | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Pressure Drop for Ductwork | 3 | inches w.g. | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Pressure Drop for each Catalyst Layer | 1 | inch w.g. | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Temperature at SCR inlet | 414 | F | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Equipment Life | 20 | years | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Annual Interest Rate | 7% | | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Catalyst Cost, Initial | 240 | $\$/ft^3$ | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Catalyst Cost, Replacement | 290 | $\$/ft^3$ | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Electrical Power Cost | 0.05 | $/kWh | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| 29% Ammonia Solution Cost | 0.101 | $/lb | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Operating Life of Catalyst | 24,000 | hr | Manual, Sec. 4.2, Ch. 2, p. 2-50 |
| Catalyst Layers | 10 | | Calculated |

### Calculations

$h_{NOx}$ = 85% — Manual, Sec. 4.2, Ch. 2, p. 2-52

$Vol_{catalyst}$ = 2.81 x 5.0 — Manual, Sec. 4.2, Ch. 2, Eq. 2.19
- $h_{adj}$ x [0.2869 + (1.058 x 0.85)] — Manual, Sec. 4.2, Ch. 2, Eq. 2.20
- $NO_{X\ adj}$ x [0.8524 + (0.3208 x 0.098)] — Manual, Sec. 4.2, Ch. 2, Eq. 2.21
- $Slip_{adj}$ x [1.2835 - (0.0567 x 2)] — Manual, Sec. 4.2, Ch. 2, Eq. 2.22
- $S_{adj}$ x [0.9636 + (0.0455 x 7.E-04)] — Manual, Sec. 4.2, Ch. 2, Eq. 2.23
- $T_{adj}$ x [15.16 - (0.03937 x 414) + (2.74E-05 x 414^2)] — Manual, Sec. 4.2, Ch. 2, Eq. 2.24

= 59 $ft^3$

$A_{catalyst} = \dfrac{1{,}764}{16 \times 60} = 1.8\ ft^2$ — Manual, Sec. 4.2, Ch. 2, Eq. 2.25

$n_{layer} = \dfrac{59}{3.1 \times 1.8} = 10.37 = 10$ layer — Manual, Sec. 4.2, Ch. 2, Eq. 2.28

$h_{layer} = \dfrac{59}{10 \times 1.8} + 1 = 4.2$ ft — Manual, Sec. 4.2, Ch. 2, Eq. 2.29

$h_{SCR}$ = 11 x (7 + 4.2) + 9 = 132.4 ft
Manual, Sec. 4.2, Ch. 2, Eq. 2.31

$m_{reagent} = \dfrac{0.0980\ lb\ NO_x}{MMBtu} \times \dfrac{5.0\ MMBtu}{hr} \times 1.05 \times 85\% \times \dfrac{17.03\ MW\ NH_3}{46.01\ MW\ NO_x}$

= 0.16 lb/hr $NH_3$ — Manual, Sec. 4.2, Ch. 2, Eq. 2.32

$m_{sol} = \dfrac{0.16\ lb\text{-}NH_3}{hr} \times \dfrac{1\ NH3\ sol'n}{29\%\ NH_3} = 0.56$ lb/hr $NH_3$ sol — Manual, Sec. 4.2, Ch. 2, Eq. 2.33

**Direct Capital Costs**

DC = $Q_B$ [$3,380 + f($h_{SCR}$) + f(NH3*rate*) + f(*new*) + f(*bypass*)]*(3500/$Q_B$)$^{0.35}$ + f($Vol_{catalyst}$)

Manual, Sec. 4.2, Ch. 2, Eq. 2.36

| | | | |
|---|---|---|---|
| f($h_{SCR}$) | = (6.12 x 132.4) - 187.9 | = $622.1 | Manual, Sec. 4.2, Ch. 2, Eq. 2.37 |
| f(NH3*rate*) | = (411 x 0.16) / 5.0 - 47.3 | = -$34.0 | Manual, Sec. 4.2, Ch. 2, Eq. 2.38 |
| f(*new*) | = -$728 | | Manual, Sec. 4.2, Ch. 2, Eq. 2.40 |
| f(*bypass*) | = 0 | | Manual, Sec. 4.2, Ch. 2, Eq. 2.41 |
| f($Vol_{catalyst}$) | = 59 x 240 = $14,179 | | Manual, Sec. 4.2, Ch. 2, Eq. 2.43 |
| Scaling Factor | = (3500 / 5.0)$^{0.35}$ | = 9.90 | Manual, Sec. 4.2, Ch. 2, Eq. 2.36 |
| DC (A) = $174,621 | | | Manual, Sec. 4.2, Ch. 2, Eq. 2.36 |

**Indirect Capital Costs**

Indirect Installation Costs — Manual, Sec. 4.2, Ch. 2, Table 2.5

| | | | |
|---|---|---|---|
| General Facilities | 0.05 x A | | |
| Engineering and Home Office | 0.10 x A | | |
| Process Contingency | 0.05 x A | | |
| Total Indirect Installation Costs (B) | B = A x (0.05 + 0.1 + 0.05) | = | $34,924 |
| Project Contingency | C = (A + B) x 0.15 | = | $31,432 |
| Total Plant Cost | D = (A + B + C) | = | $240,977 |
| Preproduction Cost | G = D x 0.02 | = | $4,820 |
| Inventory Capital | 0.6 lb/hr x 0.101 $/lb x 14 days | = | $19 |

**Total Capital Investment (TCI)** — **$245,816 per unit, 1998 dollars**

CPI Inflation Calculator 1/1998 to 1/2021: — **$398,222 per unit, 2021 dollars**

1.62 https://data.bls.gov/cgi-bin/cpicalc.pl

| Air Sciences Inc. | PROJECT TITLE: Donlin | | BY: K. LEWIS | |
|---|---|---|---|---|
| | PROJECT NO: 281-1-2 | PAGE: 4 | OF: 4 | SHEET: Heat-SCR 2 |
| CALCULATIONS | SUBJECT: Air Handlers - SCR | | DATE: October 13, 2021 | |

**Direct Annual Costs**

DAC = (Annual Maintenance Cost) + (Annual Reagent Cost) + (Annual Electric Cost) + (Annual Catalyst Cost)

Annual Maintenance Cost 0.015 x TCI = **$5,973** Manual, Sec. 4.2, Ch. 2, Eq. 2.46

Annual Reagent Cost 4,890 lb/yr sol 0.101 $/lb = **$494** See reagent use calc. below

$$m_{sol\text{-}annual} = \frac{0.56 \text{ lb } NH_3}{\text{hr}} \times 8{,}760 \text{ hr} \times \frac{1}{29\% \; NH_3} = 4{,}890 \text{ lb/yr } NH_3 \text{ sol}$$

Power Requirements = $0.105\, Q_B\, [NOx_{in}\; h_{NOx} + 0.5\,(P_{duct} + n_{total} \times P_{catalyst})$ Manual, Sec. 4.2, Ch. 2, Eq. 2.48

ammonia vap. = $0.105\, Q_B\, (NOx_{in}\; h_{NOx}) \times t_{op}$ Manual, Sec. 4.2, Ch. 2, Eq. 2.48 & 2.49
= 0.105 x 5.0 x 0.098 x 0.85 x 8,760 = 383 kWh/yr

pressure drop = $0.105\, Q_B\, (0.5\,(P_{duct} + n_{total} \times P_{catalyst}) \times t_{op}$ Manual, Sec. 4.2, Ch. 2, Eq. 2.48 & 2.49
= 0.105 x 5.0 x 0.5 x (3 + 11 x 1) x 8,760 = 32,193 kWh/yr

Total Power Loss = 32,576 kWh/yr

Annual Electrical Cost 32,576 kWh/yr x 0.05 $/kWh = **$1,629**

Catalyst Replacement Cost 59 $ft^3$ x 290 $\$/ft^3$ / 10 layers = $1,713
Manual, Sec. 4.2, Ch. 2, Eq. 2.50

FWF = $i\,[\,1/((1+i)^Y - 1)\,]$ = 0.311 Manual, Sec. 4.2, Ch. 2, Eq. 2.52

$$Y = \frac{24000}{8{,}760} = 2.7 = 3 \text{ years}$$ Manual, Sec. 4.2, Ch. 2, Eq. 2.53

Annual Catalyst Replacement Cost $1,713 x 0.311 = **$533** Manual, Sec. 4.2, Ch. 2, Eq. 2.51

**Total Direct Annual Cost** **$8,629** **per unit**

**Indirect Annual Costs**

$$CRF = \frac{i}{(1 - (1 + i)\text{-}n)} = 0.0944$$ Manual, Sec. 4.2, Ch. 2, Eq. 2.55

Annual Capital Recovery Cost $398,222 x 0.0944 = **$37,589** Manual, Sec. 4.2, Ch. 2, Eq. 2.54

**Total Indirect Cost** **$37,589**

**Total Annual Cost** **$46,218**

**Cost Effectiveness** $46,218 / 1.8 tons = **$25,335**
Manual, Sec. 4.2, Ch. 2, Eq. 2.58

# Appendix D – Air Quality Analysis

AIR SCIENCES INC.

DENVER • PORTLAND

# Air Quality Analysis Report

# Donlin Gold Project, Alaska

PREPARED FOR:
DONLIN GOLD LLC

PROJECT NO. 281-21B-1
OCTOBER 27, 2021

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# LIST OF ABBREVIATIONS

| | |
|---|---|
| ° | Degree |
| µg/m³ | Micrograms per Cubic Meter |
| µg/Nm³ | Micrograms per Normalized (Standard) Cubic Meter |
| µm | Micrometer |
| AAC | Alaska Administrative Code |
| AAQS | Ambient Air Quality Standards |
| ADEC | Alaska Department of Environmental Conservation |
| AERMOD | American Meteorological Society/Environmental Protection Agency Regulatory Model |
| Air Permit | Air Quality Control Construction Permit No. AQ0934CPT01 issued June 30, 2017 |
| ANFO | Ammonium Nitrate and Fuel Oil |
| Avg | Average |
| BACT | Best Available Control Technology |
| $B_o$ | Bowen Ratio |
| BPIP | Building Profile Input Program |
| Btu | British Thermal Unit |
| CFR | Code of Federal Regulations |
| CMAQ | Community Multi-scale Air Quality |
| CO | Carbon Monoxide |
| COA | Core Operating Area |
| DNP | Denali National Park |
| EDMS | Emissions Data Management System |
| EPA | United States Environmental Protection Agency |
| F | Fahrenheit |
| g/cm³ | Grams per Cubic Centimeter |
| g/hr | Grams per Hour |
| g/kWhe | Grams per Kilowatt-Hour Electric |

| | |
|---|---|
| g/s | Grams per Second |
| gr/ft$^3$ | Grains per Cubic Foot |
| HAP | Hazardous Air Pollutant |
| hp-hr | Horsepower-Hour |
| hr | Hour |
| km | Kilometer |
| kW | Kilowatt |
| kWhe | Kilowatt-Hour Electric |
| lb | Pound |
| lb/gal | Pounds per Gallon |
| lb/ton | Pounds per Short Ton |
| lb/VMT | Pounds per Vehicle Miles Traveled |
| LOM | Life of Mine |
| m | Meter |
| M | Moisture |
| m/s | Meters per Second |
| MACT | Maximum Achievable Control Technology |
| NAAQS | National Ambient Air Quality Standards |
| NAD83 | North American Datum of 1983 |
| NED | National Elevation Dataset |
| NEPA | National Environmental Policy Act |
| NG | Natural Gas |
| $NH_3$ | Ammonia |
| NLCD | National Land Cover Data |
| NO | Nitrogen Oxides |
| $NO_2$ | Nitrogen Dioxide |
| $NO_X$ | Oxides of Nitrogen |
| NSPS | New Source Performance Standards |
| NTE | Not-to-Exceed |

| | |
|---|---|
| NWS | National Weather Service |
| $O_3$ | Ozone |
| OLM | Ozone Limiting Method |
| P | Percentile |
| PAG | Potentially Acid-Generating |
| Pb | Lead |
| PM | Particulate Matter |
| $PM_{2.5}$ | Particulate Matter less than 2.5 Micrometers in Aerodynamic Diameter |
| $PM_{10}$ | Particulate Matter less than 10 Micrometers in Aerodynamic Diameter |
| ppb | Parts per Billion |
| ppm | Parts per Million |
| ppmvd | Parts per Million, Volumetric Dry |
| PRIME | Plume Rise Model Enhancement |
| PSD | Prevention of Significant Deterioration |
| r | Albedo |
| S | Sulfur |
| SER | Significant Emission Rate |
| $SO_2$ | Sulfur Dioxide |
| SODAR | Sonic Detection and Ranging |
| ton | Short Ton (2,000 pounds) |
| ton/day | Tons per Day |
| ton/yr | Tons per Year |
| TRS | Total Reduced Sulfur |
| ULSD | Ultra-Low-Sulfur Diesel |
| USGS | United States Geological Survey |
| UTM | Universal Transverse Mercator |
| VOC | Volatile Organic Compound |
| WBAN | Weather Bureau Air Force Navy |
| WDEQ | Wyoming Department of Environmental Quality |

| | |
|---|---|
| WRAP | Western Regional Air Partnership |
| yr | Year |
| $z_o$ | Surface Roughness Length |

# EXECUTIVE SUMMARY

Donlin Gold LLC is proposing to construct and operate the Donlin Gold project in southwest Alaska, approximately 280 miles west of Anchorage. The Donlin Gold project will consist of conventional open-pit mining operations and onsite ore preparation and gold extraction processes, along with site infrastructure that includes an airstrip, an employee accommodation complex, and a power plant.

The Donlin Gold project is a major stationary source subject to the Prevention of Significant Deterioration (PSD) regulations. In accordance with these regulations, Donlin Gold LLC has conducted a PSD air quality analysis. This analysis was based on one year of onsite meteorological data, onsite ambient air quality data, and the latest version of the AERMOD modeling system.

The results of this analysis demonstrate that the Donlin Gold project air emissions will not violate the applicable PSD increments or Ambient Air Quality Standards beyond the ambient air boundary. Additional assessments are provided to show that the Donlin Gold project air emissions will not adversely affect regional ozone formation, visibility, or soil and vegetation.

# 1.0 INTRODUCTION

Donlin Gold LLC (Donlin Gold) is proposing to construct and operate the Donlin Gold mine: a hard rock, open-pit, gold mine (Project). The Project is located in southwest Alaska, approximately 280 miles west of Anchorage. Donlin Gold is an Alaskan operated company that is owned by Barrick Gold U.S. Inc., a subsidiary of Barrick Gold Corporation, and NovaGold Resources Alaska Inc., a subsidiary of NovaGold Resources, Inc.

With regards to air pollutant emissions, the Project is a major stationary source subject to the Prevention of Significant Deterioration (PSD) regulations of 40 Code of Federal Regulations (CFR) 52.21, adopted by reference in 18 Alaska Administrative Code (AAC) 50.040(h). In accordance with the PSD regulations under 40 CFR 51.21(m), Donlin Gold has conducted a PSD air quality analysis to quantify and evaluate the impacts on ambient air quality resulting from the Project's air emissions.

The Alaska Department of Environmental Conservation (ADEC) issued Air Quality Control Construction Permit No. AQ0934CPT01 for the Project on June 30, 2017 (Air Permit). The following PSD air quality analysis validates and remains consistent with the emission limits currently established in the Air Permit.

# 2.0 PROJECT DESCRIPTION

The Project is located on the western slopes of the Kuskokwim Mountains in the Yukon–Kuskokwim region of southwest Alaska, a remote area with no existing road or rail access or other public infrastructure. Beyond the open-pit and processing facilities, the Project will require the construction of additional onsite infrastructure including waste storage facilities, power generation facilities, worker accommodations; and offsite infrastructure including a natural gas (NG) pipeline from Cook Inlet, an access road to a new port on the Kuskokwim River, an airstrip, and river transportation system with a new port at Bethel. The Project location is presented in Figure 2-1.

The Project will have an operating mine life of 27 years. Conventional open-pit development methods will be used to extract ore and waste rock, including drilling, blasting, excavating, and hauling. Hydraulic shovels and front-end loaders will be used to load ore and waste material into haul trucks. Waste rock will be hauled to the waste rock facility (some waste rock will be backfilled to the pit later in the mine life). Ore will be hauled and fed to the primary crusher or stockpiled; or it will be hauled to a long-term ore stockpile for later transfer to the primary crusher. The gold will be extracted through conventional ore crushing and milling, followed by flotation, pressure oxidation, and carbon-in-leach circuits. The process plant will be rated at a nominal production rate of 59,000 short tons (ton) of ore per day.

A detailed process and source description, including process flow diagrams, is provided in the accompanying PSD Construction Permit Application Report.

## 2.1 Site Characteristics

The Project is approximately 280 miles west of Anchorage and 155 miles northeast of Bethel, up the Kuskokwim River. The closest village is the community of Crooked Creek, approximately 10 miles to the south, on the Kuskokwim River. Bethel, 56 miles upriver from the mouth of the Kuskokwim on the Bering Sea, is the regional center for the Yukon–Kuskokwim region of Alaska. The town of Aniak, also on the Kuskokwim River, approximately 50 air miles southwest of the Project site, is the regional center for the Upper Kuskokwim Valley. There is no river, road, or rail access to the site; therefore, all personnel and supplies are currently transported by air. At present, the Project is isolated from public power utilities and all other public infrastructure.

The Project area is one of low topographic relief on the western flank of the Kuskokwim Mountains. Elevations range from 500 to 2,100 feet. Ridges are well rounded and easily accessible by all-terrain vehicle.

**Figure 2-1. Donlin Project Location**

Hillsides are forested with black spruce, tamarack, alder, birch, and larch. Soft muskeg and discontinuous permafrost are common in poorly drained areas at lower elevations and along north-facing slopes.

The area has a relatively dry interior continental climate with typically about 20 inches of total annual precipitation. Summer temperatures are relatively warm and may exceed 83 degrees Fahrenheit (°F). Minimum temperatures may fall to well below negative 45°F during the cold winter months.

## 2.2 Pollutants and Emissions

The Project will operate on a continuous, 24-hour-per-day, 7-day-per-week basis. This section describes the Project's maximum potential emissions from the operation and construction phases of the Project.

### 2.2.1 Operation Emissions

In addition to dust emissions (particulate matter [PM], particulate matter less than 2.5 micrometers [μm] in aerodynamic diameter [$PM_{2.5}$] and less than 10 μm in aerodynamic diameter [$PM_{10}$]) from mining activities (drilling, blasting, material handling, and hauling) and ore preparation activities (crushing, milling, and conveyance), the Project will also generate combustion emissions ($PM_{2.5}$, $PM_{10}$, carbon monoxide [CO], oxides of nitrogen [$NO_X$], $SO_2$, and VOC) from blasting, primary and backup power generation, process and ancillary equipment, and mobile machinery tailpipes. The maximum potential Project total annual emissions in tons per year (ton/yr) are provided in Table 2-1.

**Table 2-1. Donlin Project Maximum Potential Emissions Summary (ton/yr)**

| Source Category | CO | $NO_X$ | $PM_{2.5}$ | $PM_{10}$ | PM | $SO_2$ | VOC |
|---|---|---|---|---|---|---|---|
| Point Sources | 1,256 | 1,225 | 639 | 656 | 688 | 23.2 | 1,167.6 |
| Fugitive Sources | 1,925 | 54 | 169 | 1,350 | 4,775 | 0.2 | 0.2 |
| Mobile Machinery | 2,046 | 1,979 | 23 | 22 | 22 | 3.9 | 111.1 |
| Project Total | 5,227 | 3,258 | 831 | 2,028 | 5,485 | 27.3 | 1,278.8 |
| LOM Year | 19 | 19 | 16 | 20 | 20 | 19 | 19 |

The emissions provided in Table 2-1 represent the maximum potential annual emissions for each pollutant. As shown in Table 2-1, the total maximum emissions occur during life of mine (LOM) year 19 for CO, $NO_X$, $SO_2$, and VOC; LOM year 16 for $PM_{2.5}$; and LOM year 20 for $PM_{10}$ and PM. A detailed description of emission calculations and mining activity rates that result in the maximum emission years is provided in Section 3.7.

### 2.2.2 Construction Emissions

Construction of the Project is expected to occur over a three-to-four-year period. The total construction emissions during this period are summarized in Table 2-2.

**Table 2-2. Donlin Project Construction Emissions Summary (tons)**

| Source Category | CO | $NO_X$ | $PM_{2.5}$ | $PM_{10}$ | PM | $SO_2$ | VOC |
|---|---|---|---|---|---|---|---|
| Fugitive Sources | 152 | 4 | 105 | 748 | 3,011 | 0.01 | 0 |
| Mobile Machinery | 2,055 | 861 | 16 | 16 | 16 | 3.78 | 152 |
| Project Total | 2,207 | 865 | 121 | 764 | 3,027 | 3.80 | 152 |

As shown in Table 2-2, the total construction emissions are significantly less than the annual emissions during operation shown in Table 2-1.

## 2.3 Regulatory Basis

This section describes the regulatory basis for the PSD air quality analysis.

### 2.3.1 PSD Applicability

A comparison of the Project's stationary source emissions with the applicable PSD major source thresholds and Significant Emission Rates (SERs) is provided in Table 2-3 (fugitive and mobile machinery emissions are not included for a PSD major source determination per 40 CFR 52.21(b)(1)(iii) and (b)(4)).

**Table 2-3. Donlin Project Potential Emissions and PSD Thresholds (ton/yr)**

| Parameter | CO | $NO_X$ | $PM_{2.5}$ | $PM_{10}$ | PM | $SO_2$ | VOC |
|---|---|---|---|---|---|---|---|
| Process Source Emissions | 1,256 | 1,225 | 639 | 656 | 688 | 23 | 1,168 |
| PSD Major Source Threshold | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| SER | 100 | 40 | 10 | 15 | 15 | 40 | 40 |
| PSD Review Triggered | Yes | Yes | Yes | Yes | Yes | No | Yes |

This table shows that the Project has the potential to emit 250 ton/yr or more of a regulated New Source Review pollutant; therefore, it is subject to PSD permitting requirements pursuant to 18 AAC 50.302(a)(1), 50.306 and 40 CFR 52.21(a)(2)(iii), which require a PSD air quality analysis.

As shown in Table 2-3, the Project's potential emissions are expected to be greater than the SERs for all the pollutants shown except for $SO_2$. Therefore, and as confirmed by ADEC, $SO_2$ emissions are not included in the PSD air quality analysis provided in this report. Because the Project is major for both $NO_X$ and VOC, it is also considered major for ozone ($O_3$) per 40 CFR 52.21(b)(1)(ii), and $O_3$ review is addressed in Section 2.3.5.

In addition to the pollutants listed in Table 2-3, lead (Pb) is also a criteria pollutant for which Ambient Air Quality Standards (AAQS) and SER have been established. However, the estimated Pb emissions (less than 0.1 ton/yr) from point sources at the Project are less than the applicable SER of 0.6 ton/yr; therefore, Pb emissions are not subject to PSD review. Also, there is an Alaska-only AAQS and a PSD SER for total reduced sulfur (TRS) compounds. The estimated TRS compounds emissions (less than 3 ton/yr) from the Project's sources are less than the applicable SER of 10 ton/yr and are therefore not subject to PSD review.

### 2.3.2 Attainment Status and National Parks

The Project is in the South Central Alaska Interstate Air Quality Control Region No. 010, which is in attainment for all criteria pollutants and designated as a Class II area. The closest Class I area is the Denali National Park (DNP), located more than 300 kilometers (km) to the northeast (Figure 2-1) of the Project. The National Park Service has confirmed that no analysis is required for this Class I area (Notar 2013).

### 2.3.3 PSD Increments and AAQS

The PSD air quality analysis provided in this report includes dispersion modeling to demonstrate compliance with the applicable Class II Alaska (18 AAC 50.010) and national (40 CFR 50) AAQS and PSD increments (40 CFR 52.21(c)) provided in Table 2-4, in units of micrograms per cubic meter (μg/m$^3$) and/or parts per million (ppm).

**Table 2-4. Class II PSD Increments and AAQS**

| Pollutant | Averaging Period | PSD Increment (μg/m$^3$) | AAQS (ppm) | AAQS (μg/m$^3$) | AAQS Form |
|---|---|---|---|---|---|
| CO | 8-Hour | -- | 9 | 10,000 | Not to be exceeded more than once per year |
| | 1-Hour | -- | 35 | 40,000 | |
| $NO_2$ | Annual | 25 | 0.053 | 100 | Annual mean |
| | 1-Hour | -- | 0.1 | 188 | 98th percentile, averaged over 3 years |
| $PM_{2.5}$ | Annual (1) | 4 | -- | 12 | Annual mean, averaged over 3 years |
| | 24-Hour | 9 | -- | 35 | 98th percentile, averaged over 3 years/second-high (2) |
| $PM_{10}$ | Annual | 17 | -- | -- | Annual mean |
| | 24-Hour | 30 | -- | 150 | Not to be exceeded more than once per year on average over 3 years |

(1) Alaska AAQS is 15 μg/m$^3$.

(2) 98th percentile for AAQS and second-high for increment compliance.

The PSD increments are concentration levels that represent the maximum level of pollution or maximum permissible level of air quality deterioration allowed to occur in clean areas for a given project in conjunction with impacts from other nearby competing sources. The PSD increments were established by the United States Environmental Protection Agency (EPA) to be stringent air quality standards that are a small fraction of their corresponding AAQS (generally 25 percent of the AAQS). Significant deterioration is considered to occur when the amount of new pollution exceeds the applicable PSD increments.

The AAQS represent concentration levels of pollutants in ambient air that are considered protective of the public health, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. The AAQS also provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. These standards are established by the EPA and are adopted by state regulatory authorities. The AAQS are used in an air impact modeling analysis to demonstrate that the predicted concentrations resulting from a project's air emission sources combined with the existing air pollution (from both regional competing emission sources and from existing monitored baseline concentration levels) will not result in ambient concentrations beyond the AAQS—the upper concentration threshold that protects public health and welfare.

## 2.3.4 Preconstruction Ambient Air Quality

Donlin Gold initiated an onsite monitoring program in 2006 to evaluate the ambient air quality in the Project area (addressed in detail in Section 2.4.2). The monitored design concentrations for the applicable pollutants and their comparison to the AAQS are provided in Table 2-5.

**Table 2-5. Donlin Project Ambient Design Concentrations and AAQS**

| Pollutant | Averaging Period | Monitored Ambient Design Concentration | AAQS |
|---|---|---|---|
| CO | 8-Hour (2nd high) Maximum | 457.9 | 10,000 |
| | 1-Hour (2nd high) Maximum | 686.9 | 40,000 |
| $NO_2$ | Annual Average | 1.4 | 100 |
| | 1-Hour (98th percentile) Average | 20.7 | 188 |
| $PM_{2.5}$ | Annual Average | 2.3 | 12 |
| | 24-Hour (98th percentile) Average | 6.8 | 35 |
| $PM_{10}$ | 24-Hour (2nd high) Maximum | 14.1 | 150 |

Table 2-5 shows that the monitored design concentrations are significantly less than the corresponding AAQS for all pollutants and averaging periods. This demonstrates that the existing air quality in the Project area complies with the applicable AAQS for the triggered pollutants.

## 2.3.5 $O_3$ Review

In addition to Table 2-4, there is an Alaska AAQS and a national 8-hour AAQS for $O_3$, and as discussed earlier, the Project's emissions are subject to PSD review for $O_3$.

On January 17, 2017, the EPA promulgated an update to its Guideline on Air Quality Models (GAQM) (EPA 2017b) in 40 CFR 51, Appendix W, to incorporate a tiered demonstration approach to address the secondary chemical formation of $O_3$ and $PM_{2.5}$ associated with precursor emissions from single sources.

The 2017 GAQM outlines a two-tiered approach for addressing single-source $O_3$ and secondary $PM_{2.5}$ impacts:

1. **Tier 1:** The first tier of assessment involves those situations where existing technical information is available (e.g., results from existing photochemical grid modeling [PGM], published empirical estimates of source-specific impacts, or reduced-form models) in combination with other supportive information and analyses for the purposes of estimating secondary impacts from a particular source. According to the EPA, the existing technical information should provide a credible and representative estimate of the secondary impacts from the Project source.

2. **Tier 2:** If the first-tier analysis is not suitable, then a second-tier analysis would be conducted involving the application of more sophisticated, case-specific air quality modeling analyses using chemical transport models.

The most recent update (draft) of the EPA's guidance (EPA n.d.) on this subject suggests using qualitative methods to assess secondary impacts for parts of Alaska (like the Project) where photochemistry is not possible for portions of a year.

Alternatively, there is a simple screening lookup table method (Scheffe tables) that is widely used to predict $O_3$ ambient concentrations. However, this method is applicable to VOC-dominated sources with a VOC-to-$NO_X$ emission ratio of greater than 1, which is not applicable to a source like the Project where VOC emissions are less than $NO_X$ emissions, as shown in Table 2-1. Therefore, in the absence of a reasonable method for estimating ambient $O_3$ concentrations and per EPA's draft guidance, the potential $O_3$ formation resulting from the Project's emissions is addressed qualitatively (Section 3.13.3). The qualitative approach presented in Section 3.13.3 has been accepted by several agencies for PSD permitting purposes, including EPA Region 10,[1] ADEC,[2] and the Wyoming Department of Environmental Quality (WDEQ).[3]

## 2.4 Baseline Conditions

Donlin Gold has collected ambient air quality and meteorological and air quality starting in July 2004 at various locations in the Project proximity to establish baseline conditions for the PSD air quality analysis. A summary of Donlin Gold's ambient monitoring activity considered for this analysis is provided in Table 2-6.

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[1] EPA Region 10. 2011. "Supplemental Statement of Basis for Proposed Outer Continental Shelf Prevention of Significant Deterioration Permits Nobel Discoverer Drillship." July 6, 2011. (See page 57.) Accessed July 10, 2014. http://www.epa.gov/region10/pdf/permits/shell/discoverer_supplemental_statement_of_basis_chukchi_and_beaufort_air_permits_070111.pdf.

[2] ADEC. 2013. "Technical Analysis Report for Air Quality Control Construction Permit AQ1201CPT02." ExxonMobil Corporation Point Thomson Production Facility. June 12, 2013. (See page 21.) Accessed July 10, 2014. http://dec.alaska.gov/Applications/Air/airtoolsweb/AirPermitsApprovalsAndPublicNotices.
For Permit/Approval Type, select Major – Title I Construction (CPT), click Search, and then in the ExxonMobil Production Company row, click the Final TAR link.

[3] WDEQ. 2013. Air Quality Division, Permit Application Analysis AP-13083, Solvay Chemicals Inc. October 10, 2013.

**Table 2-6. Donlin Project Ambient Monitoring Summary**

| Monitored Parameters | Station | Monitoring Period |
|---|---|---|
| Surface Meteorology | American Ridge | July 2004 - June 2013 |
| | Camp | October 2005 - April 2012<br>August 2020 – July 2021 |
| | Hill 1918 | April 2009 - March 2011 |
| | Birch Tree Crossing | April 2010 - March 2011 |
| | Jungjuk | October 2010 - September 2012 |
| Upper Air | SODAR [(1)] | November 2008 - October 2009 |
| Air Quality | New Air Station | July 2006 - April 2013 |

[(1)] Sonic Detection and Ranging

The data listed in Table 2-6 have been reviewed by:

- ADEC (2007a) (2012a) (2012b) (2015d) (2021)
- Air Sciences (2021)
- Enviroplan (2009) (2010a) (2010b) (2010c) (2010d) (2012a) (2012b) (2012c) (2014)
- ERG (Eastern Research Group, Inc.) (2013a) (2013b)
- MACTEC (2007) (2008a) (2008b) (2009a) (2009b) (2009c) (2010) (2011)
- WESTON (2008) (2009a) (2009b) (2009c)

## 2.4.1 Baseline Meteorology

As shown in Table 2-6, Donlin Gold has collected surface and upper-air meteorological data at six different locations for varying periods. The most recent meteorological data was collected at the Camp station from August 1, 2020, to July 31, 2021, and was approved by ADEC for this air quality analysis (ADEC 2021). Section 3.5 provides a discussion of the 2020-2021 Camp station data used in this analysis.

## 2.4.2 Baseline Air Quality

Donlin Gold collected ambient air quality data at the Project site for the period of July 2006 to April 2013 to establish pre-construction baseline pollutant concentrations. These monitoring data have been submitted to ADEC for review and have been approved for use as background concentrations for the PSD air quality analysis (Enviroplan 2009) (Enviroplan 2012b) (Enviroplan 2014) (MACTEC 2009a) (MACTEC 2009b) (MACTEC 2009c) (WESTON 2008). Pollutant-specific ambient air monitoring details are provided in the following sections.

#### 2.4.2.1 CO Background

Ambient background levels of CO were collected at the onsite ambient monitoring station using a Teledyne 300E CO Analyzer, which is designated as EPA Automated Reference Method RFCA-1093-093. CO measurement was conducted for the following periods:

1. November 18, 2006, to November 17, 2007
2. January 1, 2008, to December 31, 2008

A summary of the monitored CO concentrations, in units of µg/m$^3$ and parts per billion (ppb), is provided in Table 2-7.

**Table 2-7. CO Background Concentration Summary**

| Pollutant | Averaging Period | Monitoring Period | Background Concentration (µg/m$^3$) | Background Concentration (ppb) |
|---|---|---|---|---|
| CO | 8-Hour (2nd high) | 11/18/2006 - 11/17/2007 | 457.9 | 400 |
| | | 01/01/2008 - 12/31/2008 | 343.5 | 300 |
| | 8-Hour (2nd high) Maximum | | 457.9 | 400 |
| | 1-Hour (2nd high) | 11/18/2006 - 11/17/2007 | 686.9 | 600 |
| | | 01/01/2008 - 12/31/2008 | 457.9 | 400 |
| | 1-Hour (2nd high) Maximum | | 686.9 | 600 |

#### 2.4.2.2 $NO_2$ Background

Ambient hourly $NO_2$ levels were measured at the onsite ambient monitoring station with a Teledyne 200E $NO_X$ Analyzer, which measures the concentration of nitrogen oxides (NO) and total $NO_X$ and calculates $NO_2$ concentrations. This instrument is designated as EPA Automated Reference Method RFNA-1194-099. The hourly $NO_2$ data were collected for the following periods:

1. November 18, 2006, to November 17, 2007
2. January 9, 2008, to December 31, 2008
3. December 1, 2010, to November 22, 2011
4. April 17, 2012, to April 16, 2013

A summary of the monitored $NO_2$ concentrations is provided in Table 2-8.

**Table 2-8. $NO_2$ Background Concentration Summary**

| Pollutant | Averaging Period | Monitoring Period | Background Concentration (μg/m³) | Background Concentration (ppb) |
|---|---|---|---|---|
| $NO_2$ | Annual | 11/18/2006 - 11/17/2007 | 1.5 | 0.8 |
| | | 01/09/2008 - 12/31/2008 | 2.1 | 1.1 |
| | | 12/01/2010 - 11/22/2011 | 0.5 | 0.3 |
| | | 04/17/2012 - 04/16/2013 | 1.4 | 0.7 |
| | Annual Average | | 1.4 | 0.7 |
| | 1-Hour (98th percentile) | 11/18/2006 - 11/17/2007 | 28.2 | 15.0 |
| | | 01/09/2008 - 12/31/2008 | 20.7 | 11.0 |
| | | 12/01/2010 - 11/22/2011 | 13.2 | 7.0 |
| | | 04/17/2012 - 04/16/2013 | 17.3 | 9.2 |
| | 1-Hour (98th percentile) Average | | 20.7 | 10.6 |

## 2.4.2.3 $PM_{2.5}$ Background

The hourly background $PM_{2.5}$ data were collected at the onsite ambient monitoring station using BGI PQ200 Samplers associated with Federal Reference Method RFPS-0498-116. The $PM_{2.5}$ data were collected from January 1, 2008, to December 29, 2008.

A summary of the monitored $PM_{2.5}$ concentrations is provided in Table 2-9.

**Table 2-9. $PM_{2.5}$ Background Concentration Summary**

| Pollutant | Averaging Period | Monitoring Period | Background Concentration (μg/m³) |
|---|---|---|---|
| $PM_{2.5}$ | Annual | 01/01/2008 - 12/29/2008 | 2.3 |
| | 24-Hour (98th percentile) | 01/01/2008 - 12/29/2008 | 6.8 |

## 2.4.2.4 $PM_{10}$ Background

The hourly $PM_{10}$ data were collected at the onsite ambient monitoring station with high volume samplers. These samplers have an EPA Federal Reference Method designation of RFPS-0202-141. The $PM_{10}$ data were collected from July 1, 2006, to June 30, 2008.

A summary of the monitored $PM_{10}$ concentrations is provided in Table 2-10.

**Table 2-10. $PM_{10}$ Background Concentration Summary**

| Pollutant | Averaging Period | Monitoring Period | Background Concentration ($\mu g/m^3$) |
|---|---|---|---|
| $PM_{10}$ | 24-Hour (2nd high) | 07/01/2006 - 06/30/2007 | 14.1 |
| | | 07/01/2007 - 06/30/2008 | 13.5 |
| | 24-Hour (2nd high) Maximum | | 14.1 |

### 2.4.2.5 $O_3$ Background

Ambient hourly $O_3$ concentrations at the onsite ambient monitoring station were measured with a Teledyne 400E $O_3$ Analyzer, which is designated as EPA Automated Equivalent Method EQOA-0992-087. The hourly $O_3$ data were collected for the following periods:

1. December 1, 2010, to November 22, 2011
2. April 17, 2012, to April 16, 2013

A summary of monitored $O_3$ concentrations is provided in Table 2-11.

**Table 2-11. $O_3$ Background Concentration Summary**

| Pollutant | Averaging Period | Monitoring Period | Background Concentration ($\mu g/m^3$) | Background Concentration (ppb) |
|---|---|---|---|---|
| $O_3$ | 8-Hour (4th high) | 12/01/2010 - 11/22/2011 | 99.6 | 50.8 |
| | | 04/17/2012 - 4/16/2013 | 101.8 | 51.9 |
| | 8-Hour (4th high daily maximum) Average | | 100.7 | 51.3 |

The monitored $O_3$ data were used as an input for $NO_2$ modeling (Section 3.9).

# 3.0 AIR QUALITY ANALYSIS

This section describes the modeling methods, procedures, and datasets used for the Project PSD air quality analysis. The modeling methodology was reviewed and approved by ADEC on September 28, 2015, (ADEC 2015b), and October 1, 2015, (ADEC 2015f). The results of this analysis are presented at the end of this section (Section 3.13).

## 3.1 Model Selection

Version 21112 of the AERMOD (American Meteorological Society/Environmental Protection Agency Regulatory Model) modeling system was used for this air quality analysis. AERMOD is an enhanced steady-state, Gaussian plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain (EPA 2004a). The AERMOD modeling system is listed as the recommended model for short-range analysis (up to 50 km) in 40 CFR 51, Appendix W.

## 3.2 Pollutants and Averaging Periods

The Project air quality analysis includes dispersion modeling for the pollutants and averaging periods presented in Table 3-1. This table also shows the short-term (up to 24-hour) modeled design values used for compliance demonstration.

**Table 3-1. Pollutants and Averaging Periods**

| Pollutant | Averaging Period | Compliance Design Value |
|---|---|---|
| CO | 8-Hour | Second-High |
| | 1-Hour | Second-High |
| $NO_2$ | Annual | |
| | 1-Hour | Eighth-High |
| $PM_{2.5}$ | Annual | |
| | 24-Hour | Second-High and Eighth-High (1) |
| $PM_{10}$ | Annual | |
| | 24-Hour | Second-High |

(1) Second-high for increment and eighth-high for AAQS compliance

## 3.3 Building Downwash

The effects of the building-induced downwash were incorporated into this analysis. The building downwash parameters were calculated using the most recent version of the Building Profile Input Program (BPIP) with the Plume Rise Model Enhancement (PRIME) algorithm (BPIP-PRIME version 04274).

## 3.4 Modeling Domain

For this air quality analysis, pollutant impacts were assessed at and beyond the Project ambient air boundary.

### 3.4.1 Ambient Air Boundary

The Project will be an active industrial site where hazardous activities will occur, such as explosives handling, blasting, drilling, and heavy equipment operation. To mitigate hazards from these activities, most areas at the mine will require strict safety protocols and controlled access. Donlin Gold has established a Core Operating Area (COA) boundary to identify the area where public access will be excluded. Donlin Gold has legal authority under its lease agreements with The Kuskokwim Corporation, Calista Corporation, and Lyman Resources to restrict the public from access within the COA on lands owned by these entities. This COA boundary, shown in Figures 3-1, 3-2, and 3-7, is used to define the ambient air boundary for modeling purposes.

Donlin Gold has developed a Public Access Control Plan (Donlin Gold 2017) that describes the measures that will be employed to exclude public access to the COA. These measures include the following:

- Public Easements – There are currently 15 publicly recognized access easements and/or rights-of-way (public easements) that intersect the COA. Donlin Gold has submitted a Public Easement Plan to reroute these public easements around the COA.
- Fencing – For locations where fencing will be used, the fence will extend along the COA boundary for a minimum of 100 feet in each direction from the edge of a roadway, trail, or former public easement that crosses the COA boundary.
- Signage – Warning signs will be posted on the fenced controlled boundaries of all roadways, trails, easements, and other identified access points to the COA.
- Natural Barriers – Streams and creeks, wetlands, steep slopes, and areas of thick vegetation and undergrowth around the proposed COA will, in certain instances, serve as natural barriers or impediments to access. Creeks within the COA are not navigable waters (BLM 2005); consequently, these are not considered public access routes.
- Surveillance – Mine security will routinely patrol the mine facilities and roadways for unauthorized individual(s). In addition, all onsite personnel will be briefed on the necessity of restricting public access to areas within the COA. Any suspected trespass by unauthorized individual(s) will be immediately reported to security.

- Access roads - The mine access roads are not open to public use, and access will be controlled by signage and patrols. A gate will be installed at the point the port access road crosses the COA boundary.

### 3.4.2 Receptors

The air quality analysis was conducted using the following receptor spacing and extents:

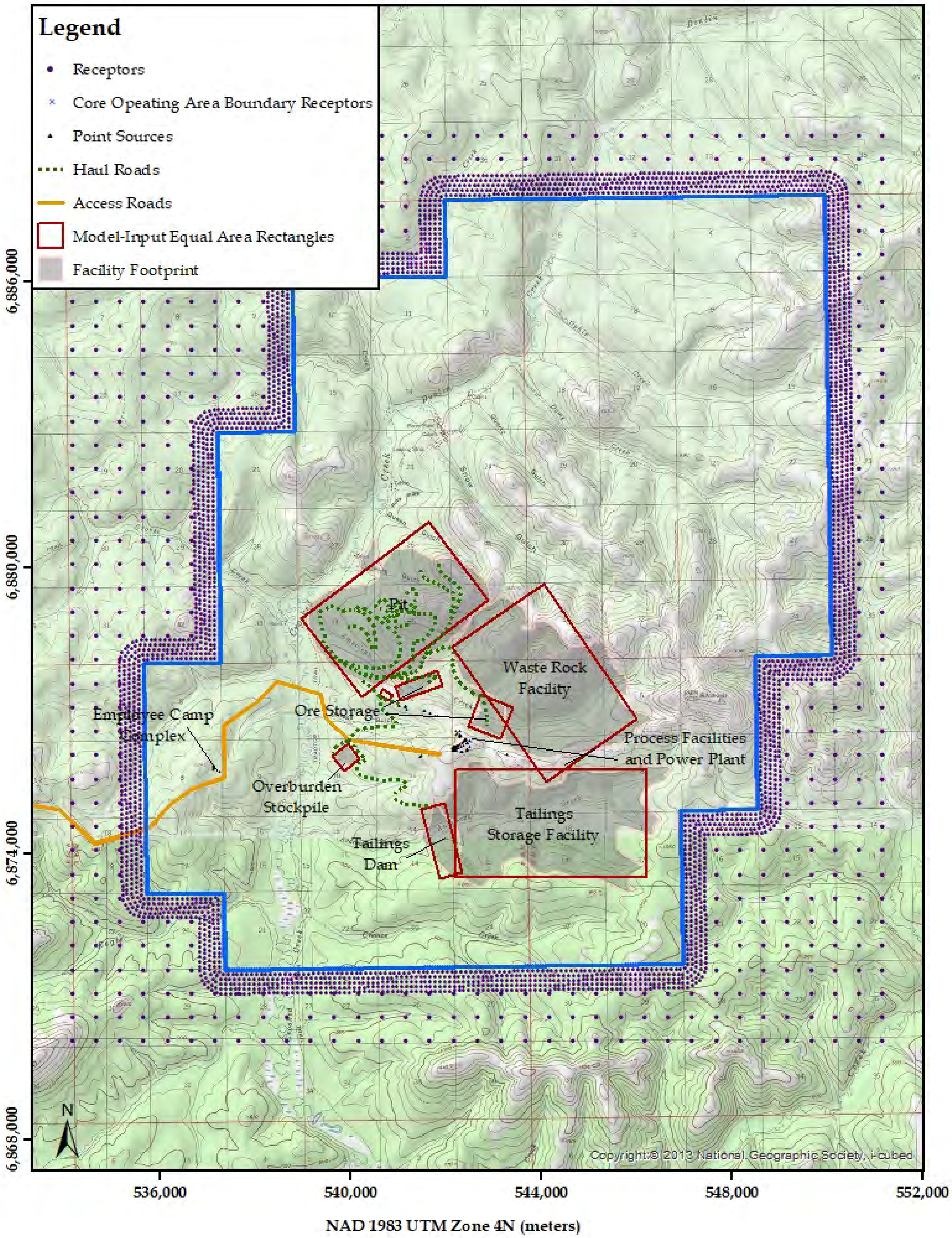
- 50-meter-spaced receptors placed along the ambient air boundary
- 100-meter-spaced receptors extending 500 meters beyond the ambient air boundary
- 500-meter-spaced receptors extending 1 km beyond the 100-meter-spaced receptors

In addition, each highest modeled impact was further evaluated by performing a hot-spot analysis using a finer 25-meter-spacing receptor grid. The modeled receptor grid is shown in Figure 3-1.

The most recent version of the AERMOD terrain preprocessor, AERMAP (version 18081), was used to develop receptor elevations and hill heights. AERMAP uses United States Geological Survey (USGS) 1-degree and 7.5-minute Digital Elevation Model or National Elevation Dataset (NED) files for this purpose. USGS 1-arc-second (30-meter) resolution NED files were used to process receptors for this analysis.

A permanent employee camp complex will be constructed within the Project COA boundary to provide onsite worker housing. This employee camp complex will meet the Alaska policy requirements (ADEC 2004) for exclusion from the model receptor domain. The Donlin Gold housing policy limits the use of the camp area to employees, contractors, or visitors present for work or official business. Casual or family visits are not permitted, and any persons staying at the living quarters will be on 24-hour call.

**Figure 3-1. Modeled Receptor Grid**



## 3.5 Meteorological Data

AERMOD requires an input of hourly meteorological data to estimate pollutant concentrations in ambient air resulting from modeled source emissions. The EPA's Guideline on Air Quality Models states, "*5 years of NWS meteorological data or at least l year of site specific data is required*" for an air quality modeling analysis (40 CFR 51, Appendix W, 8.3.1.2 b.).

For this analysis, Donlin Gold has used ADEC-approved one year (August 1, 2020, to July 31, 2021) of site-specific hourly surface meteorological data collected at the Donlin Camp station. The site-specific surface meteorological parameters collected and their usability for AERMET processing are summarized in Table 3-2.

**Table 3-2. Site-Specific Meteorological Parameters for AERMET Processing**

| Monitored Parameter | AERMET Card | AERMET Input |
|---|---|---|
| Wind speed at 10 meters | WS02 | Yes |
| Wind direction at 10 meters | WD02 | Yes |
| Standard deviation of the horizontal wind direction at 10 meters (sigma theta) | SA02 | No (1) |
| Temperature at 10 meters | TT02 | Yes |
| Temperature at 2 meters | TT01 | Yes |
| Vertical temperature difference (10 meters minus 2 meters temperature) | DT01 | Yes |
| Relative humidity at 2 meters | RH01 | Yes |
| Incoming solar radiation (insolation) | INSO | Yes |
| Station pressure | PRES | Yes |
| Precipitation amount | PAMT | No (2) |

(1) Excluded per ADEC request; not required for modeling

(2) Excluded due to insufficient capture; not required modeling

The site-specific surface data were supplemented with the following concurrent National Weather Station (NWS) datasets:

- Twice-daily upper-air data (all levels) from the McGrath NWS station.
- Cloud-cover data from the Sleetmute NWS station. Cloud-cover data from the Aniak NWS station were used to supplement the Sleetmute data, as approved by ADEC (ADEC 2015b) (ADEC 2021).

Per ADEC request, the AERMET keyword SUBNWS was not used for NWS surface data substitution. Sleetmute, Aniak, and McGrath station information is provided in Table 3-3.

**Table 3-3. Sleetmute, Aniak, and McGrath Station Information**

| Station Name | WBAN [(1)] ID | Latitude | Longitude | Distance from Donlin Project |
|---|---|---|---|---|
| Sleetmute | 26553 | 61.70°N | 157.17°W | 35 miles southeast |
| Aniak | 26516 | 61.58°N | 159.53°W | 45 miles southwest |
| McGrath | 26510 | 62.96°N | 155.61°W | 97 miles northeast |

(1) WBAN - Weather Bureau Air Force Navy

The locations of the Camp, Sleetmute, Aniak, and McGrath stations in relation to the Project are provided in Figure 3-2, and a wind frequency distribution for the Camp 2020–2021 data is presented in Figure 3-3.

Donlin Gold has used the adjusted surface friction velocity default model option (ADJ_U*) for this modeling analysis in accordance with ADEC approval granted on September 15, 2015, (ADEC 2015e). Per this approval, the low-wind non-default model option (LOWWIND3) and the sigma-theta and sigma-w meteorological parameters were not used for this modeling analysis.

## 3.5.1 Surface Characteristics for AERMET Processing

AERMET requires the input of three surface boundary layer parameters: midday Bowen ratio ($B_o$), midday albedo (r), and surface roughness length ($z_o$). These parameters are dependent on the land use and vegetative cover of the area being evaluated. Per discussions with ADEC, terrain elevation features were not considered in calculating $z_o$. The 2016 National Land Cover Data (NLCD) was processed with AERSURFACE to develop these surface characteristic parameters for the Camp station.

**Figure 3-2. Location of Meteorological Stations**

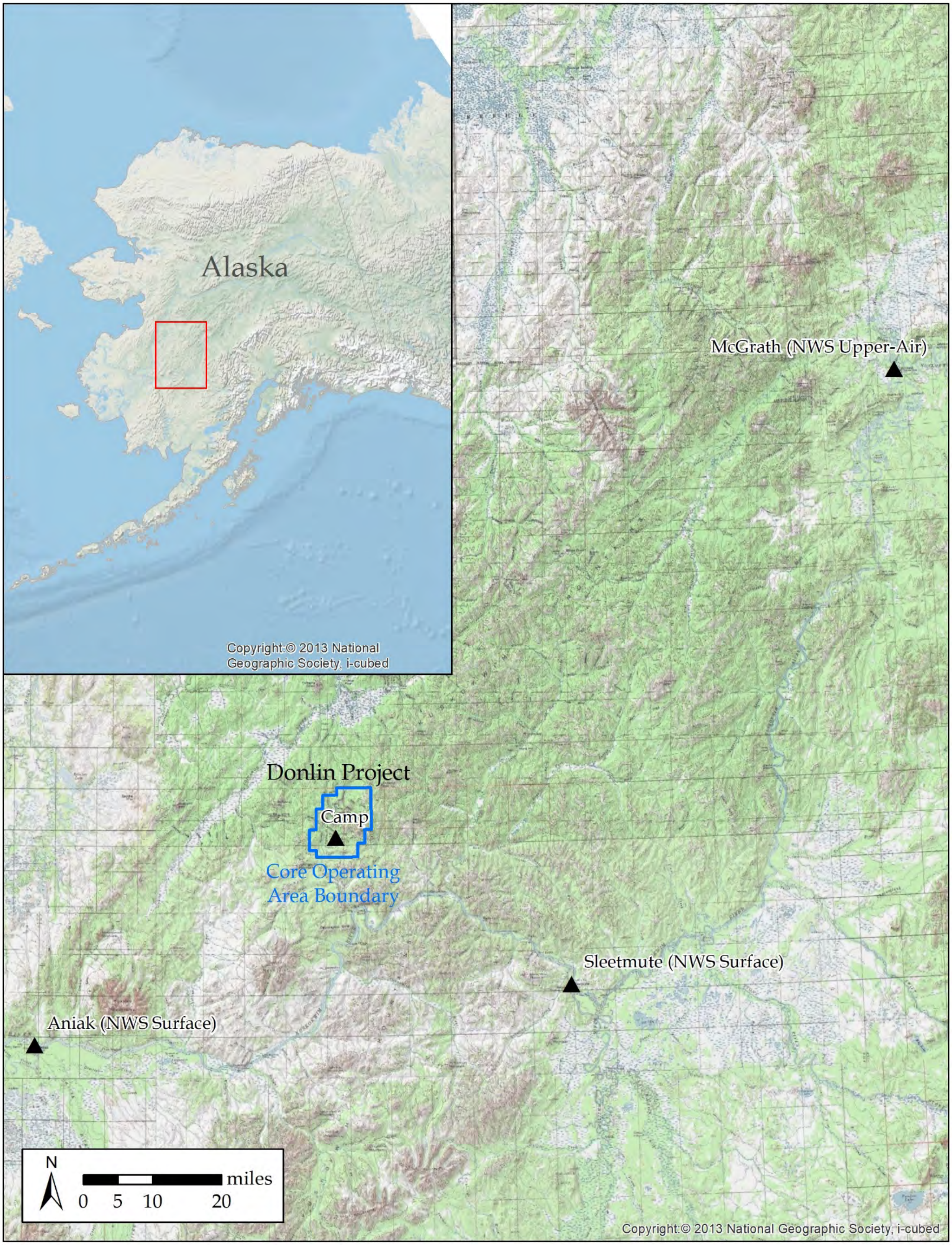
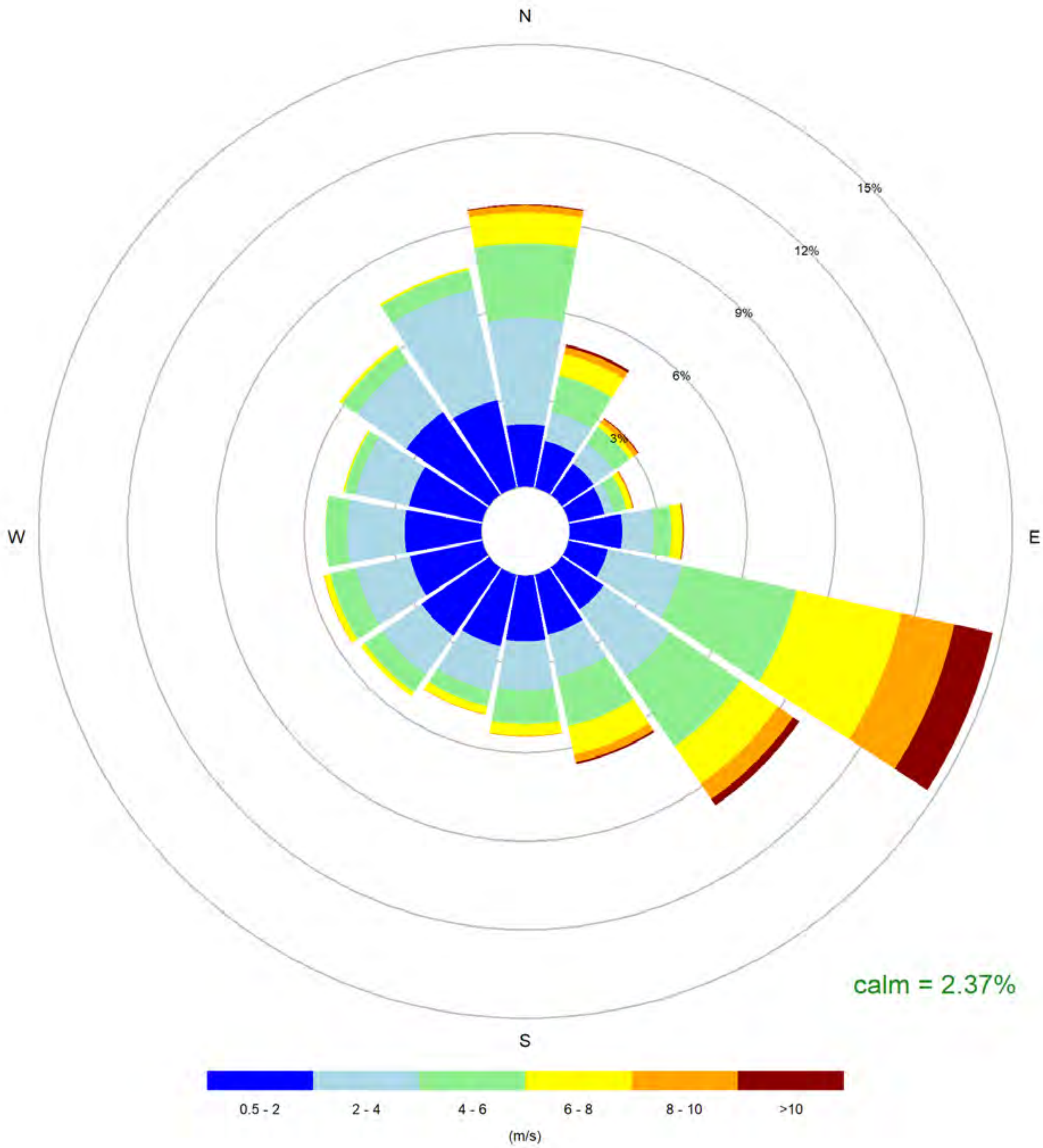


**Figure 3-3. Wind Frequency Distribution for Camp Data (August 2020 to July 2021)**



### 3.5.1.1 Bowen Ratio and Albedo

The $B_o$ and r were produced by AERSURFACE with the 2016 NLCD, using a 10-km by 10-km area around the Camp station. A high-resolution aerial photograph showing the 10-km by 10-km area around the Camp station is provided in Figure 3-4. A 10-km by 10-km land cover classification map for the Camp station area is provided in Figure 3-5.

The determination of $B_o$ is dependent on ambient moisture conditions (i.e., wet, average, or dry). For this purpose, historic 30-year (1991–2020) precipitation data from the McGrath station (closest station for which this type of data is available) were used. The data capture rate for this dataset is good, with no data missing for any given month in the data period.

The 70$^{th}$ and 30$^{th}$ percentile (P) values estimated from the 30-year precipitation data were used to assign a moisture class to each calendar month per the following scheme: monthly precipitation greater than 70$^{th}$ P as wet, between 70$^{th}$ and 30$^{th}$ P as average (Avg), and less than 30$^{th}$ P as dry. While data capture was good throughout the historical period, three months in 2021 (April, June, and July 2021) have low capture rates, with four or more days of measurement missing. For those months, the Avg moisture class was assumed.

The monthly season and moisture (M) classification and estimated r and $B_o$ for the 2020-2021 Camp data are presented in Table 3-4.

**Table 3-4. Monthly Season and Moisture Classification and Calculated r and $B_o$**

| Month | Season | r | 2020-2021 | |
|---|---|---|---|---|
| | | | M | $B_o$ |
| August | Summer | 0.14 | Dry | 0.94 |
| September | Autumn | 0.14 | Avg | 0.98 |
| October | Winter (No Snow) | 0.14 | Avg | 0.98 |
| November | Winter (Snow) | 0.40 | Avg | 0.50 |
| December | Winter (Snow) | 0.40 | Dry | 0.50 |
| January | Winter (Snow) | 0.40 | Dry | 0.50 |
| February | Winter (Snow) | 0.40 | Avg | 0.50 |
| March | Winter (Snow) | 0.40 | Wet | 0.50 |
| April | Winter (Snow) | 0.40 | Avg | 0.50 |
| May | Spring | 0.14 | Dry | 1.74 |
| June | Summer | 0.14 | Avg | 0.44 |
| July | Summer | 0.14 | Avg | 0.44 |

**Figure 3-4. 10-km by 10-km Aerial Photograph – Camp Station**

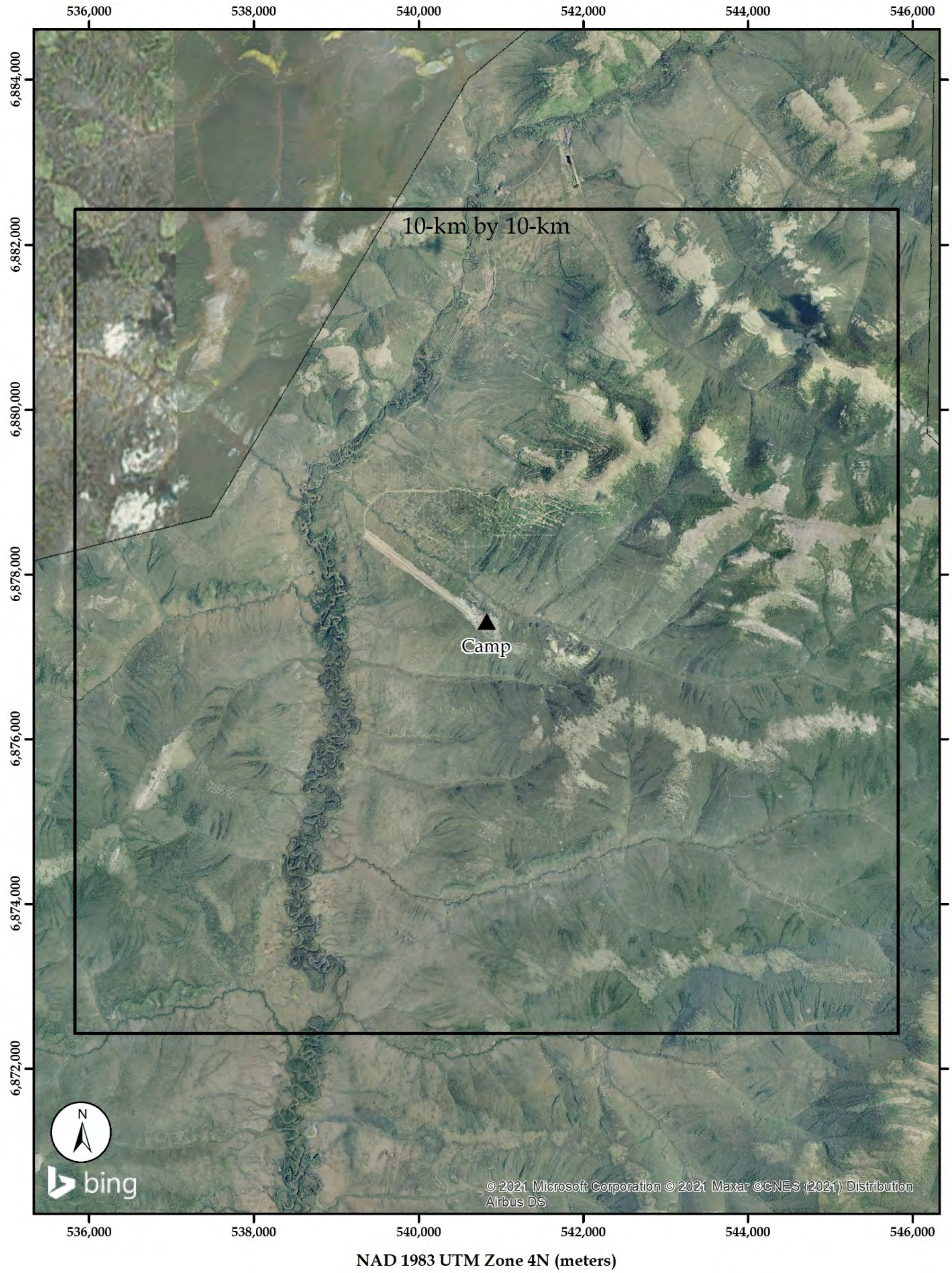
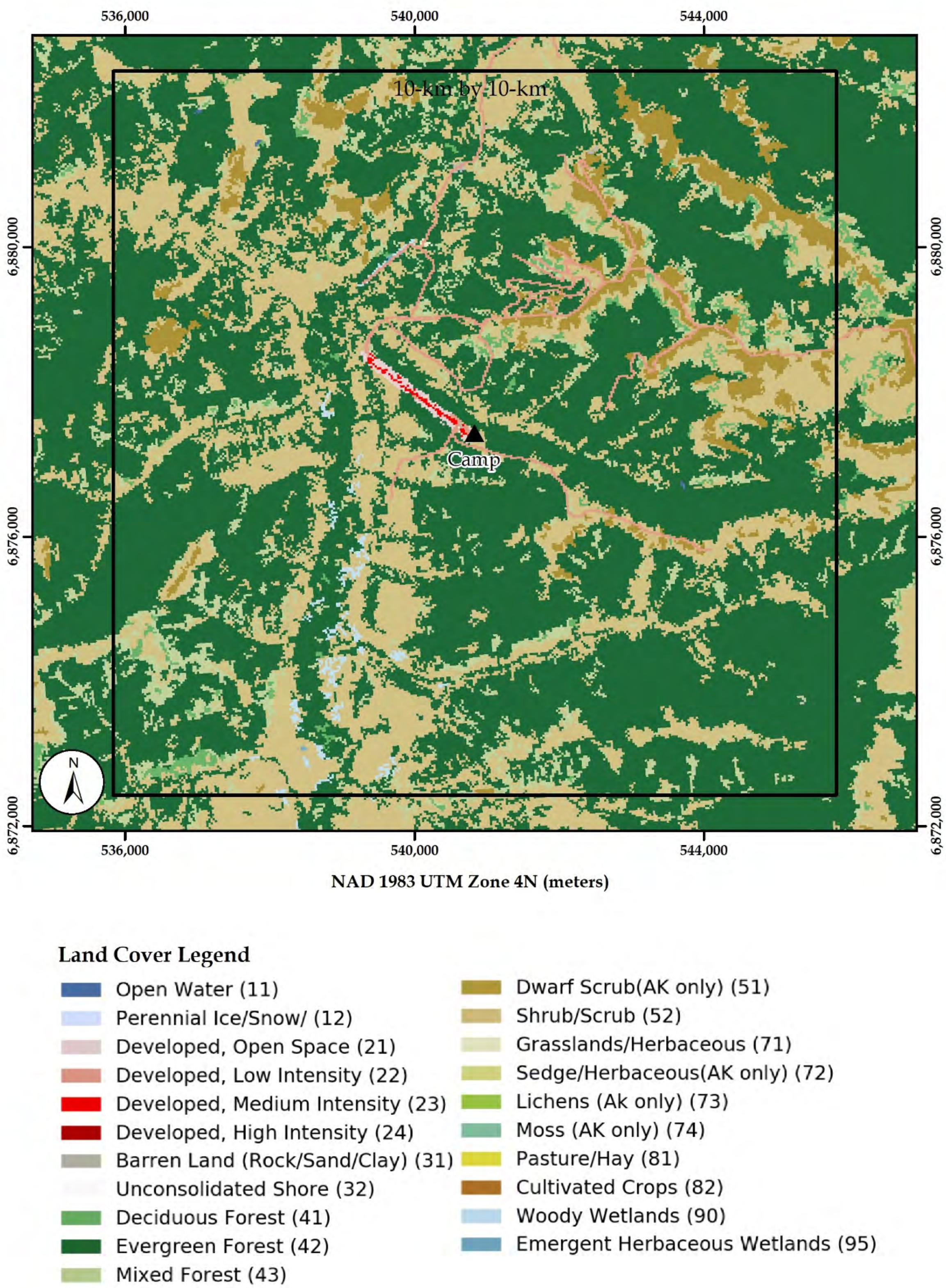


**Figure 3-5. 10-km by 10-km Land Cover Classification Map – Camp Station**



### 3.5.1.2 Surface Roughness Length

The seasonal $z_o$ values for each 30-degree sector of the 1-km radius for the Camp station are provided in Table 3-5. (Sector 1 is 0 to 30 degrees clockwise from the north, Sector 2 is 30 to 60 degrees clockwise from the north, etc.)

**Table 3-5. Calculated Seasonal Surface Roughness Length Values (m)**

| Sector | Summer | Autumn | Winter (No Snow) | Winter (Snow) | Spring |
|---|---|---|---|---|---|
| 1 | 0.717 | 0.713 | 0.695 | 0.544 | 0.709 |
| 2 | 0.924 | 0.924 | 0.895 | 0.755 | 0.913 |
| 3 | 0.546 | 0.546 | 0.546 | 0.371 | 0.546 |
| 4 | 0.985 | 0.982 | 0.974 | 0.875 | 0.981 |
| 5 | 0.671 | 0.665 | 0.648 | 0.510 | 0.663 |
| 6 | 0.672 | 0.657 | 0.626 | 0.503 | 0.653 |
| 7 | 0.798 | 0.777 | 0.731 | 0.642 | 0.770 |
| 8 | 0.526 | 0.513 | 0.473 | 0.349 | 0.503 |
| 9 | 0.386 | 0.364 | 0.324 | 0.243 | 0.361 |
| 10 | 0.367 | 0.348 | 0.303 | 0.222 | 0.343 |
| 11 | 0.343 | 0.321 | 0.287 | 0.211 | 0.321 |
| 12 | 0.753 | 0.748 | 0.730 | 0.591 | 0.745 |

Summer = June, July, August

Autumn = September

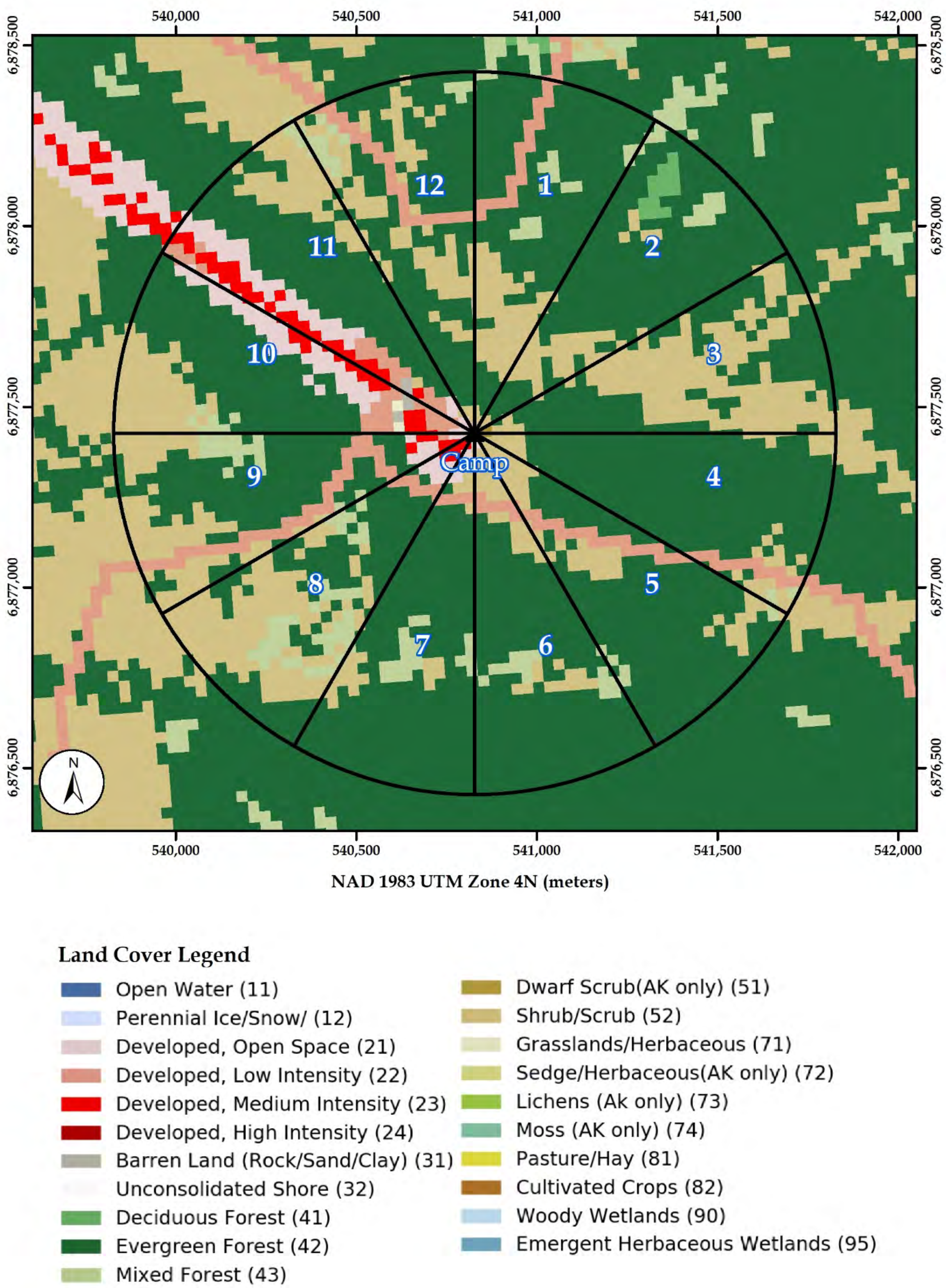
Winter (No Snow) = October

Winter (Snow) = January, February, March, April, November, December

Spring = May

A map showing the sectors and the land cover classification for a 1-km radius area around the Camp station is provided in Figure 3-6.

**Figure 3-6. 1-km Radius Land Cover Classification and Sectors – Camp Station**



## 3.6 Background Concentrations

The monitored pollutant concentrations (Section 2.4.2), also known as baseline or ambient background concentrations, are considered to be representative of the prevailing air pollution from existing sources in the region. These background concentrations are added to the modeled concentrations from Project's emissions (to account for the sources not modeled exclusively) to estimate the total ambient concentrations in the area. These total ambient concentrations are compared to the AAQS to determine compliance.

Donlin Gold has used the pollutant and averaging-period-specific measured concentrations provided in Section 2.4.2 to develop the design background values for this analysis, summarized in Table 3-6. These design background concentrations were estimated from the measured data in accordance with 40 CFR 51, Appendix W, Section 8.2 provisions without any processing. For $NO_2$ modeling, temporally varying background profiles for $NO_2$ and $O_3$ developed from the monitoring data were used. These profiles are provided in Section 3.9 and show the varying background concentration for each hour of the day for each month of the year.

**Table 3-6. Design Background Concentrations**

| Pollutant | Averaging Period | Background Concentration | |
|---|---|---|---|
| | | (μg/m³) | (ppb) |
| CO | 8-Hour (2nd high) Maximum | 457.9 | 400 |
| | 1-Hour (2nd high) Maximum | 686.9 | 600 |
| $NO_2$ | Annual Average | 1.4 | 0.7 |
| | 1-Hour (98th percentile) Average | 20.7 | 10.6 |
| $PM_{2.5}$ | Annual Average | 2.3 | N/A |
| | 24-Hour (98th percentile) Average | 6.8 | N/A |
| $PM_{10}$ | 24-Hour (2nd high) Maximum | 14.1 | N/A |
| $O_3$ | 8-Hour (4th high daily maximum) Average | 100.7 | 51.3 |

## 3.7 Source Emissions and Characterization

This section discusses emission factors and methods used to develop the Project's emissions inventory. It also addresses emissions and source characterization for model input.

### 3.7.1 Emission Calculations

An emissions inventory for the Project was developed and is provided in Appendix B. A variety of sources, including AP-42 emission factors, performance data from similar sources, manufacturer specifications, New Source Performance Standards (NSPS), and technical literature, were used to develop the Project emissions inventory. A summary of emission factor references used to develop the Project emissions inventory is provided in Tables 3-7 through 3-9.

**Table 3-7. Emission Factor References – Mill and Process Sources**

| Source Category | Pollutant | Emission Factor | | Reference | Remarks |
|---|---|---|---|---|---|
| Ore Transfer | $PM_{2.5}$ | 0.00003 | lb/ton | AP-42, Sec. 13.2.4, Eq. 1, 11/06 | Based on moisture content of 1.8% and average wind speed of 1.3 mph (to account for enclosure). (Donlin Gold 2015b) |
| | $PM_{10}$ | 0.00023 | lb/ton | | |
| Baghouses/Dust Collectors | $PM_{2.5}$, $PM_{10}$ | 0.01 | gr/ft³ | Vendor performance guarantee | Donlin Gold will require vendor performance guarantees of less than or equal to the stated emission levels. (Donlin Gold 2015b) |
| | $PM_{2.5}$, $PM_{10}$ | 0.02 | gr/ft³ | | |
| Autoclaves | $PM_{2.5}$, $PM_{10}$ | 100 | g/hr | Donlin Gold and Hatch Engineering conservative estimates | (Donlin Gold 2015b) |
| | $SO_2$ | 507 | g/hr | | |
| | $H_2S$ | 144 | g/hr | | |
| | VOC | 19 | g/hr | | |
| | CO | 2,600 | ppm | | |
| Hot Cure | $PM_{2.5}$, $PM_{10}$ | 181 | g/hr | | |
| Carbon Kiln | $PM_{2.5}$, $PM_{10}$ | 50,000 | µg/Nm³ | Similar source test data | The test data are from similar sources at Barrick Goldstrike facility in Nevada. (Donlin Gold 2015b) |
| | CO | 100,000 | µg/Nm³ | | |
| | $NO_X$ | 2,000 | µg/Nm³ | | |
| | VOC | 50,000 | µg/Nm³ | | |
| Electrowinning Cells | $PM_{2.5}$, $PM_{10}$ | 12,000 | µg/Nm³ | | |
| Retort | $PM_{2.5}$, $PM_{10}$ | 40,000 | µg/Nm³ | | |
| Induction Furnace | $PM_{2.5}$, $PM_{10}$ | 11,500 | µg/Nm³ | | |

µg/Nm³ - micrograms per normalized cubic meter

g/hr - grams per hour

gr/ft³ - grains per cubic foot

lb/ton - pounds per ton

**Table 3-8. Emission Factor References – Mining Sources**

| Source Category | Pollutant | Emission Factor | | Reference | Remarks |
|---|---|---|---|---|---|
| Drilling | $PM_{2.5}$ | 0.039 | lb/hole | AP-42, Tab. 11.9-4, 7/98 (overburden) | Scaling for drilling not available, blasting scaling factors (AP-42, Tab. 11.9-1) used |
| | $PM_{10}$ | 0.676 | lb/hole | | |
| Blasting (1) | $PM_{2.5}$ | 17.5 / 12.8 | lb/blast | AP-42, Tab. 11.9-1, 7/98 (overburden) | |
| | $PM_{10}$ | 302.6 / 221.3 | lb/blast | | |
| | CO | 67.0 | lb/ton-Emulsion | AP-42, Tab. 13.3-1, 2/80 (ANFO) | |
| | $NO_X$ | 1.8 | lb/ton-Emulsion | CSIRO, 2008 | Based on 27 tests conducted by Australian coal mining industry |
| | $SO_2$ | 0.006 | lb/ton-Emulsion | Mass balance | ULSD with 15 ppm S content |
| Material Handling | $PM_{2.5}$ | 0.0002 | lb/ton | AP-42, Sec. 13.2.4, Eq. 1, 11/06 | Based on moisture content of 2.5% and average wind speed of 7.95 mph |
| | $PM_{10}$ | 0.0015 | lb/ton | | |
| Hauling (2) | $PM_{2.5}$ | 0.328 / 0.329 | lb/VMT | AP-42, Sec. 13.2.2, Eqs. 1a and 2, 11/06 | Based on silt content of 3.8%, mean vehicle weight of 449.4 tons, 129 days per year with precipitation ≥ 0.01 inch, and 90% control |
| | $PM_{10}$ | 3.28 / 3.29 | lb/VMT | | |
| Dozing | $PM_{2.5}$ | 0.90 | lb/hr | AP-42, Tab. 11.9-1, 07/98, (overburden) | |
| | $PM_{10}$ | 1.54 | lb/hr | | |
| Grading | $PM_{2.5}$ | 0.02 | lb/VMT | AP-42, Tab. 11.9-1, 07/98 | Based on mean vehicle speed of 3 mph, and 129 days per year with precipitation ≥ 0.01 inch |
| | $PM_{10}$ | 0.28 | lb/VMT | | |
| Water Trucking | $PM_{2.5}$ | 0.22 | lb/VMT | AP-42, Sec. 13.2.2, Eqs. 1a and 2, 11/06 | Based on silt content of 3.8%, mean vehicle weight of 182.6 tons, 129 days per year with precipitation ≥ 0.01 inch, and 90% control |
| | $PM_{10}$ | 2.19 | lb/VMT | | |
| Wind Erosion of Roads | $PM_{2.5}$ | 12.52 | lb/acre-yr | AP-42, Sec. 13.2.5, 11/06 | Fastest-mile based hourly emissions summed over a year, and 90% control |
| | $PM_{10}$ | 83.43 | lb/acre-yr | | |
| Wind Erosion of Stockpiles, Waste and Tailings Facilities | $PM_{2.5}$, $PM_{10}$ | Variable | | AP-42, Sec. 13.2.5, 11/06 | Fastest-mile based hourly emissions, varied based on frequency of threshold wind events |
| Machinery Tailpipes | All | Variable | | 40 CFR 1039 | Engine size-specific Tier 4 emission factors and a load factor of 7,000 Btu/hp-hr |
| Personnel and Cargo Transportation Tailpipes | All | Variable | | EPA MOVES | |

(1) $PM_{10}/PM_{2.5}$ emission factors are a function of the blast area, which varies by LOM year. The emission factors shown are for LOM years 16 and 20, respectively.
(2) $PM_{10}/PM_{2.5}$ emission factors are a function of the truck fleet, which varies by LOM year. The emission factors shown are for LOM years 16 and 20, respectively.

Btu - British thermal unit

hp-hr - horsepower-hour

lb/VMT - pounds per vehicle miles travelled

ULSD – ultra-low-sulfur diesel

Wind erosion emissions from exposed surfaces of material stockpiles (ore stockpiles and waste dumps) and flat surfaces (tailings dry beach and road surfaces) were estimated using the fastest-mile method specified in AP-42, Section 13.2.5. An ADEC-approved factor of 1.24[4] was used to convert the hourly wind speeds to fastest-mile wind speeds. Sample wind erosion emission calculations are provided in Appendix B.

Donlin Gold will control dust emissions from unpaved roads through a combination of controls including water and chemical dust suppressant application according to its fugitive dust control plan. The fugitive dust control plan includes visual observations of dust emissions from unpaved roads to assess dust control effectiveness. As discussed below, this will provide 90 percent, or greater, dust control.

The EPA source documents for control efficiency referenced in AP-42, Section 13.2.2, Unpaved Roads, as well as additional applicable studies, were reviewed by Air Sciences. This review (described in Air Sciences' memorandum (Air Sciences 2015b)) indicated that the studies showed that chemical suppressants alone could achieve 90 percent, or more, control efficiency. The Air Sciences memorandum also provides examples of other agencies that have adopted a 90-percent-control-efficiency level with chemical dust suppressants application on unpaved roads as part of their air quality program.

The Air Sciences memorandum was reviewed by Greg Muleski of SACI, LLC. SACI provides consulting services on the characterization and control of air pollution sources, and Mr. Muleski had previously been a co-author of several EPA studies that are supporting documents for AP-42. The conclusion of the review was that chemical unpaved road dust suppressants can reasonably achieve over 90 percent average control efficiency (SACI 2015).

As discussed in Section 2.3.1, the Project is subject to PSD review for PM. Therefore, it must employ the Best Available Control Technology (BACT) to control PM (dust) emissions from unpaved roads. The EPA RACT/BACT/LAER Clearinghouse (EPA 2015) was queried for the last 10 years of determinations for the process code 99.150, Unpaved Roads. This search showed that for the determinations where a control efficiency level was provided, the majority of these determinations listed a control efficiency of 90 percent or greater. The control technologies listed for these determinations were chemical application, water application, and/or speed reduction.

Based on the BACT determinations, and the Air Sciences and SACI reviews, a 90 percent control level for unpaved road dust is considered technologically feasible. Therefore, Donlin Gold has proposed control measures for achieving 90 percent dust control in its PSD application to meet the PSD BACT requirement.

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[4] Telephone communication from A. Schuler (ADEC), per M. Rieser's (Donlin Gold) email dated April 15, 2015.

**Table 3-9. Emission Factor References – Stationary Combustion Sources**

| Source Category | Pollutant | Emission Factor | | Reference | Remarks |
|---|---|---|---|---|---|
| Wärtsilä Engines | $PM_{2.5}$, $PM_{10}$ | 0.29 | g/kWhe | Manufacturer guarantee | Worst-case ULSD combustion |
| | CO | 0.18 | g/kWhe | | |
| | $NO_X$ | 0.53 | g/kWhe | | |
| | VOC | 0.58 | g/kWhe | | |
| | $SO_2$ | 0.006 | g/kWhe | Mass balance | ULSD with 15 ppm S content and 6.74 lb/gal density |
| Other Primary/Emergency Diesel Generators and Fire Pumps | $PM_{2.5}$, $PM_{10}$, CO, $NO_X$, VOC | Variable | | 40 CFR 60, Subpart IIII, 40 CFR 1039 | Engine size-specific Tier 4 emission factors multiplied by an NTE factor of 1.25 |
| | $SO_2$ | Variable | | Mass balance | ULSD with 15 ppm S content and 6.74 lb/gal density |
| Diesel Boilers/Heaters | $PM_{2.5}$, $PM_{10}$, CO, $NO_X$, VOC | Variable | | AP-42, Ch. 1.3 | Rating-specific applicable emission factors |
| | $SO_2$ | Variable | | Mass balance | ULSD with 15 ppm S content and 6.74 lb/gal density |
| Natural Gas Boilers/Heaters | All | Variable | | AP-42, Ch. 1.4 | Rating-specific applicable emission factors |
| Waste/Sludge Incinerators | All | Variable | | Vendor performance guarantee | Donlin Gold will require vendor performance guarantees meet applicable NSPS |

g/kWhe – grams per kilowatt-hour electric

lb/gal - pounds per gallon

ppmvd – parts per million, volumetric dry

S – sulfur

NTE – not to exceed

A summary of the maximum potential Project emissions for model input, by broad source category, is provided in Table 3-10.

**Table 3-10. Maximum Potential Emissions Summary by Source Category (ton/yr)**

| Source/Activity | CO | $NO_X$ | $PM_{2.5}$ | $PM_{10}$ |
|---|---|---|---|---|
| Fugitive Sources | 1,925.4 | 53.9 | 169.5 | 1,350.3 |
| Mobile Machinery | 2,045.8 | 1,978.9 | 22.9 | 22.0 |
| Power Generation | 367.0 | 1,032.8 | 564.2 | 564.2 |
| Emergency Equipment | 18.7 | 33.3 | 1.1 | 1.1 |
| Processing Operations | 774.9 | 0.1 | 64.5 | 80.6 |
| Boilers/Heaters and Incinerators | 95.3 | 159.0 | 9.2 | 9.8 |
| Project Total | 5,227.2 | 3,257.9 | 831.3 | 2,028.0 |
| LOM Year | 19 | 19 | 16 | 20 |

The emissions provided in Table 3-10 are based on the maximum design rates for the process and ancillary sources (ore processing, power generation, and ancillary equipment), including emissions based on all 12 Wärtsilä engines operating continuously on ULSD, which results in higher emissions for all pollutants than from NG combustion. In the case of dual-fuel boilers, the higher emissions for each pollutant associated with either fuel are provided in this table. The mining activity (fugitive sources) and mobile machinery total emissions represent the maximum annual emissions over the Project's life. As shown in Table 3-10, the modeled emissions were from LOM year 19 for CO and $NO_X$; LOM year 16 for $PM_{2.5}$; and LOM year 20 for $PM_{10}$.

Potential emissions among different LOM years differ due to varying mining activity rates, specifically for: ore production, waste movement, mobile equipment fuel consumption, and material hauling. Although these activities are maximized and optimized each year per the Project Mining Operation Plan, they are capped by inherent limitations in mining capacity, such as the number of haul trucks. For example, peak ore production does not occur in the same LOM year as peak waste movement. Because emissions are based on these mining activity rates, the peak emissions for each pollutant can occur in different LOM years, as shown in Table 3-11.

**Table 3-11. Project Emissions (ton/yr) for LOM Years 16 and 20**

| Pollutant | LOM Year 16 | LOM Year 19 | LOM Year 20 |
|---|---|---|---|
| CO | 5,224 | **5,227** | 5,147 |
| $NO_X$ | 3,257 | **3,258** | 3,177 |
| $PM_{2.5}$ | **831** | 821 | 827 |
| $PM_{10}$ | 2,020 | 1,936 | **2,028** |

**Bold** values represent the maximum activity rates and emissions.

## 3.7.2 Long- and Short-Term Emissions Approach

The annual hourly average emissions were modeled for the applicable annual AAQS. The methodology for determining the model input emission rates for the short-term averaging periods (up to 24-hour) was developed with ADEC's consultation and approval (June 26, 2015, teleconference). A summary of the short-term model input emissions approach for the process sources, blasting, and fugitive and mobile equipment emissions from mining activities is as follows:

- Process Sources: Short-term model input emission rates for the process sources, including ore processing, refining, power generation, and other support activities, were based on the equipment/process-specific maximum hourly design throughput rates.
- Blasting: Short-term model input emission rates for blasting were determined by spreading the emissions from the maximum anticipated blasting requirement (up to a maximum of five blasts per day[5]) over each short-term averaging period. For example:

[5] The actual annual average number of blasts per day will be less than two.

- For 1-hour AAQS, blasting emissions were based on five blasts occurring during every 1-hour period.
- For 3-hour AAQS, blasting emissions were based on five blasts occurring during every 3-hour period (one-third of emissions modeled for 1-hour AAQS).
- For 8-hour AAQS, blasting emissions were based on five blasts occurring during every 8-hour period (one-eighth of emissions modeled for 1-hour AAQS).
- For 24-hour AAQS, blasting emissions were based on five blasts occurring during every 24-hour period (one-twenty-fourth of emissions modeled for 1-hour AAQS).

- Fugitive and Mobile Equipment Emissions from Mining Activities: As shown in Table 3-10, the maximum emissions from mining activities occur during different LOM years: CO and $NO_X$ in LOM year 19, $PM_{2.5}$ in LOM year 16, and $PM_{10}$ in LOM year 20. Therefore, to conservatively evaluate the emissions from mining activities, the annual hourly average emissions from these LOM years were modeled: CO and $NO_X$ for LOM year 19, $PM_{2.5}$ for LOM year 16, and $PM_{10}$ for LOM year 20. For each of these years, short-term model input fugitive emission rates were augmented by basing the ore loading and unloading emissions on the gyratory crusher design throughput rate of 122,400 tons per day. This daily maximum design rate is approximately three times higher than the annual average daily ore production rates for LOM years 16, 19, or 20.

### 3.7.3 Source Characterization

The Wärtsilä engines at the power plant were characterized as POINT sources for model input. The remaining sources with exhaust stacks, such as generators, boilers, autoclaves, the retort, the smelting furnace, and dust-collector-equipped sources (crusher, silos, apron feeder, etc.), were modeled as POINTCAP sources. The fugitive process sources, such as truck dump and uncontrolled ore transfers, were characterized as VOLUME sources in the model.

Unlike process sources, emissions from fugitive sources (e.g., drilling; blasting; material loading, unloading, and hauling; and wind erosion of exposed surfaces) and mobile machinery tailpipes were not modeled exclusively; rather, they were represented by appropriate activity locations. Except for haul roads (fugitive dust and tailpipe emissions from material hauling) and access roads (fugitive dust and tailpipe emissions from personnel and cargo transportation), all fugitive emissions were aggregated and assigned to appropriate modeled activity locations presented in Table 3-12. This table also shows the source type and associated dimensions for each of the modeled fugitive activity locations.

**Table 3-12. Fugitive Activity Locations Modeled**

| Model ID | Activity Location | Type | Lateral Dimensions (m) | | | Emission Sources |
|---|---|---|---|---|---|---|
| BLAST1-BLAST5 (1) | In-pit Blasting (5 locations) | VOLUME | 90 | × | 90 | Blasting |
| INPIT | Pit | OPENPIT | 3,345 | × | 2,068 | Drilling, material extraction, loading, and unloading, dozing, machinery |
| WASTE | Waste Rock Facility | VOLUME | 2,330 | × | 3,460 | Waste unloading, hauling, wind erosion, dozing, grading, machinery |
| STPILE | Short-term Ore Storage Site | VOLUME | 235 | × | 130 | Ore unloading and reloading, wind erosion, dozing, machinery |
| LTPILEW | Long-term Ore Storage Site (West) | VOLUME | 950 | × | 323 | Ore (and PAG rock) unloading and reloading, wind erosion, dozing, machinery |
| LTPILEE | Long-term Ore Storage Site (East) | VOLUME | 740 | × | 707 | Ore unloading and reloading, wind erosion, dozing, machinery |
| TAILS | Tailings Storage Facility | AREA | 4,000 | × | 2,260 | Wind erosion |
| TAILSDAM | Tailings Dam | VOLUME | 500 | × | 1,495 | Waste unloading, dozing, machinery |
| OVBSTKS | Overburden Stockpile (South) | VOLUME | 410 | × | 402 | Overburden unloading and reloading, wind erosion, dozing, machinery |

(1) Each blasting shot was characterized by an individual VOLUME source located inside the pit.
PAG = Potentially Acid-Generating

The VOLUME source dimensions for blasting were adopted from the study conducted by the Australian coal mining association (CSIRO 2008). For the remaining OPENPIT, VOLUME, and AREA sources listed in Table 3-12, the dimensions were developed by best-fitting an equal area rectangle within the actual footprint of each fugitive activity location (Figure 3-7).

The model input physical parameters for the fugitive activity locations are provided in Table 3-13.

**Table 3-13. Model Input Parameters for Fugitive Activity Locations**

| Model ID | Base Elevation (m) | Release Height (m) | Initial Lateral Dispersion (m) | Initial Vertical Dispersion (m) | Volume (million $m^3$) |
|---|---|---|---|---|---|
| BLAST1 | -159 | 75.00 | 20.93 | 69.77 | N/A |
| BLAST2 | -168 | 75.00 | 20.93 | 69.77 | N/A |
| BLAST3 | 2 | 75.00 | 20.93 | 69.77 | N/A |
| BLAST4 | 113 | 75.00 | 20.93 | 69.77 | N/A |
| BLAST5 | 346 | 75.00 | 20.93 | 69.77 | N/A |
| INPIT (1) | 207 | 4.99 | N/A | N/A | 943 |
| WASTE (2) | 472 | 6.93 | 660.31 | 6.45 | N/A |
| STPILE (2) | 220 | 6.93 | 40.65 | 6.45 | N/A |
| LTPILEW (2) | 220 | 6.93 | 128.87 | 6.45 | N/A |
| LTPILEE (2) | 304 | 6.93 | 168.18 | 6.45 | N/A |
| TAILS | 237 | 0.00 | N/A | 0.00 | N/A |
| TAILSDAM (2) | 241 | 6.93 | 201.04 | 6.45 | N/A |
| OVBSTKS (2) | 142 | 6.93 | 94.43 | 6.45 | N/A |

(1) In-pit activity release heights are weighted by associated particulate emissions, which vary by LOM year. The parameters shown are for LOM year 16.

(2) Release height and initial vertical dispersion are function of truck fleet, which varies by LOM year. The parameters shown are for LOM year 16.

The blasting physical parameters were based on dimensions provided in CSIRO 2008. The release height for the open-pit (INPIT) is a weighted release height of various activities occurring within the pit (drilling, truck loading/unloading, equipment tailpipes, and dozing) and associated $PM_{10}$ emissions, and was calculated using the recommendations provided in the Haul Road Workgroup Report (EPA 2012). The INPIT base elevation and volume are the averages for LOM year 16 and 20. A significant fraction of emissions occurring at the waste rock facility (WASTE) and the remaining fugitive activity locations with material stockpiles (STPILE, LTPILEW, LTPILEE, TAILSDAM, and OVBSTKS) is associated with truck loading/unloading. Therefore, the release heights for these sources were developed using weighted haul truck heights and recommendations provided in the Haul Road Workgroup Report (EPA 2012). The initial lateral dispersion for each VOLUME source was calculated using the respective equal area square dimension.

A representative haul road network for hauling material from inside the pit (or origin) to various destinations was developed. This network includes the following routes:

1. Inside pit
2. Pit exit to crusher and short-term ore stockpile
3. Pit exit to long-term ore stockpiles (east and west)

4. Long-term ore stockpiles (east and west) to crusher

5. Pit exit to waste rock facility

6. Pit exit to tailings dam

7. Pit exit to overburden stockpiles (south)

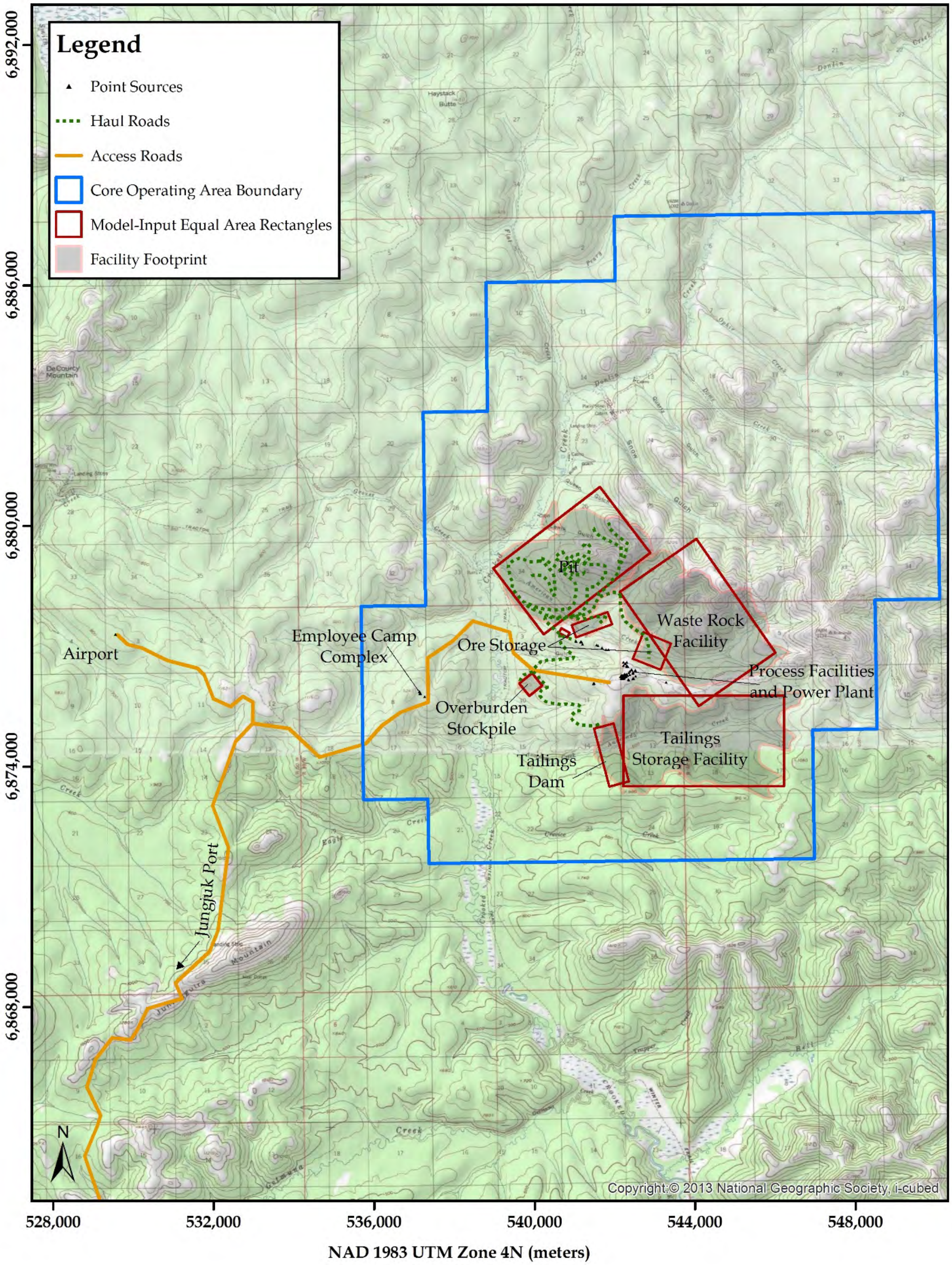
8. Overburden stockpiles (south) to waste rock facility

Each of these hauling routes was divided into a number of segments with lengths approximately equal to twice the adjusted haul road width of 35 meters (29 meters road width plus 6 meters per (EPA 2012)), and each of the segments was characterized as an individual VOLUME source in the model with a release height of 7 meters (weighted truck height times 1.7, divided by 2 (EPA 2012)), an initial lateral dispersion of 16.3 meters (adjusted road width divided by 2.15 (EPA 2012)), and an initial vertical dispersion of 6 meters (weighted top of plume height divided by 2.15 (EPA 2012)). Material hauling and tailpipe emissions associated with each of these routes were distributed based on traffic density along the segments for that route.

The access roads, including Jungjuk port to mine site, and airport to employee complex and onward to mine site, were characterized by a series of elongated AREA sources laid along the actual routes. These sources were assigned a release height of 3 meters and an initial vertical dispersion of 2.8 meters. These release parameters are based on an assumed 3.5-meter vehicle height that is representative of an overall approximation of anticipated vehicle heights (grader – 3.7 meters, cargo truck – 3.6 meters, water truck – 3.6 meters, commuter bus – 3.2 meters, and pickup truck – 3.2 meters) and the AREA source parameterization recommendations provided in (EPA 2012).

The source layout for model input is presented in Figure 3-7.

**Figure 3-7. Source Layout for Model Input**



## 3.7.4 Plume Merging for Power Plant Engines

The Project power plant will consist of 12 identical Wärtsilä engines housed in two identical engine halls, each containing six engines. Each engine hall will consist of six stacks (one per engine) with identical release characteristics, clustered together in a configuration of two banks of three stacks each. The six stacks in each cluster will be arranged tightly together, approximately one diameter apart.

When multiple plumes from closely knit stacks enter the atmosphere, they merge, and plume rise is enhanced due to the increased buoyancy flux of the combined flues. To account for this plume enhancement, each cluster of six identical Wärtsilä engine stacks was modeled as a single merged stack (2 merged stacks representing the 12 Wärtsilä engines at the power plant) in AERMOD modeling. Consistent with the guidance on characterizing a merged stack for model input, each merged stack was represented by actual release height, exhaust temperature, and velocity of a single stack, with a diameter adjusted so that the combined (six stacks) exhaust flow rate is preserved. This method is detailed in a technical memorandum entitled "Merged-Stack Modeling for Donlin Gold" (Air Sciences 2015a) and was approved by ADEC (ADEC 2015b).

## 3.7.5 Model Input Emissions

The maximum potential model input emission rates in grams per second (g/s) derived from the Project's emissions (Table 3-10) for each pollutant and averaging period are presented in Table 3-14.

**Table 3-14. Maximum Potential Model Input Emission Rates (g/s)**

| Pollutant | Averaging Period | Emissions | LOM Year |
|---|---|---|---|
| CO | 8-Hour | 4,504.69 | 19 |
| | 1-Hour | 4,504.69 | 19 |
| $NO_2$ | Annual | 93.72 | 19 |
| | 1-Hour | 210.47 | 19 |
| $PM_{2.5}$ | Annual | 23.91 | 16 |
| | 24-Hour | 24.83 | 16 |
| $PM_{10}$ | Annual | 58.34 | 20 |
| | 24-Hour | 65.12 | 20 |

The model input emission rates provided in Table 3-14 are the maximum rates that would be modeled for a specific one-hour period, except for $PM_{10}$ and $PM_{2.5}$. For these pollutants, the maximum modeled emissions varied on an hourly basis as the modeling utilized variable hourly emission rates for select activities (material transfers) that are affected by hourly wind speed. The $PM_{10}$ and $PM_{2.5}$ emission rates presented in Table 3-14 are based on the average wind speed.

The two sources/locations most affected by hourly wind speed are the pit (INPIT) and waste rock facility (WASTE). A refined method of hourly varying emissions due to wind speed fluctuations was used for these two locations. The hourly varying particulate emissions were fed into the model via an external file by specifying the HOUREMIS keyword in the input file.

## 3.8 Coordinate System

The Universal Transverse Mercator (UTM) coordinate system projected in North American Datum of 1983 (NAD83), Zone 4 North was used in the analysis to define all locations in the modeling domain (sources, buildings, and receptors).

## 3.9 $NO_2$ Modeling

The $NO_X$ emissions from the combustion sources are principally composed of NO and $NO_2$. Once in the atmosphere, the NO can convert to $NO_2$ through chemical reactions with ambient ozone ($O_3$). To address this atmospheric conversion process, the Guideline on Air Quality Models (40 CFR 51, Appendix W) recommends the following three-tiered screening approach for evaluating the $NO_2$ impacts:

- Tier 1: Assume total conversion of NO to $NO_2$.
- Tier 2: Assume representative equilibrium $NO_2/NO_X$ ratio (0.75 for annual and 0.80 for 1-hour).
- Tier 3: Use a detailed screening method on a case-by-case basis.

The non-default option of the Ozone Limiting Method (OLM), a Tier 3 method from 40 CFR 51, Appendix W, was used to estimate the $NO_2$ 1-hour and annual impacts for this analysis, as approved by ADEC and EPA (ADEC 2015b). The OLM determines the limiting factor for $NO_2$ formation by comparing the estimated maximum $NO_X$ concentration and the ambient $O_3$ concentration. The model assumes a total NO to $NO_2$ conversion when the ambient $O_3$ concentration is greater than the estimated maximum $NO_X$ concentration; otherwise, it is limited by the ambient $O_3$ concentration (Cole and Summerhays 1979).

The combined plume option (keywords OLMGROUP ALL) of the OLM was used for this analysis. The use of OLM requires the following additional input parameters:

- Background $O_3$ Concentrations – The use of the OLM option in AERMOD requires the input of hourly $O_3$ concentrations. The $O_3$ concentration values may be input as a single value, as hourly values to correspond with the meteorological data, or as temporally varying profiles. This analysis used a monthly-hour-of-day $O_3$ concentration profile developed from the onsite monitored hourly $O_3$ data (Section 2.4.2.5), presented in Table 3-15. This profile consists of the multi-year average of the highest values for each monthly-hour-of-day. This profile was implemented in AERMOD using the MHRDOW keyword.

- Ambient Equilibrium $NO_2/NO_X$ Ratio – The AERMOD default $NO_2/NO_X$ ambient equilibrium ratio of 0.90 was used for this analysis.
- In-Stack $NO_2/NO_X$ Ratio – A literature review was conducted to identify reasonable $NO_2/NO_X$ ratios for different combustion source categories. Based on this research, the $NO_2/NO_X$ ratios for this analysis are presented in Table 3-16.

**Table 3-15. Monthly-Hour-of-Day $O_3$ Profile**

| Month | Hours | Hourly Concentration (ppb) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| January | 1 - 8 | 44.9 | 45.3 | 45.6 | 45.6 | 45.7 | 45.8 | 45.7 | 45.1 |
| | 9 - 16 | 45.8 | 46.0 | 45.8 | 45.7 | 45.2 | 45.3 | 45.5 | 45.6 |
| | 17 - 24 | 45.5 | 45.2 | 45.4 | 45.3 | 45.4 | 45.4 | 45.3 | 45.0 |
| February | 1 - 8 | 44.3 | 45.1 | 44.9 | 44.6 | 44.8 | 44.4 | 45.4 | 45.2 |
| | 9 - 16 | 45.2 | 44.8 | 44.5 | 46.4 | 46.6 | 46.8 | 47.4 | 47.5 |
| | 17 - 24 | 45.7 | 44.7 | 45.9 | 43.5 | 43.7 | 43.7 | 43.4 | 43.6 |
| March | 1 - 8 | 51.2 | 50.3 | 50.2 | 50.9 | 51.7 | 51.3 | 50.9 | 50.8 |
| | 9 - 16 | 50.0 | 49.8 | 49.6 | 50.3 | 49.7 | 49.6 | 50.3 | 50.0 |
| | 17 - 24 | 49.6 | 49.5 | 49.3 | 51.7 | 51.3 | 51.3 | 51.3 | 52.3 |
| April | 1 - 8 | 51.5 | 51.5 | 51.7 | 52.0 | 51.3 | 50.6 | 49.5 | 49.8 |
| | 9 - 16 | 49.3 | 49.7 | 50.0 | 50.4 | 50.7 | 51.3 | 51.5 | 51.6 |
| | 17 - 24 | 51.4 | 51.9 | 52.0 | 53.2 | 53.7 | 52.8 | 52.2 | 51.9 |
| May | 1 - 8 | 45.9 | 46.6 | 46.6 | 46.9 | 47.0 | 46.2 | 45.6 | 45.4 |
| | 9 - 16 | 46.2 | 46.8 | 47.2 | 48.7 | 49.6 | 51.3 | 52.0 | 51.9 |
| | 17 - 24 | 51.6 | 51.8 | 51.9 | 51.2 | 49.6 | 48.2 | 47.9 | 45.9 |
| June | 1 - 8 | 41.8 | 42.0 | 42.1 | 41.7 | 39.7 | 39.9 | 41.2 | 42.3 |
| | 9 - 16 | 43.8 | 43.8 | 44.1 | 43.7 | 42.2 | 40.9 | 40.8 | 41.6 |
| | 17 - 24 | 42.8 | 43.7 | 40.0 | 41.1 | 41.1 | 42.4 | 43.9 | 42.3 |
| July | 1 - 8 | 28.2 | 28.6 | 30.1 | 29.0 | 27.0 | 27.1 | 27.0 | 26.8 |
| | 9 - 16 | 28.4 | 28.9 | 29.8 | 29.9 | 31.6 | 31.9 | 32.6 | 34.0 |
| | 17 - 24 | 32.2 | 32.6 | 33.4 | 32.2 | 31.2 | 30.9 | 30.8 | 28.9 |
| August | 1 - 8 | 31.2 | 31.3 | 31.4 | 32.8 | 32.5 | 30.7 | 28.8 | 26.9 |
| | 9 - 16 | 27.0 | 28.1 | 28.6 | 29.2 | 31.6 | 31.4 | 31.6 | 31.4 |
| | 17 - 24 | 30.4 | 30.5 | 30.6 | 34.7 | 32.3 | 30.0 | 31.4 | 31.7 |
| September | 1 - 8 | 31.8 | 32.8 | 35.1 | 34.9 | 33.8 | 33.1 | 32.2 | 31.9 |
| | 9 - 16 | 32.3 | 32.8 | 32.0 | 33.1 | 35.9 | 46.0 | 38.9 | 34.6 |
| | 17 - 24 | 35.3 | 36.0 | 33.5 | 32.5 | 32.0 | 32.5 | 32.0 | 31.6 |
| October | 1 - 8 | 36.3 | 36.1 | 36.4 | 36.7 | 37.1 | 36.5 | 36.5 | 35.5 |
| | 9 - 16 | 35.4 | 35.3 | 35.4 | 36.4 | 37.0 | 37.6 | 38.0 | 39.0 |
| | 17 - 24 | 39.2 | 38.9 | 37.8 | 39.0 | 38.7 | 35.7 | 36.3 | 36.6 |
| November | 1 - 8 | 38.5 | 38.5 | 38.3 | 38.3 | 38.3 | 38.5 | 38.5 | 38.6 |
| | 9 - 16 | 39.4 | 39.8 | 39.8 | 39.8 | 39.5 | 39.3 | 43.2 | 39.5 |
| | 17 - 24 | 39.3 | 39.1 | 39.0 | 39.8 | 39.1 | 38.7 | 38.6 | 38.6 |
| December | 1 - 8 | 40.7 | 40.0 | 40.5 | 40.9 | 41.2 | 40.9 | 41.6 | 41.6 |
| | 9 - 16 | 41.9 | 42.3 | 41.6 | 42.0 | 41.6 | 41.1 | 40.5 | 40.9 |
| | 17 - 24 | 41.1 | 41.2 | 41.2 | 41.2 | 42.0 | 41.9 | 41.3 | 41.8 |

**Table 3-16. $NO_2/NO_X$ Ratios**

| Source Category | $NO_2/NO_X$ Ratio | Reference |
|---|---|---|
| Blasting | 0.036 | (CSIRO 2008) |
| Diesel Engines | 0.11 | (ADEC 2013b) |
| Diesel Engines with Catalyzed Particulate Filter | 0.22 | (ADEC 2015a) |
| Diesel Boilers | 0.05 | AP-42, Tab. 1.3-1, 05/10, footnote d |
| Natural Gas Boilers | 0.10 | (CAPCOA 2011) |
| Diesel Machinery | 0.11 | (ADEC 2013b) |

Temporally varying $NO_2$ background concentrations for $NO_2$ annual and 1-hour modeling were integrated into AERMOD using the BACKGRND keyword. For this purpose, a monthly-hour-of-day $NO_2$ concentration profile developed from the onsite monitored hourly $NO_2$ data (Section 2.4.2.2) was used. The $NO_2$ background profile is provided in Table 3-17. This profile consists of the multi-year average of the highest values for each monthly-hour-of-day.

**Table 3-17. Monthly-Hour-of-Day $NO_2$ Profile**

| Month | Hours | Hourly Concentration (ppb) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| January | 1 - 8 | 5.3 | 4.8 | 6.0 | 5.3 | 3.3 | 5.3 | 4.5 | 6.6 |
| | 9 - 16 | 6.4 | 7.9 | 6.6 | 5.2 | 2.3 | 4.7 | 6.8 | 2.7 |
| | 17 - 24 | 3.7 | 5.9 | 5.1 | 5.2 | 6.9 | 5.7 | 5.4 | 4.3 |
| February | 1 - 8 | 5.8 | 5.0 | 6.4 | 7.6 | 4.3 | 5.1 | 5.8 | 5.2 |
| | 9 - 16 | 10.2 | 7.3 | 6.7 | 5.9 | 5.3 | 5.8 | 5.0 | 6.1 |
| | 17 - 24 | 7.3 | 9.0 | 9.4 | 7.0 | 6.0 | 5.8 | 6.1 | 5.7 |
| March | 1 - 8 | 5.8 | 5.7 | 6.9 | 7.2 | 6.9 | 8.5 | 8.6 | 10.2 |
| | 9 - 16 | 7.2 | 7.0 | 5.8 | 4.2 | 4.7 | 4.6 | 4.5 | 4.3 |
| | 17 - 24 | 5.2 | 6.2 | 5.8 | 7.4 | 7.2 | 7.0 | 9.4 | 7.1 |
| April | 1 - 8 | 5.0 | 3.7 | 3.2 | 5.0 | 3.9 | 2.6 | 4.6 | 5.8 |
| | 9 - 16 | 5.5 | 2.3 | 2.4 | 1.5 | 2.0 | 1.8 | 1.5 | 2.1 |
| | 17 - 24 | 1.9 | 1.6 | 2.4 | 2.8 | 5.9 | 4.0 | 4.2 | 4.3 |
| May | 1 - 8 | 3.1 | 2.8 | 3.8 | 5.4 | 5.2 | 4.4 | 3.5 | 3.7 |
| | 9 - 16 | 2.7 | 1.3 | 1.4 | 1.0 | 1.0 | 1.4 | 1.7 | 1.2 |
| | 17 - 24 | 2.2 | 1.6 | 2.4 | 1.4 | 1.8 | 2.9 | 3.9 | 3.6 |
| June | 1 - 8 | 2.3 | 1.9 | 2.1 | 2.4 | 2.8 | 3.2 | 2.9 | 2.7 |
| | 9 - 16 | 4.6 | 2.8 | 1.5 | 1.3 | 1.4 | 1.4 | 2.1 | 1.7 |
| | 17 - 24 | 1.3 | 1.2 | 1.1 | 3.3 | 1.7 | 2.2 | 2.0 | 2.2 |
| July | 1 - 8 | 2.0 | 1.7 | 2.1 | 2.1 | 2.1 | 2.2 | 2.7 | 2.0 |
| | 9 - 16 | 1.3 | 1.6 | 0.9 | 0.7 | 1.6 | 1.0 | 0.8 | 0.8 |
| | 17 - 24 | 0.6 | 1.0 | 0.9 | 1.2 | 1.7 | 1.8 | 2.5 | 1.7 |
| August | 1 - 8 | 2.6 | 2.3 | 3.2 | 3.1 | 3.4 | 3.8 | 3.4 | 3.0 |
| | 9 - 16 | 2.0 | 2.7 | 1.6 | 1.4 | 5.5 | 1.7 | 1.2 | 4.2 |
| | 17 - 24 | 2.8 | 1.7 | 1.4 | 2.3 | 2.3 | 3.0 | 1.7 | 2.1 |
| September | 1 - 8 | 1.8 | 2.3 | 3.2 | 2.8 | 3.3 | 2.5 | 2.4 | 2.7 |
| | 9 - 16 | 3.5 | 2.3 | 2.2 | 1.0 | 1.3 | 1.1 | 1.2 | 1.3 |
| | 17 - 24 | 1.3 | 1.5 | 2.1 | 1.9 | 1.3 | 1.0 | 2.9 | 2.2 |
| October | 1 - 8 | 2.1 | 1.7 | 1.7 | 2.3 | 2.2 | 3.1 | 3.7 | 5.1 |
| | 9 - 16 | 5.5 | 4.5 | 3.0 | 2.6 | 2.7 | 1.9 | 2.7 | 3.4 |
| | 17 - 24 | 3.3 | 3.3 | 1.7 | 2.3 | 2.4 | 2.2 | 2.7 | 2.4 |
| November | 1 - 8 | 3.5 | 3.2 | 3.8 | 4.2 | 3.2 | 4.4 | 4.7 | 4.7 |
| | 9 - 16 | 4.9 | 5.5 | 5.0 | 4.4 | 4.8 | 4.7 | 6.2 | 5.4 |
| | 17 - 24 | 4.5 | 3.3 | 2.5 | 2.9 | 3.9 | 4.9 | 3.2 | 2.3 |
| December | 1 - 8 | 3.5 | 4.4 | 6.7 | 3.8 | 6.6 | 5.7 | 4.2 | 4.9 |
| | 9 - 16 | 8.5 | 7.9 | 9.5 | 7.8 | 6.5 | 6.8 | 7.5 | 8.2 |
| | 17 - 24 | 8.2 | 5.6 | 3.5 | 4.6 | 4.9 | 5.1 | 4.0 | 3.5 |

## 3.10 Treatment of Intermittent Sources for $NO_2$ 1-Hour Analysis

In its most recent guidance on $NO_2$ 1-hour modeling (EPA 2011), EPA has recognized that intermittent sources that do not operate continuously or frequently enough, specifically emergency generators, are less likely to contribute significantly to the annual distribution of daily maximum 1-hour values. EPA also recommends "*that compliance demonstrations for the 1-hour $NO_2$ NAAQS be based on emission scenarios that can logically be assumed to be relatively continuous or which occur frequently enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations*" (EPA 2011). Also, "*EPA believes the most appropriate data to use for compliance demonstration for the 1-hour $NO_2$ NAAQS are those based on emission scenarios that are continuous enough or frequent enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations*" (EPA 2011).

The emergency equipment for the Project includes backup power generators and fire pumps. This equipment is essential to ensure safety and uninterrupted operation in case of unforeseen power failure and/or other emergency situations. This equipment is proposed to operate for 500 hours per year for the purpose of determining potential to emit, but it may operate for far fewer hours and on a random schedule. Thus, operation of the emergency equipment will not be frequent enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations, and inclusion of the equipment's maximum hourly emissions does not represent a logical emission scenario. Therefore, emissions from the emergency equipment were based on continuous operation at the average hourly rate, that is, the maximum hourly rate times 500 hours per year divided by 8,760 hours per year for the $NO_2$ 1-hour analysis.

## 3.11 Particulate Modeling

Default particulate modeling methods including deposition (to account for depletion due to particulate settling) were used for estimating $PM_{2.5}$ and $PM_{10}$ impacts for this analysis. To apply particulate settling, AERMOD requires the following source-specific variables:

1. Mass-mean aerodynamic particle diameter (PARTDIAM) for each particle size bin
2. Mass fraction (MASSFRAX) for each particle size bin
3. Particle density (PARTDENS) for each particle size bin

A list of references used to develop broad source-category-based particle size bins and associated mass fractions is provided in Table 3-18. This table also provides the densities in grams per cubic centimeter ($g/cm^3$) for each broad source category and associated reference.

**Table 3-18. References Used to Develop Deposition Parameters**

| Source Category | Particle Size Bin and Mass Fraction Reference | Density ($g/cm^3$) | Density Reference |
|---|---|---|---|
| Road Dust | AP-42, Sec. 13.2.2, Eqs. 1a and 2, and Tab. 13.2.2-2, 11/06 | 2.7 | Donlin Gold |
| Blasting | AP-42, Sec. 11.9, Tab. 11.9-1, 7/98 (blasting, overburden) | 2.7 | Donlin Gold |
| Material (Ore and Waste) Handling | AP-42, Pg. 13.2.4-4, 11/06 | 2.7 | Donlin Gold |
| Diesel Engines | AP-42, App. B-2, Tab. B.2-2, Pg. B.2-11 (Category 1, Stationary Internal Combustion Engines, Gasoline and Diesel Fuel), 01/95 | 1 | (ADEC 2014) |
| Boilers and Heaters | AP-42, App. B-2, Tab. B.2.2, Pg. B.2-12 (Category 2, Combustion, Mixed Fuels, Boilers), 01/95 | 1 | (ADEC 2014) |
| Process Source Baghouses | AP-42, App. B-1, Pg. B.1-77, Sec. 11.21 (Phosphate Rock Processing: Roller Mill and Bowl Mill Grinding), 10/86 | 2.7 | Donlin Gold |
| Silo Baghouses | AP-42, App. B-1, Pg. B.1-77, Sec. 11.21 (Phosphate Rock Processing: Roller Mill and Bowl Mill Grinding), 10/86 | 0.94 | AP-42, App. A (lime) |
| Incinerators | AP-42, App. B-1, Pg. B.1-8, Sec. 2.1 (Refuse Incineration: Municipal Waste Mass Burn Incinerator), 10/86 | 1 | (ADEC 2014) |
| Refinery Sources | AP-42, App. B-2, Tab. B.2.2, Pg. B.2-18 (Category 8, Melting, Smelting, Refining, Metals, except Aluminum), 01/95 | 1 | (ADEC 2014) |

The INPIT model ID in Table 3-12 represents the emissions from mining activities occurring within the pit and includes the following sources of particulate emissions: drilling, ore and waste loading, and mobile machinery tailpipes. However, most of these emissions (99 percent) are associated with material movement (ore and waste loading, and drilling). Because of this, the mass fractions for the INPIT source are based on the particle size multiplier for Equation 1 in AP-42, Page 13.2.4-4 (material transfers).

An example calculation of deposition parameters for the INPIT model ID is provided in Table 3-19. In addition to the deposition parameters, this table also shows the step-by-step calculations to determine mass mean diameter for each bin. The particle density shown in this table is the average of the Project's ore and waste materials.

**Table 3-19. Deposition Parameters for Model ID INPIT**

| Step | Parameter | $PM_{10}$ | | | | $PM_{2.5}$ | |
|---|---|---|---|---|---|---|---|
| | | Bin 0 [(1)] | Bin 1 | Bin 2 | Bin 3 | Bin 0 [(1)] | Bin 1 |
| | Bin Upper Diameter (µm) | 1.60 | 2.50 | 5.00 | 10.00 | 1.60 | 2.50 |
| | Particle Size Multiplier | -- | 0.05 | 0.20 | 0.35 | -- | 0.05 |
| 1 | Cumulative Mass Fraction | -- | 0.15 | 0.57 | 1.00 | -- | 1.00 |
| 2 | Mass Fraction | -- | 0.15 | 0.42 | 0.43 | -- | 1.00 |
| 3 | Spherical Volume ($\mu m^3$) | 2.14 | 8.18 | 65.45 | 523.60 | 2.14 | 8.18 |
| 4 | Mean Spherical Volume ($\mu m^3$) | -- | 5.16 | 36.82 | 294.52 | -- | 5.16 |
| 5 | Mass Mean Diameter (µm) | -- | 2.14 | 4.13 | 8.25 | -- | 2.14 |
| | Particle Density ($g/cm^3$) | -- | 2.70 | 2.70 | 2.70 | -- | 2.70 |

(1) Bin 0 is not input to the model. It is only used to estimate the mass mean diameter of Bin 1. The upper diameter for Bin 0 is estimated by linear interpolation of Bins 1 and 2, and by setting the particle size multiplier for Bin 0 to zero.

The calculation steps listed in Table 3-19 are described below. All example calculations provided in these steps are for $PM_{10}$ deposition parameters.

Step 1: The cumulative mass fraction for each bin is calculated by dividing the particle size multiplier by that of the highest bin: Bin 3 in this case. Examples:

- Bin 3 cumulative mass fraction (1.0) = Bin 3 particle size multiplier (0.35) divided by Bin 3 particle size multiplier (0.35)
- Bin 2 cumulative mass fraction (0.57) = Bin 2 particle size multiplier (0.2) divided by Bin 3 particle size multiplier (0.35)

Step 2: The mass fraction for each bin is calculated by subtracting the cumulative mass fraction of the next lower bin from the cumulative mass fraction for that bin. Examples:

- Bin 3 mass fraction (0.43) = Bin 3 cumulative mass fraction (1.0) minus Bin 2 cumulative mass fraction (0.57)
- Bin 2 mass fraction (0.42) = Bin 2 cumulative mass fraction (0.57) minus Bin 1 cumulative mass fraction (0.15)

Step 3: The spherical volume for each bin is calculated as:

$$Spherical\ Volume = \frac{4}{3}\pi\left(\frac{Bin\ Upper\ Diameter}{2}\right)^3$$

Step 4: The mean spherical volume for each bin is calculated as the average of spherical volumes of that bin and the next lower bin. Examples:

- Bin 3 mean spherical volume (294.52) = The average of Bin 3 (523.6) and Bin 2 (65.45) spherical volumes
- Bin 2 mean spherical volume (36.82) = The average of Bin 2 (65.45) and Bin 1 (8.18) spherical volumes

Step 5: The mass mean diameter for each bin is calculated from the mean spherical volume as:

$$Mass\ Mean\ Diameter = 2\left(\frac{3\ \times\ \text{Mean Spherical Volume}}{4\pi}\right)^{\frac{1}{3}}$$

The deposition parameters for the source categories are provided in Table 3-20.

**Table 3-20. Deposition Parameters by Source Category**

| Source Category | Parameter | PM10 | | | | | PM2.5 | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Bin 0 [1] | Bin 1 | Bin 2 | Bin 3 | Bin 4 | Bin 0 [1] | Bin 1 | Bin 2 |
| Road Dust | Bin Upper Diameter (µm) | 1.67 | 2.50 | 10.00 | -- | -- | 1.67 | 2.50 | -- |
| | Mass Fraction | -- | 0.10 | 0.90 | -- | -- | -- | 1.00 | -- |
| | Mass Mean Diameter (µm) | -- | 2.16 | 7.98 | -- | -- | -- | 2.16 | -- |
| | Particle Density (g/cm$^3$) | -- | 2.70 | 2.70 | -- | -- | -- | 2.70 | -- |
| Material (Ore and Waste) Handling | Bin Upper Diameter (µm) | 1.60 | 2.50 | 5.00 | 10.00 | -- | 1.60 | 2.50 | -- |
| | Mass Fraction | -- | 0.15 | 0.42 | 0.43 | -- | -- | 1.00 | -- |
| | Mass Mean Diameter (µm) | -- | 2.14 | 4.13 | 8.26 | -- | -- | 2.14 | -- |
| | Particle Density (g/cm$^3$) | -- | 2.70 | 2.70 | 2.70 | -- | -- | 2.70 | -- |
| Diesel Engines | Bin Upper Diameter (µm) | -- | 1.00 | 2.50 | 6.00 | 10.00 | -- | 1.00 | 2.50 |
| | Mass Fraction | -- | 0.85 | 0.08 | 0.03 | 0.03 | -- | 0.91 | 0.09 |
| | Mass Mean Diameter | -- | 0.79 | 2.03 | 4.87 | 8.47 | -- | 0.79 | 2.03 |
| | Particle Density (g/cm$^3$) | -- | 1.00 | 1.00 | 1.00 | 1.00 | -- | 1.00 | 1.00 |
| Boilers and Heaters | Bin Upper Diameter (µm) | -- | 1.00 | 2.50 | 6.00 | 10.00 | -- | 1.00 | 2.50 |
| | Mass Fraction | -- | 0.29 | 0.28 | 0.32 | 0.11 | -- | 0.51 | 0.49 |
| | Mass Mean Diameter (µm) | -- | 0.79 | 2.03 | 4.87 | 8.47 | -- | 0.79 | 2.03 |
| | Particle Density (g/cm$^3$) | -- | 1.00 | 1.00 | 1.00 | 1.00 | -- | 1.00 | 1.00 |
| Process Source Baghouses | Bin Upper Diameter (µm) | 0.56 | 2.50 | 6.00 | 10.00 | -- | 0.56 | 2.50 | -- |
| | Mass Fraction | -- | 0.28 | 0.50 | 0.22 | -- | -- | 1.00 | -- |
| | Mass Mean Diameter (µm) | -- | 1.99 | 4.87 | 8.47 | -- | -- | 1.99 | -- |
| | Particle Density (g/cm$^3$) | -- | 2.70 | 2.70 | 2.70 | -- | -- | 2.70 | -- |
| Silo Baghouses | Bin Upper Diameter (µm) | 0.56 | 2.50 | 6.00 | 10.00 | -- | 0.56 | 2.50 | -- |
| | Mass Fraction | -- | 0.28 | 0.50 | 0.22 | -- | -- | 1.00 | -- |
| | Mass Mean Diameter (µm) | -- | 1.99 | 4.87 | 8.47 | -- | -- | 1.99 | -- |
| | Particle Density (g/cm$^3$) | -- | 0.94 | 0.94 | 0.94 | -- | -- | 0.94 | -- |
| Incinerators | Bin Upper Diameter (µm) | -- | 2.50 | 6.00 | 10.00 | -- | -- | 2.50 | -- |
| | Mass Fraction | -- | 0.68 | 0.12 | 0.20 | -- | -- | 1.00 | -- |
| | Mass Mean Diameter (µm) | -- | 1.98 | 4.87 | 8.47 | -- | -- | 1.98 | -- |
| | Particle Density (g/cm$^3$) | -- | 1.00 | 1.00 | 1.00 | -- | -- | 1.00 | -- |
| Refinery Sources | Bin Upper Diameter (µm) | -- | 1.00 | 2.50 | 6.00 | 10.00 | -- | 1.00 | 2.50 |
| | Mass Fraction | -- | 0.78 | 0.11 | 0.08 | 0.03 | -- | 0.88 | 0.12 |
| | Mass Mean Diameter (µm) | -- | 0.79 | 2.03 | 4.87 | 8.47 | -- | 0.79 | 2.03 |
| | Particle Density (g/cm$^3$) | -- | 1.00 | 1.00 | 1.00 | 1.00 | -- | 1.00 | 1.00 |
| Blasting | Bin Upper Diameter (µm) | 2.04 | 2.50 | 10.00 | -- | -- | 2.04 | 2.50 | -- |
| | Mass Fraction | -- | 0.06 | 0.94 | -- | -- | -- | 1.00 | -- |
| | Mass Mean Diameter (µm) | -- | 2.29 | 7.98 | -- | -- | -- | 2.29 | -- |
| | Particle Density (g/cm$^3$) | -- | 2.70 | 2.70 | -- | -- | -- | 2.70 | -- |

[1] Bin 0 is not input to the model. It is only used to estimate the mass mean diameter of Bin 1. The upper diameter for Bin 0 is estimated by linear interpolation of Bins 1 and 2, and by setting the particle size multiplier for Bin 0 to zero.

## 3.12 Nearby Sources

As discussed in Section 1.0, ADEC issued a PSD permit for the Project on June 30, 2017. The PSD application for this permit was submitted and deemed complete on October 15, 2015. Therefore, the minor source baseline date was triggered for the Project area on October 15, 2015. The potential for increment consuming minor sources after the October 15, 2015, minor source baseline date, and increment consuming major sources was discussed with ADEC on September 20, 2021. An additional inquiry was made on October 11, 2021. As of the date of this application, ADEC has not identified any minor or major nearby sources for inclusion in the Project cumulative air quality impacts analysis. Thus, only the Project's emission sources were modeled for both PSD increment and AAQS compliance demonstration.

## 3.13 Results and Compliance Demonstration

This section provides the Project model results and compliance demonstration with the PSD increments and AAQS (Section 3.13.1), an analysis of secondary $PM_{2.5}$ formation (Section 3.13.2), an $O_3$ assessment (Section 3.13.3), and PSD additional impact analyses (Section 3.13.4). Copies of electronic files associated with these analyses are provided on digital media in Attachment D 1.

### 3.13.1 PSD Increments and AAQS

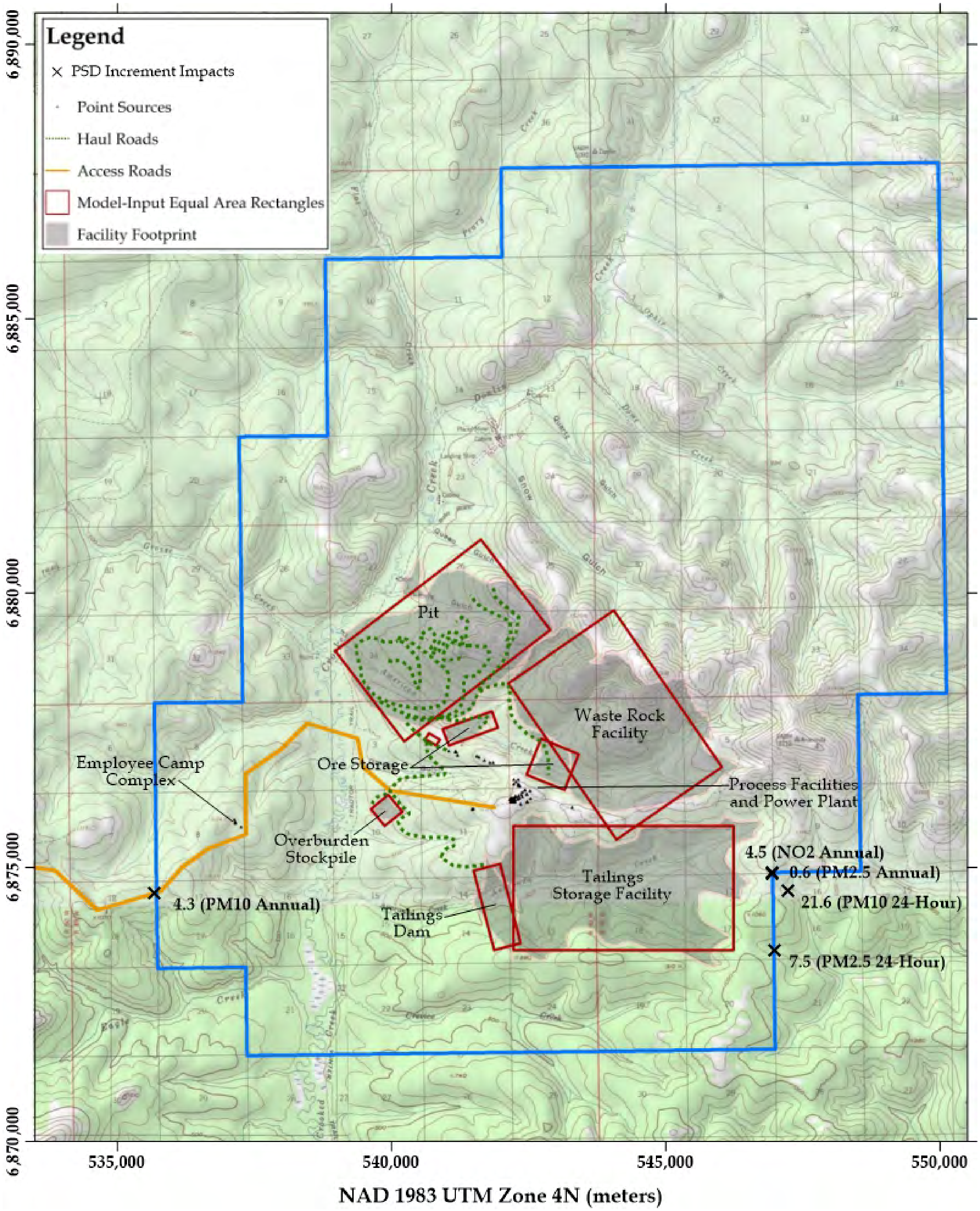
The AERMOD dispersion modeling results for the Project's emission sources and their comparison to applicable PSD increments are provided in Table 3-21.

**Table 3-21. Modeling Results and PSD Increment Compliance Demonstration**

| Pollutant | Averaging Period | Maximum Impact (µg/m$^3$) | PSD Increment (µg/m$^3$) | PSD Increment Compliance |
|---|---|---|---|---|
| $NO_2$ | Annual | 4.5 | 25 | Yes |
| $PM_{2.5}$ | Annual | 0.6 | 4 | Yes |
| | 24-Hour (2$^{nd}$ high) | 7.5 | 9 | Yes |
| $PM_{10}$ | Annual | 4.3 | 17 | Yes |
| | 24-Hour (2$^{nd}$ high) | 21.6 | 30 | Yes |

This table shows that all the modeled results for the PSD increment analysis are below their applicable standards. The locations of these impacts are provided in Figure 3-8.

**Figure 3-8. Location of Highest PSD Increment Impacts (μg/m³)**



The AERMOD dispersion modeling results (including background concentrations) for the Project's emission sources and their comparison to applicable AAQS are provided in Table 3-22.

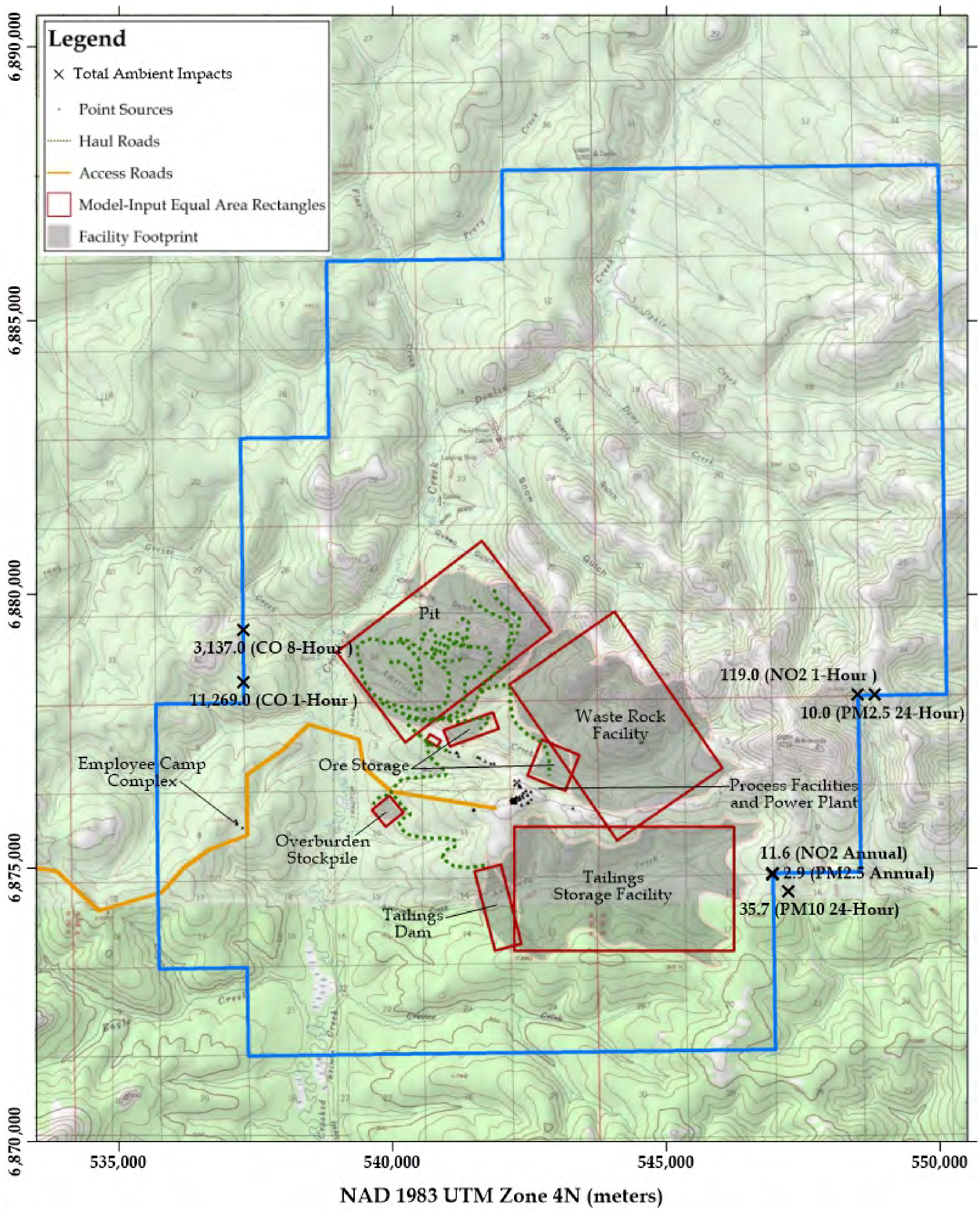
**Table 3-22. Modeling Results and AAQS Compliance Demonstration**

| Pollutant | Averaging Period | Maximum Impact (µg/m³) | Background Concentration (µg/m³) | Total Concentration (µg/m³) | AAQS (µg/m³) | AAQS Compliance |
|---|---|---|---|---|---|---|
| CO | 8-Hour (2nd high) | 2,679.1 | 457.9 | 3,137.0 | 10,000 | Yes |
| | 1-Hour (2nd high) | 10,582.1 | 686.9 | 11,269.0 | 40,000 | Yes |
| $NO_2$ | Annual | 11.6 | (included) (1) | 11.6 | 100 | Yes |
| | 1-Hour (8th high) | 119.0 | (included) (1) | 119.0 | 188 | Yes |
| $PM_{2.5}$ | Annual | 0.6 | 2.3 | 2.9 | 12 | Yes |
| | 24-Hour (8th high) | 3.2 | 6.8 | 10.0 | 35 | Yes |
| $PM_{10}$ | 24-Hour (2nd high) | 21.6 | 14.1 | 35.7 | 150 | Yes |

(1) See Table 3-17 for the monthly-hour-of-day $NO_2$ background concentration profile.

This table shows that all the modeled results for the AAQS analysis are below their applicable standards. The locations of these impacts are provided in Figure 3-9.

**Figure 3-9. Location of Highest Total Ambient Impacts (μg/m³)**



## 3.13.2 Secondary $PM_{2.5}$ Formation

This section addresses the potential secondary $PM_{2.5}$ formation associated with the Project's emissions. The qualitative approach used herein follows the concepts developed/accepted by EPA's Region 10 office for a qualitative assessment of secondary $PM_{2.5}$ impacts for an Alaska project, which is cited as an example in EPA's May 20, 2014, memorandum "Guidance for $PM_{2.5}$ Permit Modeling" (EPA 2014a). The factors considered in the assessment, and the application of each of these factors to the Project, are outlined below. In addition to AAQS compliance demonstration, this secondary $PM_{2.5}$ evaluation also has technical relevance to PSD increment compliance demonstration.

1. **The regional background $PM_{2.5}$ monitoring data and aspects of secondary $PM_{2.5}$ formation from existing sources:** Donlin Gold has monitored the ambient $PM_{2.5}$ concentrations to establish the baseline conditions (Section 2.4.2.3). The monitoring data were quality-checked and approved by ADEC for this air quality analysis. Donlin Gold believes that the monitoring data capture any secondary $PM_{2.5}$ formation from existing regional emissions. The monitoring data show that the measured annual and 24-hour $PM_{2.5}$ concentrations are well below their respective AAQS (Table 2-5). Therefore, there is no indication that secondary formation of $PM_{2.5}$ from existing sources in the region of the Project is currently causing or contributing to exceedances or a violation of the $PM_{2.5}$ AAQS.

2. **The relative ratio of the combined (modeled primary and background) $PM_{2.5}$ concentrations to AAQS:** Table 3-22 shows that the modeled $PM_{2.5}$ concentrations combined with the measured background concentrations are significantly less (over 70 percent less) than the respective AAQS for both annual and 24-hour averaging periods. This table presents the design 8th highest 24-hour concentration for demonstrating compliance with the AAQS. Even when considering a conservative "first-tier" 24-hour averaging period modeling approach (previously recommended by EPA to account for secondary $PM_{2.5}$ impacts (EPA 2010)) to combine the 1st highest modeled concentration (8.9 $\mu g/m^3$) with the monitored background concentration (6.8 $\mu g/m^3$), the total 24-hour concentration is estimated at 15.7 $\mu g/m^3$, which is significantly less than the applicable AAQS of 35 $\mu g/m^3$. Thus, considerable formation of secondary $PM_{2.5}$ emissions could occur before the AAQS would be threatened, though this is not expected to occur.

   With regards to the PSD increment, both the 1st highest modeled concentration (8.9 $\mu g/m^3$) and the 2nd highest modeled concentration (7.5 $\mu g/m^3$) are below the PSD increment of 9 $\mu g/m^3$.

3. **The spatial and temporal correlation of the primary and secondary $PM_{2.5}$ impacts:** Due to the gradual formation of secondary $PM_{2.5}$, the highest primary and secondary $PM_{2.5}$ impacts are unlikely to temporally and/or spatially coincide. The highest primary $PM_{2.5}$

impacts are expected to occur closer to the facility, while the highest secondary $PM_{2.5}$ impacts are expected to occur further downwind after sufficient time has passed for the gaseous $PM_{2.5}$ precursors (i.e., $SO_2$ and $NO_X$) to convert to $PM_{2.5}$. Consequently, it is unlikely that maximum primary $PM_{2.5}$ impacts and maximum secondary $PM_{2.5}$ impacts from the Project will occur at the same time (paired in time) or location (paired in space). See (EPA 2010).

4. **Meteorological characteristics of the region during periods of precursor emissions:** Due to the remote location of the Project and absence of any significant existing anthropogenic sources in the vicinity, there is no significant potential of high ambient concentrations of precursor pollutants associated with changing wind directions or meteorological conditions at the Project site.

5. **Existing levels of precursor species:** Due to the remote location of the Project and absence of any significant existing anthropogenic sources in the vicinity, the background concentrations of certain chemical species (including ammonia [$NH_3$] and VOC) that participate in photochemical reactions to form secondary $PM_{2.5}$ are expected to be negligible. In addition, modeling of the Project's $NH_3$ emissions shows that the maximum 8-hour $NH_3$ impact ($2^{nd}$ high) is only 1.5 μg/m$^3$, which is less than one percent of the Alaska AAQS (2,100 μg/m$^3$). Therefore, these precursor emissions are not expected to be significant for converting $NO_X$ emissions to secondary particles in the areas impacted by primary $PM_{2.5}$ emissions.

6. **The level of conservatism associated with the modeling of the primary $PM_{2.5}$ component and other elements of conservatism built into the overall AAQS compliance demonstration:** There is a considerable conservatism inherent to the regulatory modeling and AAQS compliance demonstration for the primary $PM_{2.5}$ impacts. First, the concentrations estimated by the AERMOD dispersion model are conservatively high. Model evaluation studies conducted by EPA (EPA 2014b) indicate that AERMOD can produce modeled impacts in the range of 1.5 to 5 times higher than the corresponding monitored concentrations. These studies suggest that AERMOD is biased towards over-prediction. Second, the Project air impact results provided in this report are based on conservatively high potential emission rates assuming that all activities occur concurrently and continuously. The actual level of activity and emissions are expected to be significantly lower than the potential activity and emissions. Third, as demonstrated in Item #2 above, even with the conservative "first-tier" approach, the estimated primary $PM_{2.5}$ impacts are significantly below the applicable AAQS.

   With regards to PSD increment, the "first-tier" approach and the inherent model conservatism discussed above also apply.

7. **Post-construction monitoring:** It is expected that post-construction $PM_{2.5}$ monitoring will not be deemed necessary due to the low relative ratio of the modeled primary $PM_{2.5}$ and background $PM_{2.5}$ concentrations to the $PM_{2.5}$ AAQS.

Based on these factors, and consistent with current guidance, Donlin Gold believes that an adequate assessment has been made to demonstrate that the $PM_{2.5}$ AAQS and PSD increments will be protected, accounting for primary $PM_{2.5}$ impacts and potential contributions due to $PM_{2.5}$ precursors from the Project, and that it is not necessary to further evaluate potential secondary $PM_{2.5}$ formation from the Project's emissions.

## 3.13.3 $O_3$ Assessment

Potential Project $O_3$ impacts were analyzed qualitatively by comparing the Project's $O_3$ precursor emissions ($NO_X$ and VOC) (Table 2-1) and monitored $O_3$ background concentrations (Table 3-6) to the same from a more industrialized/populated location. The purpose of this comparison was to qualitatively assess how an increase in $O_3$ precursor emissions at the Project site might affect the regional $O_3$ levels.

The Project is in the Yukon-Kuskokwim region of southwest Alaska, a remote, mountainous area with no existing road or rail access or other public infrastructure, approximately 280 miles west of Anchorage. The Project is in the State of Alaska's South Central Alaska Intrastate Air Quality Control Region 10 (40 CFR 81.247). This region is designated as attainment or unclassifiable for all criteria pollutants, including $O_3$ (40 CFR 81.302).

It is important to note that there are no $O_3$ non-attainment areas in Alaska. This implies that even for the industrialized/urban areas of Alaska with much higher $O_3$ precursor activity than the Project, the measured $O_3$ concentrations are still well below the AAQS. For this analysis, Anchorage was selected for comparison to the Project as it is the most populated region in Alaska with relatively high $O_3$ precursor activity.

A comparison of Project and Anchorage area $O_3$ precursor emissions and monitored concentrations with the 8-hour $O_3$ AAQS is provided in Table 3-23.

**Table 3-23. Project and Anchorage Area $O_3$ Comparison**

| Source | $O_3$ Precursor Emissions (ton/yr) | | | Monitored 8-Hour $O_3$ Concentration (ppb) | 8-Hour $O_3$ AAQS (ppb) |
|---|---|---|---|---|---|
| | $NO_X$ | VOC | Total | | |
| Project | 3,258 | 1,279 | 4,537 | 51.3 | 75 |
| Anchorage Area [(1), (2)] | 12,298 | 14,428 | 26,726 | 45 | |

(1) Emissions source: https://www.epa.gov/air-emissions-inventories/2011-national-emissions-inventory-nei-data

(2) Monitoring data source: EPA AirData Database; http://www.epa.gov/airdata

Table 3-23 provides the Project's maximum potential $O_3$ precursor ($NO_X$ and VOC) emissions, along with the onsite monitored $O_3$ background concentration. This table also presents the most recent available Anchorage area monitored $O_3$ concentration (2010–2012 data from the 3000 East 16th Avenue monitoring station) and the concurrent (2011) $NO_X$ and VOC emissions from all sources (mobile, industrial, etc.). The Anchorage area emissions data were obtained from EPA's National Emissions Inventory (NEI) database.

As shown in Table 3-23, the expected emissions from the Project represent a small fraction (approximately 17 percent) of the Anchorage area emissions. The Anchorage area emissions are about four times and 11 times higher than the Project's potential emissions for $NO_X$ and VOC, respectively, and yet the measured $O_3$ concentrations in the Anchorage area are still well below the AAQS (approximately 60 percent of AAQS).

Considering these factors, the Project's potential emissions contribution to $O_3$ formation in the region is not expected to be significant, nor is it expected to cause or contribute to an exceedance of the $O_3$ AAQS.

## 3.13.4 Additional Impact Analyses

PSD projects are required to address air-quality-related impacts on visibility, soil, and vegetation per 40 CFR 52.21(o)(1).

### 3.13.4.1 Visibility

For the visibility analysis, the most recent version of EPA's visibility impairment screening model VISCREEN (version 13190) (EPA 1992) was used to determine if a plume from the Project could potentially be visible by a human observer at an area of interest. Plume blight is when a coherent plume from a source is perceptible against a viewing background (e.g., the sky or a terrain feature such as a mountain) to a casual observer. The primary parameter of plume blight is the contrast between the plume and background. The model considers the absolute contrast and the difference in color contrast, which provides a measure of the difference between two arbitrary colors as perceived by humans.

The Project's associated mobile machinery tailpipe and mining activity (e.g., drilling, blasting, material extraction and transportation) emissions are fugitive in nature and would be spread over large areas. Thus, these plumes would likely not be coherent or co-located. However, plumes from point sources (power plant, dust collectors and baghouses, refining sources, etc.) would likely be coherent plumes. Therefore, this visibility analysis was based on annual emissions from all the process and auxiliary point sources. For a conservative estimate, this analysis was performed using the PM emissions, rather than the $PM_{10}$ emissions. The annual natural background visual range and background ozone concentration of 250 km and 40 ppb, respectively, were used according to Alaska guidance (ADEC 2013a) (ADEC 2015c).

The visibility analysis was performed for an observer location inside the DNP, which is located approximately 315 km northeast of the Project. ADEC recommended (ADEC 2015c) that the Project visibility analysis was only required to evaluate the "inside Class I area" scenario, and because there was no integral vista at the Project site, the "outside Class I area" scenario was not required.

Following the ADEC guidance (ADEC 2015c), the "Level 1" analysis for the DNP was performed at a source-to-observer distance of 50 km (VISCREEN maximum range). The Level 1 analysis is a screening method that conservatively assumes 1-meter-per-second (m/s) wind speed under the extremely stable "F" stability condition. The Level 1 analysis for a DNP observer located 50 km from the Project did not pass; therefore, a "Level 2" analysis was performed.

The more refined Level 2 analysis uses site-specific wind data to estimate the worst-case visibility impacts from realistic meteorological conditions and plume travel times. As part of a Level 2 analysis, the model is run for the worst-case wind conditions (wind speed and stability) for which the plume travel time between source and observer is 12 hours or less. A sustained wind speed of 8 m/s would transport a plume the 315 km between the Project and the DNP within 12 hours. The 2020–2021 site-specific meteorological data collected at the Camp station was used for this analysis. This dataset was filtered for 8 m/s or higher wind speeds, and it was determined that the worst-case stability class for consideration was "D." Therefore, per ADEC guidance (ADEC 2015c), the Level 2 analysis included modeling an observer distance of 50 km, a wind speed of 8 m/s, and a stability class of "D." The Level 2 analysis demonstrated that the plumes resulting from the Project are not likely to be visible to a casual observer at the DNP.

The VISCREEN analysis files are also provided in Attachment D 1.

#### 3.13.4.2 Soil and Vegetation

ADEC guidance (ADEC 2007b) recommends showing compliance with the secondary AAQS as a surrogate for impacts on soil and vegetation. The secondary standards were developed to provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The secondary standards are always either equal to or greater than the corresponding primary standards (i.e., less stringent); therefore, showing compliance with the primary standards (Table 3-22) also demonstrates compliance with the secondary standards.

### 3.13.4.3 Commercial, Residential, and Other Growth

40 CFR 52.21(o)(2) requires that PSD applicants address the Project-related impacts from general commercial, residential, and other growth. Donlin Gold does not expect significant changes in these categories because of the Project; therefore, these impacts are not considered significant.

# 4.0 REFERENCES

ADEC. 2004. "Ambient Air Quality Issues at Worker Housing." Alaska Department of Environmental Conservation. Policy and Procedure. Air Quality Division, October 8.

—. 2007a. "Approval of July 2005 - June 2006 American Ridge Meteorological Data (Department Project Number AQ0934PAA01)." August 31.

—. 2007b. "PSD Vegetation and Soil Assessments." Email from A. Schuler (ADEC), December 11.

—. 2012a. "Summary of ADEC's findings regarding Donlin Creek's April 2010 to March 2011 Birch Tree Meteorological Data." Memorandum prepared by Cheyenne Alabanzas, Alaska Department of Environmental Conservation, Division of Air Quality, Air Permits Program. File No. AQ0934PAA01, June 25.

—. 2012b. "Summary of ADEC's findings regarding Donlin Creek's April 2010 to March 2011 Hill 1918 Meteorological Data." Memorandum prepared by Cheyenne Alabanzas, Alaska Department of Environmental Conservation, Division of Air Quality, Air Permits Program. File No. AQ0934PAA01, June 25.

—. 2013a. "ADEC Modeling Review Procedures Manual." Alaska Department of Environmental Conservation, Division of Air Quality, June 30.

—. 2013b. "NO2 - NOX Instack Ratios Per Source Tests Approved by the Alaska Department of Environmental Conservation." August 23.

—. 2014. "Deposition Question." Email from A. Schuler (ADEC) to M. Rieser (Donlin Gold), December 30.

—. 2015a. "ADEC Comments Regarding Donlin's July 2014 Response to ADEC's June 2014 Modeling Protocol Findings." January 9.

—. 2015b. "Approval of the July 2015 Prevention of Significant Deterioration (PSD) Modeling Protocol for the Donlin Gold Project." Prepared by the Alaska Department of Environmental Conservation, Division of Air Quality, September 28.

—. 2015c. "DGLLC VISCREEN Analysis." Emails from Alan Schuler (ADEC) to Donlin Gold, September 29 and October 1.

—. 2015d. "Findings Regarding the Donlin Gold LLC (DGLLC) 2012-2013 American Ridge Meteorological Data." Prepared by the Alaska Department of Environmental Conservation, Division of Air Quality, July 6.

—. 2015e. "Memorandum - Request to use ADJ_u* for Donlin Gold Project." Prepared by the Alaska Department of Environmental Conservation, Division of Air Quality, September 15.

—. 2015f. "RE: Model Updates." Email from A. Schuler (ADEC) to M. Rieser (Donlin Gold), October 1.

—. 2021. "Donlin Gold LLC Project, Annual Data Summary Report for August 1, 2020 – July 31, 2021, Revision 1." State of Alaska Department of Environmental Conservation Division of Air Quality, September 2.

Air Sciences. 2015a. "Merged-Stack Modeling for Donlin Gold." February 11.

—. 2015b. "Unpaved Road Dust Control Efficiency from Chemical Suppressants." Prepared for Robert (Nick) Enos (Donlin Gold), February 27.

—. 2021. "Donlin Gold Project Permit No: AQ0934CPT01. Camp Meteorological Monitoring Program. Annual Report: August 1, 2020 to July 31, 2021 Revision 1." Project No. 281-21A-2, August 31.

BLM. 2005. "Memorandum from Chief Navigability Section (927) to Chief, Branch of Survey Planning and Preparation (927), Subject: Navigable Waters in the Georgetown (2672) and Lime Village (2667) Survey Windows (Calista Region, CAA-1)." April 16.

CAPCOA. 2011. "Modeling Compliance of the Federal 1-Hour NO2 NAAQS." California Air Pollution Control Officers Association Guidance Document. Prepared by CAPCOA Engineering Managers, October 27.

Cole, H. S., and J. E. Summerhays. 1979. "A Review of Techniques Available for Estimating Short-Term NO2 Concentrations." *Journal of the Air Pollution Control Association.* Vol. 29. no. 8. Published online March 13, 2012. 812-817. Accessed July 15, 2015. http://www.tandfonline.com/doi/pdf/10.1080/00022470.1979.10470866.

CSIRO. 2008. "NOx Emissions from Blasting Operations in Open-Cut Coal Mining." *Atmospheric Environment.* (42) 34: 7874–7883. November.

Donlin Gold. 2015b. "RE: Response to ADEC Comments on the Emissions Inventory from Donlin Gold, LLC." Letter from M. Rieser (Donlin Gold) to B. Crutchfield (ADEC), June 4.

—. 2017. "Core Operating Area Public Access Control Plan. Donlin Gold Project. March 2017 (Revision 4)." Donlin Gold, March.

Enviroplan. 2009. "Findings Report PM10 Data Review and Annual Report Review for the Donlin Creek Project's New Air Station for the Period July 1, 2007 through June 30, 2008." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-3001-17, NTP No. 18-3001-17-14A. Enviroplan Consulting Project No. 7058.08, May 28.

—. 2010a. "Final Findings Report (Revised) Meteorological Data Review for the Donlin Creek LLC Project Camp Meteorological Site for the Period May 1, 2009 through April 30, 2010." Prepared for the Alaska Department of Environmental Conservation, Division of

Air Quality. ADEC Contract No. 18-6004-16, NTP-18-6004-16-6B. Enviroplan Consulting Project No. 7080.08, December 9.

—. 2010b. "Final Findings Report (Revised) Meteorological Data Review for the Donlin Creek Project SODAR Meteorological Station for the Period November 1, 2008 through October 31, 2009." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-6004-16, NTP-18-6004-16-6B. Enviroplan Consulting Project No. 7081.08, December 13.

—. 2010c. "Final Findings Report Meteorological Data Review and Annual Report Review for the Donlin Creek Project American Ridge Meteorological Monitoring Site for the Period July 1, 2008 through June 30, 2009." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-3001-17, NTP-18-3001-17-33A. Enviroplan Consulting Project No. 7068.08, February 11.

—. 2010d. "Final Findings Report Meteorological Data Review for the Donlin Creek Project Hill 1918 Meteorological Station for the Period April 1, 2009 through March 31, 2010." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-6004-16, NTP-18-6004-16-6A. Enviroplan Consulting Project No. 7081.08, October 6.

—. 2012a. "Final Findings Report (Revised) Meteorological Data Review for the Donlin Creek LLC Project Camp Meteorological Site for the Period May 1, 2010 through April 30, 2011." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-6004-16, NTP-18-6004-16-68A. Enviroplan Consulting Project No. 7096.08, March 20.

—. 2012b. "Final Findings Report Meteorological Data Review for the Donlin Creek LLC Jungjuk Meteorological Monitoring Site for the Period October 1, 2010 through September 30, 2011." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-6004-16, NTP-18-6004-16-73A. Enviroplan Consulting Project No. 7099.08, April 4.

—. 2012c. "Final Findings Report NO2 and O3 Data Review and Annual Report Review for the Donlin Gold Mining Project, New Air Station Ambient Air Quality Monitoring Program for the Period December 1, 2010 through November 30, 2011." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-6004-16, NTP 18-6004-16-79A. Enviroplan Consulting Project No. 7101.08, June 7.

—. 2014. "Final Findings Report NO2 and O3 Data Review and Annual Report Review for the Donlin Gold Mining Project, New Air Station Ambient Air Quality Monitoring Program For the Period April 17, 2012 through April 16, 2013." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-9006-14-05, NTP No. 18-9006-14-05-03. Enviroplan Consulting Project No. 7119.08, January 14.

EPA. 1992. "Workbook for Plume Visual Impact Screening and Analysis (Revised)." EPA-454/R-92-023, October.

—. 2004a. "AERMOD: Description of Model Formulation." EPA-454/R-03-004, September.

—. 2010. "Modeling Procedures for Demonstrating Compliance with PM2.5 NAAQS." Memorandum from Stephen D. Page (EPA Office of Air Quality Planning and Standards Director), March 23. Accessed July 15, 2015. http://www.epa.gov/region7/air/nsr/nsrmemos/pm25memo.pdf.

—. 2011. "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard." Memorandum from Tyler Fox (EPA Air Quality Modeling Group Leader) to Regional Air Division Directors, March 1. Accessed July 15, 2015. http://www.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf.

—. 2012. "Haul Road Workgroup Final Report Submission to EPA-OAQPS." Memorandum from Tyler Fox (EPA Air Quality Modeling Group Leader) to Regional Office Modeling Contacts, March 2. Accessed July 2, 2015. http://www.epa.gov/scram001/reports/Haul_Road_Workgroup-Final_Report_Package-20120302.pdf.

—. 2014a. "Guidance for PM2.5 Permit Modeling." Memorandum from Stephen D. Page (EPA Director) to Regional Air Division Directors, Regions 1-10, May 20. Accessed July 2, 2015. http://www.epa.gov/scram001/guidance/guide/Guidance_for_PM25_Permit_Modeling.pdf.

—. 2014b. "Webinar: AERMOD Modeling System Update." Office of Air Quality Planning and Standards, Air Quality Modeling Group, January 14. Accessed July 15, 2015. http://www.epa.gov/ttn/scram/webinar/AERMOD_13350_Update/AERMOD_System_Update_Webinar_01-14-2014_FINAL.pdf.

—. 2015. "Technology Transfer Network, Clean Air Technology Center - RACT/BACT/LAER Clearinghouse." Accessed May 2015. http://www.epa.gov/ttn/catc/rblc/htm/rbxplain.html.

—. 2017b. "Revision to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter." 40 CFR Part 51, Appendix W. Docket ID No. EPA-HQ-OAR-2015-0310, January 17.

—. n.d. "Revised DRAFT Guidance for Ozone and Fine Particulate Matter Permit Modeling." From: Richard Wayland and Scott Mathias (Divsion Directors) to Regional Air Divsion Directors, Regions 1 – 10.

ERG. 2013a. "Final Findings Report of the Meteorological Data Review and Annual Report Review for Donlin Gold, LLC (Donlin), Meteorological Monitoring Program: American Ridge (July 1, 2011 through June 30, 2012)." Prepared for the Alaska Department of

Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-6004-13, NTP-18-6004-13-11A, January 22.

—. 2013b. "Final Findings Report of the Meteorological Data Review and Annual Report Review for Donlin Gold, LLC (Donlin), Meteorological Monitoring Program: Camp (May 1, 2011 through April 30, 2012)." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-6004-13, NTP-18-6004-13-11A, January 22.

MACTEC. 2007. "Final Findings Report Barrick Gold Corp. Donlin Creek PSD Quality Meteorological Monitoring Annual Data Report." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-9010-12, NTP No. 18-9010-12-6A. MACTEC Federal Programs, Inc. Project No. 827106G187.000, February 19.

—. 2008a. "Final Findings Report Barrick Gold Corp. Donlin Creek American Ridge Station PSD Quality Meteorological Monitoring Annual Data Report July 1, 2006 - June 30, 2007." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-3001-19, NTP No. 18-3001-19-11A. MACTEC Federal Programs, Inc. Project No. 827108G246.000, September 11.

—. 2008b. "Final Findings Report Barrick Gold Corp. Donlin Creek Camp Station PSD Quality Meteorological Monitoring Annual Data Report May 1, 2006 - April 30, 2007." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-3001-19, NTP No. 18-3001-19-2A. MACTEC Federal Programs, Inc. Project No. 827108G220.000, April 11.

—. 2009a. "Final Findings Report Donlin Creek Gold Mining Project Annual Gaseous Pollutant Monitoring Report Monitoring Year November 18, 2006 to November 18, 2007." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-3001-19, NTP No. 18-3001-19-20A. MACTEC Federal Programs, Inc. Project No. 6880-09-G277.000, May 20.

—. 2009b. "Final Findings Report Donlin Creek Gold Mining Project Gaseous Pollutant Monitoring Report – New Air Station Monitoring Year January 1 to December 31, 2008." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-3001-19, NTP No. 18-3001-19-21A. MACTEC Federal Programs, Inc. Project No. 6880-09-G279.000, May 28.

—. 2009c. "Final Findings Report Donlin Creek Gold Mining Project PM2.5 Monitoring Report – New Air Station Monitoring Year January 1 to December 31, 2008." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-3001-19, NTP No. 18-3001-19-26B. MACTEC Federal Programs, Inc. Project No. 6880-09-G285.000, August 17.

—. 2010. "Final Findings Report Donlin Creek American Ridge Meteorological Monitoring Program July 2009 – June 2010." Prepared for the Alaska Department of Environmental

Conservation, Division of Air Quality. ADEC Contract No. 18-6004-17, NTP No. 16A. MACTEC Engineering and Consulting, Inc. Project No. 648010G336, December 15.

—. 2011. "Final Findings Report Donlin Creek American Ridge Meteorological Monitoring Program July 2009 – June 2010." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-6004-17, NTP No. 16B. MACTEC Engineering and Consulting, Inc. Project No. 648010G336, April 6.

Notar, John. 2013. "Re: Donlin Gold Mine NEPA Document and PSD Application." Email from National Park Service Air Resources Division to Environmental Protection Agency, Region 10, August 7.

SACI. 2015. "Control of Unpaved Road Dust Using Chemical Suppressants." Prepared for Robert (Nick) Enos (Donlin Gold), May 14.

WESTON. 2008. "Final Findings Report Review of Ambient PM10 Data Submitted by McVehil-Monnett Associates, Inc. from the Barrick Gold U.S., Inc. Donlin Creek Project." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. Weston Solutions Inc. W.O. No. 13345.005.004.0002, May.

—. 2009a. "Final Findings Report Donlin Creek LLC American Ridge Station PSD Quality Meteorological Monitoring Annual Data Report July 1, 2007 - June 30, 2008." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-3001-21, NTP No. 18-3001-21-7A. W.O. No. 13345.009.001.0002, June.

—. 2009b. "Final Findings Report Donlin Creek LLC Camp Station PSD Quality Meteorological Monitoring Annual Data Report May 1, 2007 - April 30, 2008." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-3001-21, NTP No. 18-3001-21-16A. W.O. No. 13345.009.001.0001, May.

—. 2009c. "Final Findings Report Donlin Creek LLC Camp Station PSD Quality Meteorological Monitoring Annual Data Report May 1, 2008 - April 30, 2009." Prepared for the Alaska Department of Environmental Conservation, Division of Air Quality. ADEC Contract No. 18-3001-21, NTP No. 18-3001-21-9B. W.O. No. 13345.009.001.0003, November.

## Attachment D 1 – Electronic Files

The electronic files can be accessed via the following link:

https://drive.google.com/drive/folders/1XknbndRt12EXG0ANTuDR_ETXBVAJnpTZ?usp=sharing

# Appendix E – Fugitive Dust Control Plan

AIR SCIENCES INC.

DENVER • PORTLAND

# Fugitive Dust Control Plan

# Donlin Gold Project, Alaska

PREPARED FOR:
DONLIN GOLD LLC

PROJECT NO. 281-15-2
OCTOBER 2015
(RESUBMITTED
OCTOBER 27, 2021)

# TABLE OF CONTENTS

# 1.0 INTRODUCTION

Donlin Gold LLC (Donlin Gold) is proposing to construct and operate the Donlin Gold mine: a hard rock, open-pit, gold mine (Project). The Project is located in southwest Alaska, approximately 280 miles west of Anchorage. Donlin Gold is an Alaskan operated company that is owned by Barrick Gold U.S. Inc., a subsidiary of Barrick Gold Corporation, and NovaGold Resources Alaska Inc., a subsidiary of NovaGold Resources, Inc.

The Project has the potential to generate fugitive dust emissions. This document provides a Fugitive Dust Control Plan (FDCP) for minimizing fugitive dust emissions.

## 1.1 Objective and Best Practical Methods

The objective of the FDCP is to ensure that fugitive dust generated from the Project will be controlled to minimize its potential to adversely affect local air quality. Best practical methods (BPMs) will be used to limit controllable fugitive dust emissions. The BPMs utilized at any time will depend on site conditions and will not compromise the safe operation of the mine.

The Project also incorporates design features that minimize dust emissions from ore processing activities (i.e., ore crushing, ore conveying, and stockpiling of crushed ore) through a combination of emissions capture and control, and enclosures.

Donlin Gold's goal is to keep the fugitive dust emissions resulting from the Project's activities within air quality compliance standards through the diligent use of BPMs for fugitive dust control, personnel training, and performance assessments.

# 2.0 FUGITIVE DUST CONTROL PLAN

The Project's activities and areas contributing to fugitive dust will include drilling and blasting, material loading and unloading, haul roads, access roads (airstrip, camp, and Jungjuk Port), ore crushing, construction and maintenance, and wind erosion from exposed areas such as tailings, waste rock storage, and ore and overburden stockpiles. As practicable, measures will be taken to control fugitive dust during the course of the Project, and surface disturbances will be limited to those areas that are reasonably necessary.

Employees, contractors, and visitors on the Project's site will be informed of their responsibility to control and report fugitive dust, as discussed in Section 3.0, Training and Compliance. Donlin Gold's area supervisors, construction managers, or appointed equivalents will be authorized to temporarily cease operations in an event of adverse wind or other meteorological conditions that cause excessive dust. All Donlin Gold's employees and contractors are empowered to report dusty conditions.

The following sections of this FDCP identify the BPMs that will be used as needed and when practical to minimize fugitive dust emissions from the Project's activities.

## 2.1 Drilling and Blasting

The BPMs for controlling fugitive dust from drilling and blasting in the pits are as follows:

1. Allow natural conditions such as wet weather (rain and snow) or inherent material moisture content to maintain dust control until the use of conventional dust control methods is necessary.

2. Avoid drilling and blasting during adverse wind or other meteorological conditions that cause excessive dust.

3. When practical, utilize drilling and blasting techniques that minimize dust generation, such as the following:

    a. Good-quality blast hole stemming to confine blast energy

    b. Wet and/or shrouded drilling

## 2.2 Material Loading and Unloading

Material loading and unloading activities generate dust emissions from the handling of materials (e.g., loading of haul trucks via a shovel, truck dumping, etc.). The BPMs for controlling these emissions are as follows:

1. Allow natural conditions such as wet weather (rain and snow) or inherent material moisture content to maintain dust control until the use of conventional dust control methods is necessary.

2. Avoid material handling activities during adverse wind or other meteorological conditions that cause excessive dust.

3. Use water trucks to apply water in working areas.

## 2.3 Haul Roads and Access Roads

Haul trucks and light vehicles traveling on unpaved roads (haul roads and access roads) can generate fugitive dust emissions. The BPMs for controlling these emissions are as follows:

1. Allow natural conditions such as wet weather (rain and snow) or inherent material moisture content to maintain dust control until the use of conventional dust control methods is necessary.

2. Use large-capacity haul trucks (400-ton) to minimize haul road travel, where practical.

3. Limit the speed of the haul trucks and light vehicles.

4. Apply water and chemical dust suppressants on road surfaces.

5. During winter, use graders to blade snow over road surfaces where this may be done safely.

As described above, Donlin Gold will employ a combination of water (or snow, as applicable) and chemical dust suppressant application to control dust from unpaved roads. The application frequency will depend on the natural moisture condition of the road surfaces due to ice, rain, or snow; maintaining safe driving conditions; and visible observations of dust levels from the road surfaces.

## 2.4 Ore Crushing

The Project's ore crushing circuit includes run-of-mine ore gyratory crushing, coarse ore transfers, and recycle pebble crushing. Particulate emissions are generated by the crushing and handling of the ore.

Mined ore is loaded through a dump pocket (with a rock breaker) to the gyratory crusher (GC). The GC discharges through a surge pocket and apron feeder to a conveyor system. Ore is carried by conveyor to the coarse ore stockpile. The coarse ore stockpile is reclaimed by four apron feeders and transferred to the semi-autogenous grinding (SAG) mill feed conveyor. The SAG mill is a wet process and does not generate particulate emissions.

Material discharged from the SAG mill is washed and screened, and the oversized material is sent to the pebble crushers. After crushing, the ore is discharged to the pebble discharge conveyor, which transfers to the SAG mill feed conveyor.

The crushing and handling of ore will generate dust emissions. Each emission point in these circuits will be controlled by a dust collector or enclosure as described below:

1. An enclosure will be installed at the dump pocket. The enclosure will have openings to allow haul trucks to enter and dump ore into the dump pocket from two sides.
2. Dust emissions from gyratory crushing (including ore transfers out of the crusher) will be captured and controlled by a dust collection system.
3. Enclosures will be installed at the transfers to and from the coarse ore stockpile feed conveyor.
4. Dust emissions from the coarse ore stockpile reclaim apron feeders will be captured and controlled by dust collection systems.
5. An enclosure will be installed at the SAG mill feed conveyor discharge.
6. Dust emissions from the pebble crushers (including ore transfers in and out of the crushers) will be captured and controlled by a dust collection system.
7. An enclosure will be installed at the transfer from the pebble discharge conveyor.

## 2.5 Construction and Maintenance

Construction and maintenance activities such as road grading, bulldozing, and earth moving can generate dust emissions. The BPMs for controlling these emissions are as follows:

1. Allow natural conditions such as wet weather (rain and snow) or inherent material moisture content to maintain dust control until the use of conventional dust control methods is necessary.

2. Avoid construction and maintenance activities during adverse wind or other meteorological conditions that cause excessive dust.

3. Use water trucks to apply water in working areas.

4. Apply water and chemical dust suppressants to haul roads and access roads as discussed in Section 2.3, Haul Roads and Access Roads, to control dust from these surfaces during grading.

## 2.6 Reducing Wind Erosion

Wind erosion can generate dust emissions from exposed and active mining areas such as the tailings impoundment beach, waste rock dump, run-of-mine ore and overburden stockpiles, and the haul and access roads. The BPMs for controlling these emissions are as follows:

1. Allow natural conditions such as wet weather (rain and snow) or inherent material moisture content to maintain dust control until the use of conventional dust control methods is necessary.

2. Use a phased approach to surface disturbance rather than disturbing the entire area all at once, and, concurrent with operations, reclaim disturbed areas once they are no longer required for active mining or other operations.

3. Use dozers to maintain the waste facility surfaces.

4. Use water trucks to apply water in working areas.

5. Promote encrustation of exposed areas by applying chemical dust suppressants.

6. Apply water and chemical dust suppressants to haul roads and access roads as discussed in Section 2.3 to control windblown dust from these surfaces.

7. Install a cover over the coarse ore stockpile.

# 3.0 TRAINING AND ASSESSMENTS

## 3.1 Personnel Training

Donlin Gold will provide its employees, contractors, and visitors with the necessary training to meet the objective set forth in this FDCP. Dust control and dusty condition reporting training will be provided to all employees and contractors. Site visitors will receive instructions on reporting dusty conditions during visitor orientation.

## 3.2 Performance Assessments

The FDCP will be reviewed periodically to evaluate if the BPMs employed are sufficient to meet the plan's objective. These performance assessments will be accomplished through routine inspections by Donlin Gold's environmental staff and by follow-up on observations reported by Donlin Gold's staff, contractors, and visitors. Donlin Gold's staff will observe each of the fugitive dust sources listed herein and determine whether the appropriate dust control is being achieved. Changes will be made to the FDCP as appropriate based on the findings of the performance assessments.

# Appendix F – Vendor Data

AIR SCIENCES INC.

DENVER • PORTLAND • LOS ANGELES

# Vendor Data

# Donlin Gold Project, Alaska

PREPARED FOR:
DONLIN GOLD LLC

PROJECT NO. 281-15-2
OCTOBER 2015
(RESUBMITTED
OCTOBER 27, 2021)

**Appendix F**
**Table of Contents**

Wärtsilä North America, Inc.

Donlin Gold LLC
Mr. Mike Rieser, Senior Environmental Engineer
4720 Business Park Blvd., Suite G-25
Anchorage, Alaska 99503

Dear Mike,

You have requested that Wartsila confirm some performance values for our 18V50DF type generator sets and in response I provide the following information.

1) The Wartsila 18V50DF has been rated at 17076 kWe for a long time. In this case for the Donlin Creek project, for gas operation there is no derating, but due to the site elevation there is derating for liquid fuel operation. In my files I have the site elevation for Donlin at 984 feet. At this elevation, the gross (generator terminal) output is 17,076 kWe on gas, and the gross output is 16,786 kWe when running on diesel fuel.

2) The gross heat rate (generator terminal heat rate) of the 18V50DF for gas operation is 7462 BTU/kWh (LHV) and the gross heat rate of the set on diesel fuel would be 7914 BTU/kWh (LHV).

3) You provided some emissions data as follows and requested our comments.

| | Natural Gas Operation | Diesel fuel operation | |
|---|---|---|---|
| CO | 0.12 | 0.18 | g/kWhe |
| NOX | 0.08 | 0.53 | g/kWhe |
| PM(1) | 0.13 | 0.15 | g/kWhe |
| VOC ($CH_4$) | 0.09 | 0.21 | g/kWhe |
| $NH_3$ (SCR slip) | 9 | 9 | ppmvd |

(1) PM limit during ULSD firing is front half PM only.

Our comments: The g/kWh figures are OK, with a couple of comments. We normally have language with regard to the VOC emissions which states if certain components of the fuel gas change, it can affect the VOC emissions. This language looks like this:

**Correction based upon the influence of gas composition on VOC emissions:**

If the concentration the sum of propane + butane + pentane + hexane ($C_3H_8$ + $C_4H_{10}$ + $C_5H_{12}$ + $C_6H_{14}$) in the pipeline natural gas exceed the values specified in paragraph *"Gas composition"* in this document the VOC emissions shall be corrected according to the table below. In the table the sum of propane + butane + pentane + hexane is denoted $C_{GasVOC}$.

| | Corrected VOC emissions (ppm-v, 15% $O_2$, dry) [ g/kWh at alternator terminals] |
|---|---|
| Concentration of VOC components in feed gas | 100% load |
| $C_{GasVOC}$ < 0.30 vol-% | 20 ppm-v, 15% $O_2$, dry [0.09 g/kWh] |
| 0.30 vol-% ≤ $C_{GasVOC}$ < 0.50 vol-% | 25 ppm-v, 15% $O_2$, dry [0.12 g/kWh] |
| 0.50 vol-% ≤ $C_{GasVOC}$ < 1.00 vol-% | 33 ppm-v, 15% $O_2$, dry [0.15 g/kWh] |
| 1.00 vol-% ≤ $C_{GasVOC}$ < 1.50 vol-% | 40 ppm-v, 15% $O_2$, dry [0.18 g/kWh] |

The EPA test method used to measure the front half PM emissions for the liquid fuel PM limit is Test Method 5.

Regards,

Christopher L. Whitney
Manager, Sales Support

**Wärtsilä North America, Inc.**
900 Bestgate Road
Suite 400
Annapolis, Maryland 21401
Tel. (410) 573-2100
Fax (410) 573-2200

**Model:** DQCA
**Frequency:** 60
**Fuel type:** Diesel
**KW rating:** 600 standby
545 prime
**Emissions level:** EPA NSPS Stationary Emergency Tier 2

## > Generator set data sheet

Cummins® Power Generation

**Our energy working for you.™**

| | |
|---|---|
| **Exhaust emission data sheet:** | **EDS-1086** |
| **Exhaust emission compliance sheet:** | **EPA-1120** |
| **Sound performance data sheet:** | **MSP-1064** |
| **Cooling performance data sheet:** | **MCP-173** |
| **Prototype test summary data sheet:** | **PTS-160** |
| **Standard set-mounted radiator cooling outline:** | |
| **Optional set-mounted radiator cooling outline:** | |
| **Optional heat exchanger cooling outline:** | |
| **Optional remote radiator cooling outline:** | |

## Fuel consumption

| | Standby | | | | Prime | | | | Continuous |
|---|---|---|---|---|---|---|---|---|---|
| | **kW (kVA)** | | | | **kW (kVA)** | | | | **kW (kVA)** |
| **Ratings** | 600 (750) | | | | 545 (681) | | | | |
| **Load** | **1/4** | **1/2** | **3/4** | **Full** | **1/4** | **1/2** | **3/4** | **Full** | **Full** |
| **US gph** | 13.0 | 22.5 | 33.0 | 42.0 | 12.0 | 21.0 | 30.0 | 38.5 | |
| **L/hr** | 49.2 | 85.2 | 124.9 | 159.0 | 45.4 | 79.5 | 113.6 | 145.7 | |

## Engine

| | Standby rating | Prime rating | Continuous rating |
|---|---|---|---|
| Engine manufacturer | Cummins Inc. | | |
| Engine model | QSK23-G7 NR2 | | |
| Configuration | Cast Iron, in line 6 cylinder | | |
| Aspiration | Turbocharged and air-to-air aftercooled | | |
| Gross engine power output, kWm (bhp) | 910 (1220) | 809 (1085) | |
| BMEP at set rated load, kPa (psi) | 1944 (282) | 1752 (254) | |
| Bore, mm (in) | 170 (6.69) | | |
| Stroke, mm (in) | 170 (6.69) | | |
| Rated speed, rpm | 1800 | | |
| Piston speed, m/s (ft/min) | 10.21 (2010) | | |
| Compression ratio | 16:1 | | |
| Lube oil capacity, L (qt) | 102 (108) | | |
| Overspeed limit, rpm | 2100 | | |
| Regenerative power, kW | 93 | | |

## Fuel flow

| | | |
|---|---|---|
| Maximum fuel flow, L/hr (US gph) | 685 (181) | |
| Maximum fuel inlet restriction, kPa (in Hg) | 13.44 (4) | |
| Maximum fuel inlet temperature, °C (°F) | 71 (160) | |


D-3352e (7/10)

## Air

| | Standby rating | Prime rating | Continuous rating |
|---|---|---|---|
| Combustion air, $m^3$/min (scfm) | 59 (2081) | 56 (1961) | |
| Maximum air cleaner restriction, kPa (in $H_2O$) | 6.2 (25) | | |
| Alternator cooling air, $m^3$/min (cfm) | 117 (4156) | | |

## Exhaust

| | | | |
|---|---|---|---|
| Exhaust flow at set rated load, $m^3$/min (cfm) | 137 (4830) | 128 (4515) | |
| Exhaust temperature, °C (°F) | 440 (824) | 429 (804) | |
| Maximum back pressure, kPa (in $H_2O$) | 10.1 (40.8) | | |

## Standard set-mounted radiator cooling

| | | | |
|---|---|---|---|
| Ambient design, °C ( °F) | 50 (122) | | |
| Fan load, $kW_m$ (HP) | 27 (36) | | |
| Coolant capacity (with radiator), L (US gal) | 89 (23.5) | | |
| Cooling system air flow, $m^3$/min (scfm) | 1252 (44183) | | |
| Total heat rejection, MJ/min (Btu/min) | 26.4 (25002) | 23.9 (22706) | |
| Maximum cooling air flow static restriction, kPa (in $H_2O$) | 0.12 (0.5) | | |
| Maximum fuel return line restriction kPa (in Hg) | 30.47 (9) | | |

## Optional set-mounted radiator cooling

| | | | |
|---|---|---|---|
| Ambient design, °C (°F) | | | |
| Fan load, $kW_m$ (HP) | | | |
| Coolant capacity (with radiator), L (US gal) | | | |
| Cooling system air flow, $m^3$/min (scfm) | | | |
| Total heat rejection, MJ/min (Btu/min) | | | |
| Maximum cooling air flow static restriction, kPa (in $H_2O$) | | | |
| Maximum fuel return line restriction, kPa (in Hg) | | | |

## Optional heat exchanger cooling

| | | | |
|---|---|---|---|
| Set coolant capacity, L (US gal) | | | |
| Heat rejected, jacket water circuit, MJ/min (Btu/min) | | | |
| Heat rejected, aftercooler circuit, MJ/min (Btu/min) | | | |
| Heat rejected, fuel circuit, MJ/min (Btu/min) | | | |
| Total heat radiated to room, MJ/min (Btu/min) | | | |
| Maximum raw water pressure, jacket water circuit, kPa (psi) | | | |
| Maximum raw water pressure, aftercooler circuit, kPa (psi) | | | |
| Maximum raw water pressure, fuel circuit, kPa (psi) | | | |
| Maximum raw water flow, jacket water circuit, L/min (US gal/min) | | | |
| Maximum raw water flow, aftercooler circuit, L/min (US gal/min) | | | |
| Maximum raw water flow, fuel circuit, L/min (US gal/min) | | | |
| Minimum raw water flow at 27 °C (80 °F) inlet temp, jacket water circuit, L/min (US gal/min) | | | |
| Minimum raw water flow at 27 °C (80 °F) inlet temp, aftercooler circuit, L/min (US gal/min) | | | |
| Minimum raw water flow at 27 °C (80 °F) inlet temp, fuel circuit, L/min (US gal/min) | | | |
| Raw water delta P at min flow, jacket water circuit, kPa (psi) | | | |
| Raw water delta P at min flow, aftercooler circuit, kPa (psi) | | | |
| Raw water delta P at min flow, fuel circuit, kPa (psi) | | | |
| Maximum jacket water outlet temp, °C (°F) | | | |
| Maximum aftercooler inlet temp, °C (°F) | | | |
| Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C ( °F) | | | |
| Maximum fuel return line restriction, kPa (in Hg) | | | |

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Power Generation

## Optional remote radiator cooling[1]

| | Standby rating | Prime rating | Continuous rating |
|---|---|---|---|
| Set coolant capacity, L (US gal) | | | |
| Max flow rate at max friction head, jacket water circuit, L/min (US gal/min) | | | |
| Max flow rate at max friction head, aftercooler circuit, L/min (US gal/min) | | | |
| Heat rejected, jacket water circuit, MJ/min (Btu/min) | | | |
| Heat rejected, aftercooler circuit, MJ/min (Btu/min) | | | |
| Heat rejected, fuel circuit, MJ/min (Btu/min) | | | |
| Total heat radiated to room, MJ/min (Btu/min) | | | |
| Maximum friction head, jacket water circuit, kPa (psi) | | | |
| Maximum friction head, aftercooler circuit, kPa (psi) | | | |
| Maximum static head, jacket water circuit, m (ft) | | | |
| Maximum static head, aftercooler circuit, m (ft) | | | |
| Maximum jacket water outlet temp, °C (°F) | | | |
| Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F) | | | |
| Maximum aftercooler inlet temp, °C (°F) | | | |
| Maximum fuel flow, L/hr (US gph) | | | |
| Maximum fuel return line restriction, kPa (in Hg) | | | |

## Weights[2]

| | |
|---|---|
| Unit dry weight kgs (lbs) | 6379 (14061) |
| Unit wet weight kgs (lbs) | 6521 (14372) |

**Notes:**

[1] For non-standard remote installations contact your local Cummins Power Generation representative.
[2] Weights represent a set with standard features. See outline drawing for weights of other configurations.

## Derating factors

| | |
|---|---|
| **Standby** | Engine power available up to 2705 m (8875 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations, derate at 4.4% per 305 m (1000 ft). Above 40 °C (104 °F) derate 10% per 10 °C (18 °F). |
| **Prime** | Engine power available up to 2641 m (8665 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations, derate at 4.5% per 305 m (1000 ft). Above 40 °C (104 °F) derate 20.9% per 10 °C (18 °F). |
| **Continuous** | |

## Ratings definitions

| Emergency standby power (ESP): | Limited-time running power (LTP): | Prime power (PRP): | Base load (continuous) power (COP): |
|---|---|---|---|
| Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514. | Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528. | Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514. | Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514. |

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D-3352e (7/10)



Power Generation

## Alternator data

| Voltage | Connection[1] | Temp rise degrees C | Duty[2] | Single phase factor[3] | Max surge kVA[4] | Winding No. | Alternator data sheet | Feature Code |
|---|---|---|---|---|---|---|---|---|
| 380-480 | Wye | 125/105 | S/P | | 2944 | 312 | ADS-309 | B282-2 |
| 600 | Wye | 125/105 | S/P | | 2944 | 7 | ADS-309 | B300-2 |
| 600 | Wye | 105/80 | S/P | | 2944 | 7 | ADS-309 | B301-2 |
| 220/380 | Wye | 105/80 | S/P | | 3313 | 311 | ADS-310 | B599-2 |
| 480 | Wye | 105/80 | S/P | | 2944 | 312 | ADS-309 | B600-2 |
| 480 | Wye | 80 | S | | 2944 | 312 | ADS-309 | B601-2 |
| 600 | Wye | 80 | S | | 2944 | 7 | ADS-309 | B604-2 |
| 380 | Wye | 80 | S | | 3866 | 312 | ADS-311 | B660-2 |
| 190-480 | Wye | 125/105 | S/P | | 2944 | 311 | ADS-309 | B731-2 |
| 208/416 | Wye | 105/80 | S/P | | 2944 | 311 | ADS-309 | B733-2 |
| 208/416 | Wye | 80 | S | | 3313 | 311 | ADS-310 | B734-2 |
| 440 | Wye | 125/105 | S/P | | 2944 | 312 | ADS-309 | B741-2 |

**Notes:**

[1] Limited single phase capability is available from some three phase rated configurations. To obtain single phase rating, multipy the three phase kW rating by the Single Phase Factor[3]. All single phase ratings are at unity power factor.
[2] Standby (S), Prime (P) and Continuous ratings (C).
[3] Factor for the *Single Phase Output from Three Phase Alternator* formula listed below.
[4] Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

## Formulas for calculating full load currents:

**Three phase output**

$$\frac{\text{kW} \times 1000}{\text{Voltage} \times 1.73 \times 0.8}$$

**Single phase output**

$$\frac{\text{kW} \times \text{SinglePhaseFactor} \times 1000}{\text{Voltage}}$$

**Cummins Power Generation**
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

**Warning:** Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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D-3352e (7/10)



Power Generation

| | |
|---|---|
| **Model:** | **DQGAB** |
| **Frequency:** | **60** |
| **Fuel type:** | **Diesel** |
| **KW rating:** | **1500 standby**<br>**1350 prime** |
| **Emissions level:** | **EPA NSPS Stationary Emergency Tier 2** |

## Generator set data sheet

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**Power Generation**

| | |
|---|---|
| **Exhaust emission data sheet:** | **EDS-1059** |
| **Exhaust emission compliance sheet:** | **EPA-1093** |
| **Sound performance data sheet:** | **MSP-1034** |
| **Cooling performance data sheet:** | **MCP-152** |
| **Prototype test summary data sheet:** | **PTS-265** |
| **Standard set-mounted radiator cooling outline:** | **0500-4357** |
| **Optional set-mounted radiator cooling outline:** | |
| **Optional heat exchanger cooling outline:** | |
| **Optional remote radiator cooling outline:** | **0500-4309** |

## Fuel consumption

| | **Standby** | | | | **Prime** | | | | **Continuous** |
|---|---|---|---|---|---|---|---|---|---|
| | **kW (kVA)** | | | | **kW (kVA)** | | | | **kW (kVA)** |
| **Ratings** | 1500 (1875) | | | | 1350 (1688) | | | | |
| **Load** | **1/4** | **1/2** | **3/4** | **Full** | **1/4** | **1/2** | **3/4** | **Full** | **Full** |
| **US gph** | 32.5 | 60.2 | 83.4 | 109.4 | 30.1 | 55.2 | 78.1 | 97.8 | |
| **L/hr** | 123 | 227.9 | 315.7 | 414.1 | 113.9 | 209 | 295.6 | 370.2 | |

## Engine

| | **Standby rating** | **Prime rating** | **Continuous rating** |
|---|---|---|---|
| Engine manufacturer | Cummins Inc. | | |
| Engine model | QSK50-G4 NR2 | | |
| Configuration | Cast iron, V 16 cylinder | | |
| Aspiration | Turbocharged and low temperature aftercooled | | |
| Gross engine power output, kWm (bhp) | 1656 (2220) | 1470 (1971) | |
| BMEP at set rated load, kPa (psi) | 2192 (318) | 1957 (284) | |
| Bore, mm (in) | 159 (6.25) | | |
| Stroke, mm (in) | 159 (6.25) | | |
| Rated speed, rpm | 1800 | | |
| Piston speed, m/s (ft/min) | 9.5 (1875) | | |
| Compression ratio | 15:1 | | |
| Lube oil capacity, L (qt) | 235 (248) | | |
| Overspeed limit, rpm | 2100 ±50 | | |
| Regenerative power, kW | 168 | | |

## Fuel flow

| | | |
|---|---|---|
| Maximum fuel flow, L/hr (US gph) | 757 (200) | |
| Maximum fuel inlet restriction, kPa (in Hg) | 30 (9.0) | |
| Maximum fuel inlet temperature, °C (°F) | 70 (160) | |


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| Air | Standby rating | Prime rating | Continuous rating |
|---|---|---|---|
| Combustion air, m³/min (scfm) | 139 (4895) | 133 (4700) | |
| Maximum air cleaner restriction, kPa (in $H_2O$) | 6.2 (25) | | |
| Alternator cooling air, m³/min (cfm) | 207 (7300) | | |

| Exhaust | | | |
|---|---|---|---|
| Exhaust flow at set rated load, m³/min (cfm) | 342 (12065) | 312 (11000) | |
| Exhaust temperature, °C (°F) | 491 (915) | 446 (835) | |
| Maximum back pressure, kPa (in $H_2O$) | 6.78 (27) | | |

| Standard set-mounted radiator cooling | | | |
|---|---|---|---|
| Ambient design, °C ( °F) | 40 (104) | | |
| Fan load, $kW_m$ (HP) | 45 (60) | | |
| Coolant capacity (with radiator), L (US gal) | 541 (143) | | |
| Cooling system air flow, m³/min (scfm) | 1705 (60150) | | |
| Total heat rejection, MJ/min (Btu/min) | 72.3 (68580) | 64.8 (61510) | |
| Maximum cooling air flow static restriction, kPa (in $H_2O$) | 0.12 (0.5) | | |
| Maximum fuel return line restriction kPa (in Hg) | | | |

| Optional set-mounted radiator cooling | | | |
|---|---|---|---|
| Ambient design, °C (°F) | | | |
| Fan load, $kW_m$ (HP) | | | |
| Coolant capacity (with radiator), L (US gal) | | | |
| Cooling system air flow, m³/min (scfm) | | | |
| Total heat rejection, MJ/min (Btu/min) | | | |
| Maximum cooling air flow static restriction, kPa (in $H_2O$) | | | |
| Maximum fuel return line restriction, kPa (in Hg) | | | |

| Optional heat exchanger cooling | | | |
|---|---|---|---|
| Set coolant capacity, L (US gal) | | | |
| Heat rejected, jacket water circuit, MJ/min (Btu/min) | | | |
| Heat rejected, aftercooler circuit, MJ/min (Btu/min) | | | |
| Heat rejected, fuel circuit, MJ/min (Btu/min) | | | |
| Total heat radiated to room, MJ/min (Btu/min) | | | |
| Maximum raw water pressure, jacket water circuit, kPa (psi) | | | |
| Maximum raw water pressure, aftercooler circuit, kPa (psi) | | | |
| Maximum raw water pressure, fuel circuit, kPa (psi) | | | |
| Maximum raw water flow, jacket water circuit, L/min (US gal/min) | | | |
| Maximum raw water flow, aftercooler circuit, L/min (US gal/min) | | | |
| Maximum raw water flow, fuel circuit, L/min (US gal/min) | | | |
| Minimum raw water flow at 27 °C (80 °F) inlet temp, jacket water circuit, L/min (US gal/min) | | | |
| Minimum raw water flow at 27 °C (80 °F) inlet temp, aftercooler circuit, L/min (US gal/min) | | | |
| Minimum raw water flow at 27 °C (80 °F) inlet temp, fuel circuit, L/min (US gal/min) | | | |
| Raw water delta P at min flow, jacket water circuit, kPa (psi) | | | |
| Raw water delta P at min flow, aftercooler circuit, kPa (psi) | | | |
| Raw water delta P at min flow, fuel circuit, kPa (psi) | | | |
| Maximum jacket water outlet temp, °C (°F) | | | |
| Maximum aftercooler inlet temp, °C (°F) | | | |
| Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C ( °F) | | | |
| Maximum fuel return line restriction, kPa (in Hg) | | | |

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Power Generation

## Optional remote radiator cooling[1]

| | Standby rating | Prime rating | Continuous rating |
|---|---|---|---|
| Set coolant capacity, L (US gal) | | | |
| Max flow rate at max friction head, jacket water circuit, L/min (US gal/min) | 1779 (470) | | |
| Max flow rate at max friction head, aftercooler circuit, L/min (US gal/min) | 492 (130) | | |
| Heat rejected, jacket water circuit, MJ/min (Btu/min) | 35.44 (33610) | 32.11 (30455) | |
| Heat rejected, aftercooler circuit, MJ/min (Btu/min) | 26.93 (25545) | 23.96 (22725) | |
| Heat rejected, fuel circuit, MJ/min (Btu/min) | | | |
| Total heat radiated to room, MJ/min (Btu/min) | 9.94 (9425) | 8.78 (8330) | |
| Maximum friction head, jacket water circuit, kPa (psi) | 67 (10) | | |
| Maximum friction head, aftercooler circuit, kPa (psi) | 48 (7) | | |
| Maximum static head, jacket water circuit, m (ft) | 18.3 (60) | | |
| Maximum static head, aftercooler circuit, m (ft) | 18.3 (60) | | |
| Maximum jacket water outlet temp, °C (°F) | 104 (220) | 100 (212) | |
| Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F) | 49 (120) | | |
| Maximum aftercooler inlet temp, °C (°F) | 71 (160) | 66 (150) | |
| Maximum fuel flow, L/hr (US gph) | | | |
| Maximum fuel return line restriction, kPa (in Hg) | | | |

## Weights[2]

| | |
|---|---|
| Unit dry weight kgs (lbs) | 10989 (24220) |
| Unit wet weight kgs (lbs) | 11493 (25330) |

**Notes:**

[1] For non-standard remote installations contact your local Cummins Power Generation representative.

[2] Weights represent a set with standard features. See outline drawing for weights of other configurations.

## Derating factors

| | |
|---|---|
| **Standby** | Engine power available up to 890 m (2920 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations, derate at 6.6% per 305 m (1000 ft) and 14.0% per 10 °C (18 °F). |
| **Prime** | Engine power available up to 562 m (1844 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations, derate at 6.6% per 305 m (1000 ft) and 14.0% per 10 °C (18 °F). |
| **Continuous** | |

## Ratings definitions

| Emergency standby power (ESP): | Limited-time running power (LTP): | Prime power (PRP): | Base load (continuous) power (COP): |
|---|---|---|---|
| Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514. | Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528. | Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514. | Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514. |

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Power Generation

## Alternator data

| Voltage | Connection[1] | Temp rise degrees C | Duty[2] | Single phase factor[3] | Max surge kVA[4] | Winding No. | Alternator data sheet | Feature Code |
|---|---|---|---|---|---|---|---|---|
| 380 | Wye, 3-phase | 125 | P | | 5743 | | ADS-332 | B596-2 |
| 380 | Wye, 3-phase | 150/105 | S/P | | 6716 | | ADS-333 | B595-2 |
| 380 | Wye, 3-phase | 80 | P | | 6716 | | ADS-333 | B687-2 |
| 380 | Wye, 3-phase | 105/80 | S/P | | 7361 | | ADS-334 | B599-2 |
| 380 | Wye, 3-phase | 80 | S | | 7695 | | ADS-335 | B660-2 |
| 440 | Wye, 3-phase | 125 | P | | 4602 | | ADS-330 | B692-2 |
| 440 | Wye, 3-phase | 150/125 | S/P | | 5521 | | ADS-331 | B691-2 |
| 440 | Wye, 3-phase | 125/105 | S/P | | 5743 | | ADS-332 | B663-2 |
| 440 | Wye, 3-phase | 80 | S | | 6716 | | ADS-333 | B688-2 |
| 440 | Wye, 3-phase | 80 | P | | 7695 | | ADS-331 | B689-2 |
| 480 | Wye, 3-phase | 105 | P | | 4602 | | ADS-330 | B693-2 |
| 480 | Wye, 3-phase | 125/105 | S/P | | 5521 | | ADS-331 | B276-2 |
| 480 | Wye, 3-phase | 80 | P | | 5521 | | ADS-331 | B694-2 |
| 480 | Wye, 3-phase | 105/80 | S/P | | 5743 | | ADS-332 | B600-2 |
| 480 | Wye, 3-phase | 80 | S | | 6716 | | ADS-333 | B601-2 |
| 600 | Wye, 3-phase | 105 | P | | 4602 | | ADS-330 | B581-2 |
| 600 | Wye, 3-phase | 125/105 | S/P | | 5521 | | ADS-331 | B602-2 |
| 600 | Wye, 3-phase | 80 | P | | 5521 | | ADS-331 | B695-2 |
| 600 | Wye, 3-phase | 105/80 | S/P | | 5743 | | ADS-332 | B603-2 |
| 600 | Wye, 3-phase | 80 | S | | 6716 | | ADS-333 | B604-2 |
| 4160 | Wye, 3-phase | 105 | P | | 6204 | | ADS-322 | B312-2 |
| 4160 | Wye, 3-phase | 105/80 | S/P | | 7005 | | ADS-323 | B313-2 |

**Notes:**

[1] Limited single phase capability is available from some three phase rated configurations. To obtain single phase rating, multipy the three phase kW rating by the Single Phase Factor[3]. All single phase ratings are at unity power factor.
[2] Standby (S), Prime (P) and Continuous ratings (C).
[3] Factor for the *Single Phase Output from Three Phase Alternator* formula listed below.
[4] Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

## Formulas for calculating full load currents:

**Three phase output**

$$\frac{\text{kW} \times 1000}{\text{Voltage} \times 1.73 \times 0.8}$$

**Single phase output**

$$\frac{\text{kW} \times \text{SinglePhaseFactor} \times 1000}{\text{Voltage}}$$

**Cummins Power Generation**
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Phone: 763 574 5000
Fax: 763 574 5298

**Warning:** Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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D-3334j (7/10)

Cummins Power Generation

# EPA Tier 2 Exhaust Emission Compliance Statement
# 1500DQGAB
## 60 Hz Diesel Generator Set

## Compliance Information:

**The engine used in this generator set complies with the Tier 2 emissions limits of U.S EPA New Source Performance Standards for Stationary Emergency engines under the provisions of 40 CFR 60 Subpart IIII when tested per ISO 8178 D2.**

| | |
|---|---|
| Engine Manufacturer: | Cummins Inc |
| EPA Certificate Number: | CEX-STATCI-11-04 |
| Effective Date: | 06/08/2010 |
| Date Issued: | 06/08/2010 |
| EPA Diesel Engine Family: | BCEXL050.AAD |
| CARB Executive Order: | |

## Engine Information:

| | | | |
|---|---|---|---|
| Model: | Cummins Inc QSK50-G4 NR2 | Bore: | 6.25 in. (159 mm) |
| Engine Nameplate HP: | 2220 | | |
| Type: | 4 Cycle, 60°V, 16 Cylinder Diesel | Stroke: | 6.25 in. (159 mm) |
| Aspiration: | Turbocharged and Low Temperature Aftercooled | Displacement: | 3067 cu. in. ( 50.2 liters ) |
| Compression Ratio: | 15.0:1 | | |
| Emission Control Device: | Turbocharged and Low Temperature Aftercooled | | |

## U.S. Environmental Protection Agency NSPS Stationary Emergency Tier 2 Limits

| COMPONENT | (All values are Grams per HP-Hour) |
|---|---|
| NOx + HC (Oxides of Nitrogen as NO2 + Non Methane Hydrocarbons) | 4.77 |
| CO (Carbon Monoxide) | 2.61 |
| PM (Particulate Matter) | 0.15 |

Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

# JW6H-UF38

# Stationary Fire Pump Engine Driver

# EMISSION DATA

## EPA 40 CFR Part 60

**6** *Cylinders*
**Four** *Cycle*
**Lean** *Burn*
**Turbocharged & Jacket Water Aftercooled**

| 500 PPM SULFUR #2 DIESEL FUEL | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | GRAMS / HP- HR | | | | EXHAUST | |
| RPM | BHP (3) | FUEL GAL/HR (L/HR) | NMHC | NOx | CO | PM (4) | °F (°C) | CFM ($m^3$/min) |
| 1760 | 252 | 14 (54) | 0.27 | 7.43 | 0.87 | 0.17 | 832 (445) | 1351 (38) |

*Notes:*

1) *6081AF001 Base Engine Model manufactured by John Deere Corporation. For John Deere Emissions Conformance to EPA 40 CFR Part 60 see Page 2 of 2.*
2) *The Emission Warranty for this engine is provided directly to the owner by John Deere Corporation. A copy of the John Deere Emission Warranty can be found in the Clarke Operation and Maintenance Manual.*
3) *Engines are rated at standard conditions of 29.61in. (7521 mm) Hg barometer and 77°F (25° C) inlet air temperature. (SAE J1349)*
4) *PM is a measure of total particulate matter, including $PM_{10}$.*

CLARKE
FIRE PROTECTION PRODUCTS
3133 EAST KEMPER ROAD
CINCINNATI, OH 45241

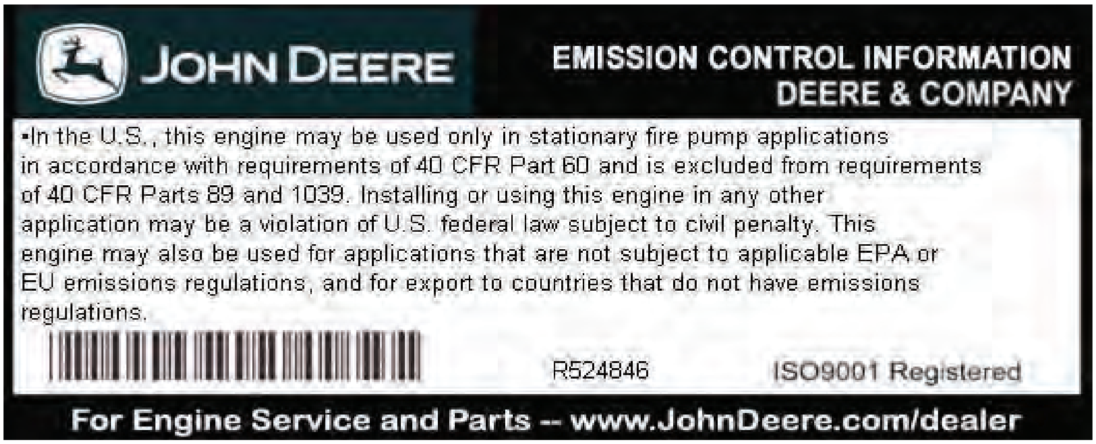
JOHN DEERE

John Deere Power Systems
3801 W. Ridgeway Ave., PO Box 5100
Waterloo, Iowa USA 50704-5100

31 October 2007

**Subject: Fire Pump Ratings – Conformance to EPA 40 CFR Part 60 (NSPS requirements)**

All John Deere stationary fire pump engines conform to the requirements of 40 CFR Part 60. All such engines include an emission label, stating the engine conforms to the requirements of 40 CFR Part 60. An example of the emission label is show below:




This label applies to all of the following engine models, sold to Clarke Fire Protection, for use in stationary fire pump applications:

| John Deere Engine Model |
|---|
| 4045DF120 |
| 4045DF159 |
| 4045TF252 |
| 4045TF254 |
| 4045TF220 |
| 6068TF252 |
| 6068TF254 |
| 6068HF252 |
| 6068HF254 |
| 6068HF120 |
| 6068TF220 |
| 6081AF001 |
| 6081HF001 |
| 6125AF001 |
| 6125HF070 |

All engines conforming to 40 CFR Part 60 (identified by emission label, as shown above) are covered under the emissions warranty of 40 CFR Part 89.

Sincerely,

Kyle J. Tingle
Regional Sales Manager, JDPS

# Technical Specifications

Available in the following configurations:

- Standard configuration for most installations.
- Super Economizer (SE) for increased efficiency.
- Low NOx Burners or Flue Gas Recirculation for reduced emissions.
- Fully Modulating Burners
- Fuel Options: Natural Gas, Propane, #2 Fuel Oil, Biogas, Biofuels and Hydrogen

Clayton Steam Generators:

- SAVE FUEL
  The unique counter flow design provides higher fuel-to-steam efficiency than traditional boilers.

- ARE SAFE FOR PERSONNEL AND EQUIPMENT
  Inherently safe, the Clayton design eliminates hazardous steam explosions.

- PROVIDE RAPID RESPONSE
  The Clayton design responds rapidly to sudden or fluctuating load demands.

- START FAST
  The Clayton design will provide full output from a cold start within fifteen minutes, without thermal stress.

- ARE COMPACT AND LIGHTWEIGHT
  The Clayton design typically occupies one-third of the floor space and weighs 75% less than a traditional boiler.

- ENSURES HIGH QUALITY STEAM
  Clayton provides a 99.5% quality separator to minimize moisture in the steam.

- OFFERS ADVANCED CONTROLS
  PLC controls, Variable Speed Drives and a linkage-less servo controlled burner management system are standard.

- INCLUDES OUTSTANDING SUPPORT
  Every Steam Generator is backed by Clayton factory direct sales and service plus full service feedwater treatement.

E704 700 BHP
Steam Generator

# Clayton Steam Generator

# SPECIFICATIONS

| | MODEL E704 Standard | MODEL SE704 with Super Economizer | MODEL E704-FMB with Low NOx Burner | MODEL SE704-FMB with Low NOx Burner and Super Economizer | MODEL E704-FGR with Flue Gas Recirculation | MODEL SE704-FGR with Flue Gas Recirculation and Super Economizer |
|---|---|---|---|---|---|---|
| BOILER HORSEPOWER | 700 BHP | 700 BHP | 700 BHP | 700 BHP | 700 BHP | 700 BHP |
| HEAT INPUT Oil | 27,895,833 BTU/HR | 27,247,093 BTU/HR | NA | NA | 27,895,833 BTU/HR | 27,247,093 BTU/HR |
| Gas | 28,576,220 BTU/HR | 27,895,833 BTU/HR | 29,290,625 BTU/HR | 28,576,220 BTU/HR | 28,576,220 BTU/HR | 27,895,833 BTU/HR |
| NET HEAT OUTPUT | 23,432,500 BTU/HR | 23,432,500 BTU/HR | 23,432,500 BTU/HR | 23,432,500 BTU/HR | 23,432,500 BTU/HR | 23,432,500 BTU/HR |
| EQUIVALENT OUTPUT (from and at 212°F feedwater and 0 PSIG steam) | 24,150 LB/HR | 24,150 LB/HR | 24,150 LB/HR | 24,150 LB/HR | 24,150 LB/HR | 24,150 LB/HR |
| DESIGN PRESSURE (see note 1) | 65 - 500 PSIG | 65 - 500 PSIG | 65 - 500 PSIG | 65 - 500 PSIG | 65 - 500 PSIG | 65 - 500 PSIG |
| STEAM OPERATING PRESSURE (determined by design pressure) | 60 - 450 PSIG | 60 - 450 PSIG | 60 - 450 PSIG | 60 - 450 PSIG | 60 - 450 PSIG | 60 - 450 PSIG |
| OIL CONSUMPTION at maximum steam output (see note 2) | 198 GPH | 194 GPH | NA | NA | 198 GPH | 194 GPH |
| GAS CONSUMPTION at maximum steam output (see note 4) | 28,576 Ft.$^3$/HR | 27,896 Ft.$^3$/HR | 29,291 Ft.$^3$/HR | 28,576 Ft.$^3$/HR | 28,576 Ft.$^3$/HR | 27,896 Ft.$^3$/HR |
| BURNER CONTROLS | | | | | | |
| modulating | 5 to 1 Turndown | 5 to 1 Turndown | 4 to 1 Turndown | 4 to 1 Turndown | 4 to 1 Turndown | 4 to 1 Turndown |
| THERMAL EFFICIENCY as tested (see note 3) | | | | | | |
| firing rate % | 50% 100% | 50% 100% | 50% 100% | 50% 100% | 50% 100% | 50% 100% |
| oil-fired efficiency % | 85 84 | 87 86 | NA NA | NA NA | 85 84 | 87 86 |
| gas-fired efficiency % | 83 82 | 85 84 | 81 80 | 83 82 | 83 82 | 85 84 |
| ELECTRIC MOTOR | Blower Pump | Blower Pump | Blower Pump Cooling | Blower Pump Cooling | Blower Pump Cooling | Blower Pump Cooling |
| design pressure 15-300 psig | 60 HP 40 HP | 60 HP 40 HP | 75 HP 40 HP 7.5 HP | 75 HP 40 HP 7.5 HP | 60 HP 40 HP 7.5 HP | 60 HP 40 HP 7.5 HP |
| design pressure 301-500 psig | 60 HP 50 HP | 60 HP 50 HP | 75 HP 50 HP 7.5 HP | 75 HP 50 HP 7.5 HP | 60 HP 50 HP 7.5 HP | 60 HP 50 HP 7.5 HP |
| ELECTRIC FLA, based on 460 V (see note 5) | | | | | | |
| design pressure 15-300 psig | 155 | 155 | 190 | 190 | 166 | 166 |
| design pressure 301-500 psig | 170 | 170 | 205 | 205 | 181 | 181 |
| GAS SUPPLY REQUIRED | | | | | | |
| pilot | 5 to 60 psig | 5 to 60 psig | 5 to 60 psig | 5 to 60 psig | 5 to 60 psig | 5 to 60 psig |
| main burner | 5 to 10 psig | 5 to 10 psig | 5 to 10 psig | 5 to 10 psig | 5 to 10 psig | 5 to 10 psig |
| AIR SUPPLY REQUIRED (pilot - see note 6) | NA | NA | 150 SCFH @ 3 to 150 PSIG | 150 SCFH @ 3 to 150 PSIG | NA | NA |
| AIR SUPPLY REQUIRED (burner -see note 7) | 30 SCFM @ 70 to 100 PSIG | 30 SCFM @ 70 to 100 PSIG | NA | NA | 30 SCFM @ 70 to 100 PSIG | 30 SCFM @ 70 to 100 PSIG |
| WATER SUPPLY REQUIRED | 3711 GPH | 3711 GPH | 3711 GPH | 3711 GPH | 3711 GPH | 3711 GPH |
| HEATING SURFACE | 1,522.6 Ft.$^2$ | 1,701.0 Ft.$^2$ | 1,522.6 Ft.$^2$ | 1,701.0 Ft.$^2$ | 1,522.6 Ft.$^2$ | 1,701.0 Ft.$^2$ |
| APPROXIMATE OVERALL DIMENSIONS | | | | | | |
| length | 141 IN | 141 IN | 160 IN | 160 IN | 159 IN | 159 IN |
| width | 140 IN | 140 IN | 149 IN | 149 IN | 140 IN | 140 IN |
| height | 205 IN | 215 IN | 205 IN | 215 IN | 227 IN | 237 IN |
| WEIGHT | | | | | | |
| installed - wet | 29,400 LBS | 30,400 LBS | 29,400 LBS | 30,400 LBS | 29,400 LBS | 30,400 LBS |
| shipping | 24,400 LBS | 25,100 LBS | 24,400 LBS | 25,100 LBS | 24,400 LBS | 25,100 LBS |
| SHIPPING CUBE | 1,662 Ft$^3$ | 1,694Ft$^3$ | 1,758 Ft$^3$ | 1,790 Ft$^3$ | 1,758 Ft$^3$ | 1,790 Ft$^3$ |

1) Design pressure available up to 3000 psig. Consult factory for details.
2) Based on No. 2 fuel oil with a High Heat Value (HHV) of 140,600 BTU/Gal.
3) Efficiencies shown are nominal. Small variations may occur due to manufacturing tolerance. Please consult factory for guaranteed values.
4) Based on natural gas with a High Heat Value (HHV) of 1,000 BTU/Ft.$^3$)
5) Continuous running. For 575 V multiply by 0.8; for 380 V multiply by 1.1; for 230 V multiply by 2.0; for 208 V multiply by 2.2.
6) Pilot air for FMB gas pilot only. Typically 10 seconds per light off.
7) Atomizing air required for oil burner, modulating units only.






G-1031 10/07

# TECHNICAL SPECIFICATIONS

## CLAYTON STEAM GENERATORS:

* **SAVE FUEL**
  *The unique counter flow, controlled flow design provides higher fuel to steam efficiencies than traditional boilers.*

* **ARE SAFE FOR PERSONNEL & EQUIPMENT**
  *The Clayton units inherently eliminate the potential for hazardous steam explosions due to their smaller physical size and low water volume.*

* **PROVIDE RAPID RESPONSE**
  *With low water volume and physical size, Clayton units can respond very quickly to load changes*

* **PROVIDE FAST START-UP AND LOAD REPONSE**
  *The units will provide full output from a cold start within ten minutes, without thermal stress.*

* **ARE COMPACT AND LIGHTWEIGHT**
  *The Clayton design typically occupies one-third of the floor space and is 75% lighter than a conventional boiler.*

* **ENSURE HIGH QUALITY STEAM**
  *Provide greater than 99.5% quality steam.*

* **AFFORD FUEL VERSATILITY**
  *Natural gas, propane, light or heavy oil burners are available or in combination.*

* **HAVE ADVANCED CONTROLS**
  *Programmable Logic Controllers (PLC) are standard for accurate and reliable operation.*

* **ARE AVAILABLE WITH LOW NOx**
  *Industry leading Low NOx burners are available to meet strict environmental regulations.*

- ***ARE BACKED BY** Fast, Expert Factory-Direct service that is available 24 hours per day throughout the U.S., Canada, Mexico, Europe, Asia and service distributors worldwide.*

Clayton
INNOVATIVE STEAM SOLUTIONS

MODEL E504
STEAM GENERATOR
500 BHP

# CLAYTON STEAM GENERATOR

# SPECIFICATIONS

## MODEL E504

| | MODEL E504 Standard | MODEL SE504 with Super Economizer | MODEL EG504-FMB with Low NOx Burner | MODEL SEG504-FMB with Low NOx Burner and Super Economizer |
|---|---|---|---|---|
| BOILER HORSEPOWER | 500 | 500 | 500 | 500 |
| HEAT INPUT, BTU/hr Oil | 20,165,663 | 19,462,209 | NA | NA |
| Gas | 20,411,585 | 19,691,176 | 20,663,580 | 19,691,176 |
| NET HEAT OUTPUT, BTU/hr | 16,737,500 | 16,737,500 | 16,737,500 | 16,737,500 |
| EQUIVALENT OUTPUT (from and at 212°F feedwater and 0 PSIG steam) | 17,250 lbs/hr | 17,250 lbs/hr | 17,250 lbs/hr | 17,250 lbs/hr |
| DESIGN PRESSURE (see note 1) | 65 - 500 PSIG | 65 - 500 PSIG | 65 - 500 PSIG | 65 - 500 PSIG |
| STEAM OPERATING PRESSURE (determined by design pressure) | 60 - 450 PSIG | 60 - 450 PSIG | 60 - 450 PSIG | 60 - 450 PSIG |
| OIL CONSUMPTION at maximum steam output (see note 2) | 143.4 gph | 138.4 gph | N/A | N/A |
| GAS CONSUMPTION at maximum steam output (see note 3) | 20,412 cfh | 19,691 cfh | 20,664 cfh | 19,691 cfh |
| BURNER CONTROLS modulating | 5 to 1 Turndown | 5 to 1 Turndown | 4 to 1 Turndown | 4 to 1 Turndown |
| EFFICIENCY | | | | |
| oil-fired efficiency % | 83% | 86% | NA | NA |
| gas-fired efficiency % | 82% | 85% | 81% | 85% |
| ELECTRIC MOTORS, HP | Blower / Pump | Blower / Pump | Blower / Pump / Cooling | Blower / Pump / Cooling |
| design pressure 15-300 psig | 25 / 20 | 25 / 20 | 50 / 20 / 7.5 | 50 / 20 / 7.5 |
| design pressure 301-500 psig | 25 / 30 | 25 / 30 | 50 / 30 / 7.5 | 50 / 30 / 7.5 |
| ELECTRIC FLA, based on 460 V (see note 4) | | | | |
| design pressure 15-300 psig | 66 | 66 | 108 | 108 |
| design pressure 301-500 psig | 79 | 79 | 122 | 122 |
| GAS SUPPLY PRESSURE REQUIRED | 5 to 10 psig | 5 to 10 psig | 5 to 10 psig | 5 to 10 psig |
| ATOMIZING AIR REQUIRED (see note 5) | | | | |
| Capacity | 30 scfm | 30 scfm | NA | NA |
| Minimum pressure | 70 psig | 70 psig | NA | NA |
| AIR SUPPLY REQUIRED (FMB -see note 6) | N/A | N/A | 5 scfm @ 3 to 150 psig | 5 scfm @ 3 to 150 psig |
| WATER SUPPLY REQUIRED | 2,650 gph | 2,650 gph | 2,650 gph | 2,650 gph |
| HEATING SURFACE | 912 sq.ft. | 1,207 sq.ft. | 912 sq.ft. | 1,207 sq.ft. |
| EXHAUST STACK DIAMETER, o.d. | 31.75 in. | 31.75 in. | 31.75 in. | 31.75 in. |
| APPROXIMATE OVERALL DIMENSIONS | | | | |
| length | 133 in. | 133 in. | 156 in. | 156 in. |
| width | 131 in. | 131 in. | 142 in. | 142 in. |
| height | 131 in. | 157 in. | 135 in. | 161 in. |
| WEIGHT | | | | |
| installed - wet | 17,408 lbs | 20,400 lbs | 17,708 lbs | 20,700 lbs |
| shipping | 14,790 lbs | 17,190 lbs | 15,090 lbs | 17,490 lbs |
| FW pump skid | 2,000 lbs | 2,000 lbs | 2,000 lbs | 2,000 lbs |

1) Design pressures are available up to 3000 psig. Consult factory for details.
2) Based on No. 2 fuel oil with a High Heat Value (HHV) of 140,600 BTU/Gal.
3) Based on Natural Gas with a High Heat Value (HHV) of 1,000 BTU/Ft.$^3$
4) Continuous running. For 575 V multiply by 0.8; for 380 V multiply by 1.1; for 230 V multiply by 2.0; for 208 V multiply by 2.2.
5) Atomizing air required for oil burner.
6) Compressed air required for FMB.

The description and specifications shown were in effect at the time this publication was approved for printing. Clayton Industries, whose policy is one of continuous improvement, reserves the right to discontinue models, or change specifications or design, without notice.

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Clayton Thermal Products Ltd (UK)
Clayton Scandinavia A.S.
Clayton Nederland B.V.
Clayton de France S.A.R.L.
Clayton Sales & Service Canada

*World Leaders in Precision Steam Generators, Fluid Heaters, Heat Recovery Systems and Customer Service*

## EQUIPMENT SPECIFICATIONS

| | |
|---|---|
| Item No. 11: | **Auxiliary Natural Gas Burner** |
| Number Required: | One |
| Capacity: | 2 MBTU/hr **CORRECTION: 2 MMBTU/hr** |
| Supply: | Includes low fire start switch, connection bracket for control valve c/w valve and valve assembly. |
| Note: | For preheating only, not required during normal operation. |

**Tag Data - Indoor Gas Heating Products (Qty: 138)**

| Item | Tag(s) | Qty | Description | Model Number |
|---|---|---|---|---|
| A1 | DC-1-81-HEU-111 to 129;<br>DC-1-81-HEU-134 to 141;<br>DC-1-81-HEU-152 to 177;<br>DC-1-81-HEU-188 to 191;<br>DC-1-81-HEU-210 to 219<br>DC-1-81-HEU-226 to 239;<br>DC-1-81-HEU-242 to 248;<br>DC-1-81-HEU-280 to 286;<br>DC-1-81-HEU-305 to 308;<br>DC-1-81-HEU-425 to 439;<br>DC-1-81-HEU-501 to 506;<br>DC-1-81-HEU-562 to 579 | 138 | Indoor Gas Heating Products | GAND017AEG |

**Product Data - Indoor Gas Heating Products**

**Item: A1 Qty: 138 Tag(s): DC-1-81-HEU-1**

Separated combustion propeller fan gas unit heater
Natural gas
175 MBH input/140 MBH output
115/60/1 main power supply
Two stage gas control, intermittent pilot
#409 stainless steel heat exchanger
Totally enclosed motor – Trane Standard Design
Two stage room tstat TH522 (Fld)
409 stainless steel burners
409 stainless steel draft diverter
3/4" NPT high gas pressure regulator (Fld)
Horizontal concentric vent kit – **316 SS Construction** (Fld)
OSHA fan guard
4" Vent Cap (Fld) – **316 SS Construction**
Reducer 5" to 4" (Fld) – **316SS Construction**
Air flow prove switch (Fld)
**NEMA 4X Electrical Enclosure**

**Performance Data - Indoor Gas Heating Products**

| Tags | DC-1-81-HEU-1 |
|---|---|
| Elevation (m) | 220 |
| Blower fan airflow (L/s) | 1204 |
| Input (MBH) | 175 |
| Output (MBH) | 140 |

DONLIN CREEK
A BARRICK/NOVAGOLD COMPANY

amec

**TECHNICAL SPECIFICATION**

| **AIR HANDLING UNITS** | **166549-12-SP-002** |
|---|---|
| Donlin Creek Feasibility Study Update 2 | REV. B |
| Alaska, USA | Project No. 166549 |

## APPENDIX – VENDOR DATA SHEETS (TO BE FILLED IN BY THE VENDOR)

**EQUIPMENT DATA SHEET ITEM NO 1**

**AIR HANDLING UNITS**

**EQUIPMENT NUMBER: DC-1-81-HVA-104 TO 107, DC-1-81-HVA-109, 201, 126, 127, 111, 112,113; 202 TO 207; 220, 230.**

| **DESCRIPTION** | **UNITS** | **SPECIFIED** | **VENDOR** |
|---|---|---|---|
| Service | | Process Buildings, Mine Site Truck shop | ↔ Same |
| Quantity | | Nineteen (19) | 19 |
| Manufacture / Model | | By Vendor | Bousquet / HDG(H)-400 |
| Noise Level (Max) | dBA @ 1 m | ≤80 | ≤ 80 |
| **FAN SECTION** | | | |
| Air Flow Rate | m3 / hr (cfm) | **68,000 (40,000)** | 40000 CFM. |
| External Static Pressure | Pa (in. WG) | 250 (1") | 1" |
| Wheel Size / Blade Type | - | By Vendor | Twin 32" / BI/AF |
| Drive Type | - | Belt with guard per OSHA | Belt w/guard per OSHA. |
| Bearings Type / Life, L 10 Rating | hr | As Specified | As Specified |
| Motor Model / Enclosure | | By Vendor | / TEFC IEEE 841 |
| Motor HP | kW (HP) | 30 (40) | 30HP. |
| Fan & Motor Weight | kg (lbs) | By Vendor | TBA |
| **ELECTRICAL** | | | |
| Power Supply | V / Ph / Hz | 480 /3 /60 | 480/3/60 |
| Control Voltage | V / Ph / Hz | 120 / 1 / 60 or by Vendor | 120/1/60 |
| Electrical /Control Panel (NEMA 4) | | As Specified | NEMA 4. |
| **GAS BURNER & HEAT EXCHANGER** | | | |
| Gas Burner Type / Model | | By Vendor | HDG(I) -400 |
| Burner and HEX Material | | Stainless Steel | 304L SS. |
| Heating Output capacity | kW (MBH) | 1,100 (3,750) | 4,000 MBH. |
| Gas Supply Pressure | kPa (psi) | 35 - 70 (5 - 10) | 1/2 psig |

DONLIN CREEK
A BARRICK/NOVAGOLD COMPANY

amec

**TECHNICAL SPECIFICATION**

| AIR HANDLING UNITS | 166549-12-SP-002 |
|---|---|
| Donlin Creek Feasibility Study Update 2 | REV. B |
| Alaska, USA | Project No. 166549 |

**EQUIPMENT DATA SHEET ITEM NO 1**

**AIR HANDLING UNITS**

**EQUIPMENT NUMBER:** DC-1-81-HVA-104 TO 107, DC-1-81-HVA-109, 201, 126, 127, 111, 112,113; 202 TO 207; 220, 230.

| DESCRIPTION | UNITS | SPECIFIED | VENDOR |
|---|---|---|---|
| Burner Control | | By Vendor | Yes, as Specified |
| Burner Turndown Ratio | | Min. 1:8 | 25:1 |
| **FILTERS** | | | |
| Arrangement | - | MERV 7 pre-filter only | Merv 7. |
| Air Friction: Clean / Dirty (average) | Pa W.G. | 37.5 /250 | 73.9 / 250 |
| Face Velocity | m/s | By Vendor | 2.032 |
| **CONSTRUCTION** | | | |
| Casing | - | Galvanized steel: Wall min 18Ga.; floor min 14Ga. | G-90 16ga exterior Floor: 14ga checker plate |
| Insulation | - | 50 mm (2") thick, 24 kg/m3 (1.5 lb/ft3) fiberglass | 2"; 1.5 lb/ft3 reinforced fiberglass |
| Weight (Operating) | kg (lbs) | By Vendor | 16319 lbs |
| Dimensions (L x W x H) | mm | By Vendor | 306" X 150" X 84" |
| Access Doors | - | As Specified | As specified |
| Drain Pan | - | N /A | N/A. |
| Outside Air Motorized Damper | | Yes, by Vendor | Yes |
| *Mixing Section c /w Motorized Dampers (Three position) | | Yes, By Vendor | Yes |
| **CONTROLS** | | As specified | As specified. |
| | | | |
| | , | | |
| | | | |

## TECHNICAL SPECIFICATION

| | |
|---|---|
| **AIR HANDLING UNITS** | **166549-12-SP-002** |
| Donlin Creek Feasibility Study Update 2 | REV. B |
| Alaska, USA | Project No. 166549 |

| **EQUIPMENT DATA SHEET ITEM NO 2** | | | |
|---|---|---|---|
| **AIR HANDLING UNITS** | | | |
| **EQUIPMENT NUMBER: DC-1-81-HVA-108, 119, 233, 234, 257, DC-1-81-HVA-231, 253.** | | | |
| **DESCRIPTION** | **UNITS** | **SPECIFIED** | **VENDOR** |
| Service | | Pebble Crushing, Repair Shop, Truck Wash Bay, Tailing Pump House, WTP | <-> Same |
| Quantity | | **Seven (7)** | 7 |
| Manufacture / Model | | By Vendor | Bousquet / HDG(H)-200 |
| Noise Level (Max) | dBA @ 1 m | ≤80 | ≤ 80 |
| **FAN SECTION** | | | |
| Air Flow Rate | m3 / hr (cfm) | **34,000 (20,000)** | 20000 CFM |
| External Static Pressure | Pa (in. WG) | 250 (1") | 1" |
| Wheel Size / Blade Type | - | By Vendor | Twin 22" / BI / AF |
| Drive Type | - | Belt with guard per OSHA | Belt w/guard per OSHA |
| Bearings Type / Life, L 10 Rating | hr | As Specified | As specified. |
| Motor Model / Enclosure | | By Vendor | Baldor / TEFC IEEE841 |
| Motor HP | kW (HP) | 15 (20) | 15HP |
| Fan & Motor Weight | kg (lbs) | By Vendor | TBA |
| **ELECTRICAL** | | | |
| Power Supply | V / Ph / Hz | 480 /3 /60 | 480/3/60 |
| Control Voltage | V / Ph / Hz | 120 / 1 / 60 or by Vendor | 120/1/60 |
| Electrical /Control Panel | | NEMA 4 | nema 4 |
| **GAS BURNER & HEAT EXCHANGER** | | | |
| Gas Burner Type / Model | | By Vendor | HDG(C)-200 |
| Burner and HEX Material | | Stainless Steel | 304L SS |
| Heating Output capacity | kW (MBH) | 565 (1,930) | 2,000 MBH |
| Gas Supply Pressure | kPa (psi) | 35 - 70 (5 - 10) | 1/2 psig |
| Burner Control | | By Vendor | Yes, as specified |

**TECHNICAL SPECIFICATION**

| AIR HANDLING UNITS | 166549-12-SP-002 |
|---|---|
| Donlin Creek Feasibility Study Update 2 | REV. B |
| Alaska, USA | Project No. 166549 |

**EQUIPMENT DATA SHEET ITEM NO 2**

**AIR HANDLING UNITS**

**EQUIPMENT NUMBER: DC-1-81-HVA-108, 119, 233, 234, 257, DC-1-81-HVA-231, 253.**

| DESCRIPTION | UNITS | SPECIFIED | VENDOR |
|---|---|---|---|
| Burner Turndown Ratio | | Min. 1:8 | 25:1 |
| **FILTERS** | | | |
| Arrangement | - | MERV 7 pre-filter only | Merv 7. |
| Air Friction: Clean / Dirty (average) | Pa W.G. | 37.5 /250 | 73.7 / 250 |
| Face Velocity | m/s | By Vendor | 2.032 |
| **CONSTRUCTION** | | | |
| Casing | - | Galvanized steel: Wall min 18Ga.; floor min 14Ga. | G-90 16ga exterior floor: 14ga checker plate |
| Insulation | - | 50 mm (2") thick, 24 kg/m3 (1.5 lb/ft3) fiberglass | 2"; 1.5 lb/ft3 reinforced fiberglass |
| Weight (Operating) | kg (lbs) | By Vendor | 9411 lbs |
| Dimensions (L x W x H) | mm | By Vendor | 182" x 108" x 76" |
| Access Doors | - | As Specified | As specified |
| Drain Pan | - | N /A | N/A |
| Outside Air Motorized Damper | | Yes, by Vendor | Yes |
| *Mixing Section c /w Motorized Dampers (Three position) | | Yes, by Vendor | Yes |
| **CONTROLS** | | As specified | As specified |
| | | | |
| | | | |
| | | | |

Note:

1. Outdoor air damper opens 50% during winter operation, when outdoor air temperature is less than 10 deg C (adjustable).
2. Outdoor air temperature sensor to be installed at air handling air intake.

   Outdoor air damper opens 100% during summer operation, when outdoor air temperature is above 10 deg C (Adjustable).

PURE HEAT

Hydronic Air Heater

# Pureheat

## Bringing clean, dry heat to the job site

» The Pureheat hydronic air heater provides temporary heat for large buildings, removes excess moisture from the workspace, and saves up to 50% of the fuel over traditional methods. With accessories, such as hose handling systems, this portable unit can also be used to cure concrete, thaw frozen ground and prevent frost. The Pureheat offers simple operation. «


## ADDITIONAL ADVANTAGES:

- **The Pureheat has no open flame** for added safety in the work space and dependable with no flame blowout in high wind conditions.
- **Unit features 83% heater efficiency** with 860,000 BTU/hr input.
- **Flexible fuel choice.** Burners available in three options: diesel, natural gas or propane.
- **The on-board hose connection manifolds are conveniently located** for easy access on the trailer. Connect and disconnect hoses with ease using Pureheat's simple, heavy-duty quick-connect fittings.
- **Powerful liquid-to-air heat exchangers** bring clean, dry heat to your workspace. Three models are available: HX50 (50,000 BTU/hr), HX100 (100,000 BTU/hr), and HX200 (200,000 BTU/hr).
- **Store and transport all system hoses inside the trailer** on the heavy-duty self-contained hose reel with electric rewind, clutch and brake.

| Technical Data | | | Pureheat |
|---|---|---|---|
| Dimensions (L x W x H) | in (mm) | | 172 x 93 x 93 (4400 x 2400 x 2400) |
| Ground Clearance | in (mm) | | 9 (229) |
| Weight w/o fuel tank | lbs (kg) | | 7155 (3245) |
| Weight w/o fuel* | lbs (kg) | | 8185 (3713) |
| Weight with fuel* | lbs (kg) | | 11,230 (5094) |
| Optional diesel fuel capacities | gal (l) | | 175 or 435 (662 or 1647) |
| Heat transfer fluid | gal (l) | | 145 (549) |
| Pump | hp (kW) | | 1.5 (1.1) centrifugal |
| Hose | ft (m) | | 1000 (300) total = 4 x 50 (15) + 8 x 100 (30) |
| Hose reel | | | 1 |
| Hose rewind | | | 120V AC, with DC clutch |
| Circulation loops | | | up to 20 |
| Tires | | | LT235/85R16 |
| Hitch | | | pintle |
| Loading Ramp | | | 1 |
| Lifting bar | | | standard |
| HX-Series Heat Xchangers (choose one set)<br>or<br>or | HX50 (50,000 BTU/hr, 710 cfm)<br>HX100 (100,000 BTU/hr, 1315 cfm)<br>HX200 (200,000 BTU/hr, 2400 cfm) | | qty 16<br>qty 8<br>qty 4 |
| **Performance** | | | |
| Fuel options | | | diesel, natural gas or propane |
| Fuel, input | BTU (kW) / hr | | 860,000 (252) |
| Fuel, output | BTU (kW) / hr | | 714,000 (209) |
| Run time (at full load) | hr | | up to 71 |
| Heater efficiency | % | | 83 |
| Temperature controller | | | digital |
| Fuel consumption at full load: | Propane<br>Natural Gas<br>Diesel | gph (l/hr)<br>cfh (l/min)<br>gph (l/hr) | 9.4 (35.6)<br>860 (406)<br>6.1 (23.2) |
| Electrical requirement | | | 1 - 15amp, 1 - 20amp x 120v AC |
| Normal operating temperature | F (C) | | 100° - 180° (37.8° - 82.2°) |
| HTF flow rate | gph (l/hr) | | 2700 (10,221) |

*with optional 435-gallon fuel tank

## Standard Package

Hydronic Air Heater Pureheat — Includes base unit, hoses, burner, ramp, manifold, brackets and operator's manual.

**Please refer to our Price List and Ordering Guide for complete accessory information.**

Specifications may change due to continuous product development. Users are advised to consult Wacker Neuson's Operator's Manual and website for specific information regarding the engine power rating. Actual power output may vary due to conditions of specific use.

0985937/Apr-2009/Layout Goes Studio/Printing Marek Group

**FLSmidth Salt Lake City, Inc.**
7158 S. FLSmidth Drive · Midvale, Utah 84047-5559 · USA
Tel +1 801 871 7000 · Fax +1 801 871 7001
www.flsmidth.com

## DATA SHEETS

## FOR

## FULLER-TRAYLOR® 1600 x 2300 (63" x 91") TYPE "TSU" TOP SERVICE ULTRA DUTY PRIMARY GYRATORY CRUSHERS WITH BELL HEAD FITTINGS, SPIRAL BEVEL GEARING, OPEN BOTTOM DISCHARGE AND HYDRAULIC SUPPORT

---

| | |
|---|---|
| Crusher Size | 1600 x 2300 (63" x 91") |
| Feed Opening - Radial Width | 63" (1600 mm) |
| Crusher Setting - Open Setting | |
| Minimum | 7" (178 mm) |
| Maximum | 10" (254 mm) |
| Shaft Adjustment | 2" (51 mm) Minimum Relief |
| | 12" (305 mm) Total Travel |
| Main Shaft Dimensions: | |
| Under Head | 41" (1040 mm) Diameter |
| In Spider | 24" (600 mm) Diameter |
| In Eccentric | 34" (860 mm) Diameter |
| Mantle Dimensions: | |
| Top | 38" (975 mm) Diameter |
| Bottom | 91" (2300 mm) Diameter |
| Concaves: | |
| Material | Cast Manganese Steel |
| Number of Rows | Three (3) |
| Backing Material | Epoxy |
| Outer Eccentric Bearing | 44.5" (1130 mm) Diameter |
| Inner Eccentric Bearing | 34" (860 mm) Diameter |

Bevel Gear – Forged Alloy Steel - Cut Teeth

**FLSmidth Salt Lake City, Inc.**
7158 S. FLSmidth Drive · Midvale, Utah 84047-5559 · USA
Tel +1 801 871 7000 · Fax +1 801 871 7001
www.flsmidth.com

| | |
|---|---|
| Bevel Pinion - Forged Alloy Steel - Cut Teeth | |
| Countershaft Diameter | |
| Nominal | 11" (283 mm) |
| In Anti-Friction Bearings | 10" (246 mm) |
| Bearing L10 Service Life | 100,000 Hours |
| Eccentric Throw | 1-3/4" (45.0 mm) or 1-1/2" (38.1 mm) |
| Countershaft Speed | 590 RPM Nominal |
| Shaft Gyrations | 132 Per Minute |
| Countershaft Extension (Option) | 7" (178 mm) Diameter x Approximately 67" (1700 mm) Long |
| Crusher Coupling (Option) | Polymeric Flexible Type |
| Countershaft Extension Coupling (Option) | Polymeric Flexible Type with Controlled Torque Type |
| Crusher Drive Motor (Option) | 1000 HP (750 kW), 600 RPM Direct |
| Lubrication Pump | 100 GPM (378 L/Min), Standby Standard |
| Lubrication Pump Motor | 30 HP (22 kW), Standby Standard |
| Lubrication System Sump Tank Capacity | 900 Gallons (3400 Liters) |
| Lubrication System Cooling Water Required | N/A – Air Cooled System |
| Lubrication Cooling Pump (Option) | N/A – Air Cooled System |
| Lubrication Cooling Pump Motor (Option) | N/A – Air Cooled System |
| Hydraulic System Pump | 4.75 GPM (18 L/Min) |
| Hydraulic System Pump Motor | 7.5 HP (5.6 kW) |
| Hydraulic System Sump Tank Capacity | 150 Gallons (567 Liters) |
| Spider Lubrication Pump Motor (Option) | 0.75 HP Integral Motor |

ENERGY TECHNOLOGY PRODUCTS
A division of Industrial Pollution Control, Inc
• 9295 198 Street, Unit 107 • Langley, British Columbia • V1M 3J9 • T: 604 882 8886

**QUOTATION #M-071307-02-REV3**

9-Mar-11

Amec Americas
Suite 400, 111 Dunsmuir Street
Vancouver, BC V6B 5W3

Attention: Rob Kerr
Reference: Donlin Creek Gold Project Feasibility Study
Project #: 155096-12-SP-004, DUST COLLECTORS

Dear Sir,

Thank you for the opportunity to refresh this budget quote. Following is our revised proposal with up-to-date pricing held firm through June 2011.

Please take note of the following soft product release, with official product launch to follow at end of May, 2011:

**NEW PRODUCT ANNOUNCEMENT SOFT LAUNCH: PowerCore® VH Series dust collector from Donaldson® Torit®**

Please see the VH Series product bulletin on the end of this proposal. Although pricing is not yet available, we will be in position to offer pricing on this product in June 2011. We anticipate this product will be able to offer savings in the range of 15-20%, significant space savings, and no compromise in performance. Following is a comparison chart of the tag numbers, models quoted, and comparable VH Series unit we would offer as alternate:

| TAG | UNIT SIZE QUOTED | VH SERIES EQUIVALENT |
|---|---|---|
| | | |
| DC-1-81-DCL-100 | DFT 4-96 | VH 3-18 |
| DC-1-14-DCL-200, 300, 400, 500 | DFT 3-24 | VH 1-4 |
| DC-1-16-DCL-600 | DFT 3-54 | VH 2-12 |

Please feel free to contact us at our office with any questions.

Mike Meade
General Manager
mike@etpbc.ca

**EQUIPMENT #DC-1-81-DCL-100**

**Donaldson Torit®** offers its Downflo® II series dust collector, **Model DFT 4-96,** as described below:

**Model**: DFT 4-96

**Quantity:** 1

**Filter Area:** 24,384 ft² **Air-to-Media Ratio**: 1.03 : 1

**Filter Cartridge Material**: Endura Tek 80/20 blend

**Filter Quantity:** 96

**Design Condition**: 25,015 ACFM

**Application**: Crusher dust control

**HOUSING**

Bolted and welded ledgeless housing construction is 3/16", 10, and 12 gauge steel and is rated for + 15 /-20" wg, and designed in compliance with IBC2003 International Building Codes.

**FINISH**

Exterior surfaces are painted with a blue acrylic urethane finish over an alkyd enamel primer. Coating passes a 350-hour salt spray corrosion performance test. Interior surfaces are primed with blue.

**DISCHARGE HOPPER**

**Standard** ledgeless discharge hopper is fabricated of 12-gauge steel. Collector has one hopper per module, 6 total. Top and bottom flange is square with a 10" discharge opening. The design features no internal ledges.

**SCREW CONVEYOR & "AN" ROTARY AIRLOCK WITH COMMON DRIVE**

20'-10 3/16" screw conveyor fixed to hopper discharge points. Class B, 9-inch flared trough screw conveyor construction includes 3/16-inch half pitch screw, 10 gauge troughs and 14 gauge covers, hardened coupling shafts, hard iron hanger bearings, Grade 2 coupling bolts, and a common drive with guard for the screw and rotary airlock. Conveyor discharge is modified to a flush discharge to accommodate the Torit "AN" rotary airlock.

General specifications for screw conveyor:

- All units to be shop assembled, test run, quality control approved and crated for shipment.
- All interior surfaces to be hand cleaned and primed. All exterior surfaces to be acid etched, primed, and painted one coat of Torit blue enamel.
- Components:
    - 3 HP TEFC motor and drive
    - 9H412R-HP helicoid screws
    - Grade 2 coupling bolts with locknuts
    - 2" common drive shaft for airlock
    - 2" hardened coupling shafts

- 9" x 2" style #226 hangers with hard iron bearings (required on all conveyors longer than 10'-0")
- (1) 9" x 2" flush end trough end with (1) 2" waste pack seal with lip seal or felt seal
- (1) 2" flanged ball bearing (all mounted at discharge end)
- (1) 9" x 2" trough end with foot, punched for screw conveyor drive (mounted at intake end)
- 9" x 10ga form top U-troughs with top flange punched for trough hopper collector and with
- (1) flush end discharge
- Silicone flange gaskets
- 1/8"TK neoprene blend top flange gasket
- 9" x 14ga flanged and bolted covers (where required)
- 9" trough support feet at trough joints
- Pricing includes a common drive (20 RPM drive) for a screw conveyor and rotary airlock. Combination drive includes the chain, sprockets, guards, and larger screw conveyor drive as specified above.

**ROTARY AIRLOCK DISCHARGE VALVE**

Single rotary valve discharge vale supplied at end of screw conveyor

- **HOUSING**- Valve body and rotor are constructed of mild steel rated at +/- 17"wg and painted with an exterior color of blue. AN valve body, end plate, and rotor are fabricated (not machined). A **12" square** inlet and outlet are provided.
- **ROTOR**- Rotor includes six blades. Each is equipped with flexible **neoprene** wipers.
- **DISCHARGE CAPACITY**- 2.46 $ft^3$ / rev., sized at 20 RPM.

**SUPPORT LEG STRUCTURE**

Support leg structures for collectors with standard hoppers provide 48" clearance below the hopper discharge flange and are designed for seismic zone 4, 100-mph wind load, and 30 lbs. per square foot roof load.

**DUST LADEN AIR INLET**

A high inlet creates a general downward airflow pattern in the filter section to optimize filter performance. Top and front inlet locations are standard on each module. Each filter column is protected from direct dust impingement by an internal baffle plate.

**FILTERS PER SPECIFICATION**

Donaldson Endura-Tek™ Cartridge. Composition of Media:

- Proprietary blend of cellulose and synthetic fibers.
- Fractional Efficiency: 99.99% on 0.5 µm dust particles.
- Standard Construction
  - Galvanized expanded metal liners with 72% open area.
  - Galvanized steel end caps.
- Structural Integrity
  - Donaldson's Pleatloc™ design maintains uniform pleat spacing throughout filter life.
  - Adhesive spiral beading inside the filter secures pleats and reduces pleat tip abrasion.

- Top Gasket
    - Molded one-piece urethane gaskets provide a positive, airtight seal.
- Operating Temperature
    - 150°F / 65°C maximum.
- Special media treatment allows filters to maintain low airflow restriction in humid operating conditions, resulting in reduced energy requirements and lower operating costs.
- Each filter contains 254 ft² media area.

**FILTER ACCESS**

Filter cartridges are accessed from outside the collector through round access ports on the front of the unit. Each port provides access to two filter cartridges. No tools are required for filter removal/installation.

**FILTER CLEANING**

Periodic pulses of compressed air, using sequential opening/closing of provided solenoid and diaphragm valves, automatically clean cartridges. Pulsed air backflushes in the opposite direction of normal airflow. The proprietary ExtraLife™ cleaning system delivers maximum cleaning energy and provides uniform pulse pressure for superior cleaning effectiveness. Solenoid enclosures are NEMA 4 and factory mounted.

**CLEANING CONTROLS**

A solid-state timer enclosure enclosed in integrated control panel (shown below) controls the pulse timing. Standard Dwyer Photohelic® gauge is provided and controls the filter cleaning by measuring and controlling between high- and low-pressure set points. A plastic enclosure protects electronic components, electrical connections, and a glass-epoxy printed circuit board. Phototransistor signal actuates relay, which activates the filter cleaning cycle. CE, UL, SA rated.

**INTERGRATED CONTROL PANEL**

Control panels include: IEC through-the-door disconnect switch, manual motor protector with magnetic contactor, control power transformer with 100 VA extra capacity, pulse control using the pulse timer with Photohelic, one set of start-stop push buttons for all motors (fan, airlocks, screw conveyor, etc.) and one pilot light per motor in the panel door, all fuses and terminal blocks as required, all components prewired and mounted in a Type 12 electrical enclosure with ASA-61 gray enamel finish exterior, and white sub panel. Includes UL label.

**REQUIRED SERVICES**

The collector requires 20 scfm of maximum 90-100 psig, clean, dry compressed air based on a 10 second pulse interval. Timer requires 110 VAC.

**REMOTE FAN**

New York Blower Backward Inclined SWSI, Size 36, PLR Wheel, Class 3, Arrangement 1, Discharge UB, Motor Position W
Operating/Design Capacity- 25,015 CFM, 10.0"w.g. Fan SP at 1495 RPM, 54.1 BHP; at 70°F and mean sea level, 0.075 lbs/cubic foot

Motor (Provided and mounted by NYB)
Integral, High Efficiency, 60 HP, 1800 RPM, TE, 364T, 3-60-460V

Accessories/Modifications

- Constant V-Belt Drive
- Cleanout Door: Quick Opening
- Drain
- Drain Plug
- Flanged Inlet
- Flanged Outlet
- Belt Guard Position W,Z
- Shaft and Bearing Guard
- Paint all surfaces Torit blue

**UNIT PRICE (EXW: Baldwin, Wisconsin & LaPorte, IN): $137,120.00 USD**

Motor & drive breakout prices:

- Fan motor & drive: $6,027.75 USD
- Rotary Valve motor & drive assembly: $1,665.00 USD
- Screw Conveyor motor & drive assembly: $1,800.00 USD

**EQUIPMENT # DC-1-14-DCL-200, 300, 400, & 500**

**Donaldson Torit®** offers its Downflo® II series dust collector, **Model DFT 3-24,** as described below:

**Model**: DFT 3-24

**Quantity:** 4

**Filter Area:** 6,096 ft² **Air-to-Media Ratio**: .917 : 1

**Filter Cartridge Material**: Endura Tek 80/20 blend

**Filter Quantity:** 24

**Design Condition**: 5,592 ACFM

**Application**: Reclaim feed dust control

**HOUSING**

Bolted and welded ledgeless housing construction is 3/16", 10, and 12 gauge steel and is rated for + 15 /-20" wg, and designed in compliance with IBC2003 International Building Codes.

**FINISH**

Exterior surfaces are painted with a blue acrylic urethane finish over an alkyd enamel primer. Coating passes a 350-hour salt spray corrosion performance test. Interior surfaces are primed with blue.

**DISCHARGE HOPPER**

**Standard** ledgeless discharge hopper is fabricated of 12-gauge steel. Collector has one common hopper for two (2) modules. Top and bottom flange is square with a 10" discharge opening. The design features no internal ledges.

**SINGLE ROTARY AIRLOCK DISCHARGE VALVE**

Single rotary valve discharge vale supplied

- **HOUSING**- Valve body and rotor are constructed of mild steel rated at +/- 17"wg and painted with an exterior color of blue. AN valve body, end plate, and rotor are fabricated (not machined). A **10" square** inlet and outlet are provided.
- **ROTOR**- Rotor includes six blades. Each is equipped with flexible **neoprene** wipers.
- **DISCHARGE CAPACITY**- 1.34 ft³ / rev., sized at 22 RPM.

**SUPPORT LEG STRUCTURE**

Support leg structures for collectors with standard hoppers provide 48" clearance below the hopper discharge flange and are designed for seismic zone 4, 100-mph wind load, and 30 lbs. per square foot roof load.

**DUST LADEN AIR INLET**

A high inlet creates a general downward airflow pattern in the filter section to optimize filter performance. Top and front inlet locations are standard on each module. Each filter column is protected from direct dust impingement by an internal baffle plate.

**FILTERS PER SPECIFICATION**

Donaldson Endura-Tek™ Cartridge. Composition of Media:

- Proprietary blend of cellulose and synthetic fibers.
- Fractional Efficiency: 99.99% on 0.5 µm dust particles.
- Standard Construction
  - Galvanized expanded metal liners with 72% open area.
  - Galvanized steel end caps.
- Structural Integrity
  - Donaldson's Pleatloc™ design maintains uniform pleat spacing throughout filter life.
  - Adhesive spiral beading inside the filter secures pleats and reduces pleat tip abrasion.
- Top Gasket
  - Molded one-piece urethane gaskets provide a positive, airtight seal.
- Operating Temperature
  - 150°F / 65°C maximum.
- Special media treatment allows filters to maintain low airflow restriction in humid operating conditions, resulting in reduced energy requirements and lower operating costs.
- Each filter contains 254 $ft^2$ media area.

**FILTER ACCESS**

Filter cartridges are accessed from outside the collector through round access ports on the front of the unit. Each port provides access to two filter cartridges. No tools are required for filter removal/installation.

**FILTER CLEANING**

Periodic pulses of compressed air, using sequential opening/closing of provided solenoid and diaphragm valves, automatically clean cartridges. Pulsed air backflushes in the opposite direction of normal airflow. The proprietary ExtraLife™ cleaning system delivers maximum cleaning energy and provides uniform pulse pressure for superior cleaning effectiveness. Solenoid enclosures are NEMA 4 and factory mounted.

**CLEANING CONTROLS**

A solid-state timer enclosure enclosed in integrated control panel (shown below) controls the pulse timing. Standard Dwyer Photohelic® gauge is provided and controls the filter cleaning by measuring and controlling between high- and low-pressure set points. A plastic enclosure protects electronic components, electrical connections, and a glass-epoxy printed circuit board. Phototransistor signal actuates relay, which activates the filter cleaning cycle. CE, UL, SA rated.

**INTERGRATED CONTROL PANEL**

Control panels include: IEC through-the-door disconnect switch, manual motor protector with magnetic contactor, control power transformer with 100 VA extra capacity, pulse control using the pulse timer with Photohelic, one set of start-stop push buttons for all motors (fan, airlocks, screw conveyor, etc.) and one pilot light per motor in the panel door, all fuses and terminal blocks as required, all components prewired and mounted in a Type 12 electrical enclosure with ASA-61 gray enamel finish exterior, and white sub panel. Includes UL label.

**REQUIRED SERVICES**

The collector requires 20 scfm of maximum 90-100 psig, clean, dry compressed air based on a 10 second pulse interval. Timer requires 110 VAC.

**REMOTE FAN**

New York Blower Backward Inclined SWSI, Size 18, PLR Wheel, Class 3, Arrangement 9, Discharge UB, Motor Position L
Operating/Design Capacity- 5,592 CFM, 10.0"w.g. Fan SP at 2912 RPM, 12. BHP; at 70°F and mean sea level, 0.075 lbs/cubic foot

Motor (Provided and mounted by NYB)
Integral, High Efficiency, 15 HP, 1800 RPM, TE, 254T, 3-60-460V

Accessories/Modifications

- Constant V-Belt Drive
- Cleanout Door: Quick Opening
- Drain
- Drain Plug
- Flanged Inlet
- Flanged Outlet
- Belt Guard Position W,Z
- Shaft and Bearing Guard
- Paint all surfaces Torit blue

UNIT PRICE (EXW: Baldwin, Wisconsin & LaPorte, IN): $44,803.00 USD
**FOUR (4) UNITS (EXW: Baldwin, Wisconsin & LaPorte, IN): $179,212.00 USD**

Motor & drive breakout prices:

- Fan motor & drive: $1,536.30 USD each
- Rotary Valve motor & drive assembly: $1,385 USD each

**EQUIPMENT #DC-1-16-DCL-600**

**Donaldson Torit®** offers its Downflo® II series dust collector, **Model DFT 3-54,** as described below:

**Model**: DFT 3-54

**Quantity:** 1

**Filter Area:** 13,716 ft² **Air-to-Media Ratio**: 1.09 : 1

**Filter Cartridge Material**: Endura Tek 80/20 blend

**Filter Quantity:** 54

**Design Condition**: 15,009 ACFM **CORRECTION: 15,009 ACFM per crusher; 30,017 ACFM for both crushers**

**Application**: Pebble crusher dust control

**HOUSING**

Bolted and welded ledgeless housing construction is 3/16", 10, and 12 gauge steel and is rated for + 15 /-20" wg, and designed in compliance with IBC2003 International Building Codes.

**FINISH**

Exterior surfaces are painted with a blue acrylic urethane finish over an alkyd enamel primer. Coating passes a 350-hour salt spray corrosion performance test. Interior surfaces are primed with blue.

**DISCHARGE HOPPER**

**Standard** ledgeless discharge hopper is fabricated of 12-gauge steel. Collector has three (3) hoppers for three (3) modules. Top and bottom flange is square with a 10" discharge opening. The design features no internal ledges.

**ROTARY AIRLOCK DISCHARGE VALVES**

Three (3) rotary valve discharge vales supplied (one per hopper)

- **HOUSING**- Valve body and rotor are constructed of mild steel rated at +/- 17"wg and painted with an exterior color of blue. AN valve body, end plate, and rotor are fabricated (not machined). A **10" square** inlet and outlet are provided.
- **ROTOR**- Rotor includes six blades. Each is equipped with flexible **neoprene** wipers.
- **DISCHARGE CAPACITY**- 1.34 ft³ / rev., sized at 22 RPM.

**SUPPORT LEG STRUCTURE**

Support leg structures for collectors with standard hoppers provide 48" clearance below the hopper discharge flange and are designed for seismic zone 4, 100-mph wind load, and 30 lbs. per square foot roof load.

**DUST LADEN AIR INLET**

A high inlet creates a general downward airflow pattern in the filter section to optimize filter performance. Top and front inlet locations are standard on each module. Each filter column is protected from direct dust impingement by an internal baffle plate.

**FILTERS PER SPECIFICATION**

Donaldson Endura-Tek™ Cartridge. Composition of Media:

- Proprietary blend of cellulose and synthetic fibers.
- Fractional Efficiency: 99.99% on 0.5 μm dust particles.
- Standard Construction
  - Galvanized expanded metal liners with 72% open area.
  - Galvanized steel end caps.
- Structural Integrity
  - Donaldson's Pleatloc™ design maintains uniform pleat spacing throughout filter life.
  - Adhesive spiral beading inside the filter secures pleats and reduces pleat tip abrasion.
- Top Gasket
  - Molded one-piece urethane gaskets provide a positive, airtight seal.
- Operating Temperature
  - 150°F / 65°C maximum.
- Special media treatment allows filters to maintain low airflow restriction in humid operating conditions, resulting in reduced energy requirements and lower operating costs.
- Each filter contains 254 $ft^2$ media area.

**FILTER ACCESS**

Filter cartridges are accessed from outside the collector through round access ports on the front of the unit. Each port provides access to two filter cartridges. No tools are required for filter removal/installation.

**FILTER CLEANING**

Periodic pulses of compressed air, using sequential opening/closing of provided solenoid and diaphragm valves, automatically clean cartridges. Pulsed air backflushes in the opposite direction of normal airflow. The proprietary ExtraLife™ cleaning system delivers maximum cleaning energy and provides uniform pulse pressure for superior cleaning effectiveness. Solenoid enclosures are NEMA 4 and factory mounted.

**CLEANING CONTROLS**

A solid-state timer enclosure enclosed in integrated control panel (shown below) controls the pulse timing. Standard Dwyer Photohelic® gauge is provided and controls the filter cleaning by measuring and controlling between high- and low-pressure set points. A plastic enclosure protects electronic components, electrical connections, and a glass-epoxy printed circuit board. Phototransistor signal actuates relay, which activates the filter cleaning cycle. CE, UL, SA rated.

**INTERGRATED CONTROL PANEL**

Control panels include: IEC through-the-door disconnect switch, manual motor protector with magnetic contactor, control power transformer with 100 VA extra capacity, pulse control using the pulse timer with Photohelic, one set of start-stop push buttons for all motors (fan, airlocks, screw conveyor, etc.) and one pilot light per motor in the panel door, all fuses and terminal blocks as required, all components prewired and mounted in a Type 12 electrical enclosure with ASA-61 gray enamel finish exterior, and white sub panel. Includes UL label.

**REQUIRED SERVICES**

The collector requires 20 scfm of maximum 90-100 psig, clean, dry compressed air based on a 10 second pulse interval. Timer requires 110 VAC.

**REMOTE FAN**

New York Blower Backward Inclined SWSI, Size 24, PLR Wheel, Class 3, Arrangement 1, Discharge UB, Motor Position W
Operating/Design Capacity- 15,009 CFM, 10.0"w.g. Fan SP at 2522 RPM, 34.4 BHP; at 70°F and mean sea level, 0.075 lbs/cubic foot

Motor (Provided and mounted by NYB)
Integral, High Efficiency, 40 HP, 1800 RPM, TE, 324T, 3-60-575V

Accessories/Modifications

- Constant V-Belt Drive
- Cleanout Door: Quick Opening
- Drain
- Drain Plug
- Flanged Inlet
- Flanged Outlet
- Belt Guard Position W,Z
- Shaft and Bearing Guard
- Paint all surfaces Torit blue

**UNIT PRICE (EXW: Baldwin, Wisconsin & LaPorte, IN): $90,545.00 USD**

Motor & drive breakout prices:

- Fan motor & drive: $3,464.10 USD
- Rotary Valve motor & drive assembly (3 required on this collector): $1,385 USD each, $4,155.00 USD TOTAL

**LOT NET PRICE EQUIPMENT SUPPLY, EXW: BALDWIN, WI: $406,874.00 USD**

**TERMS:** to be negotiated
**LEAD-TIME:** typically 10-12 weeks to build an order of this size, after approval of drawings
**EXW PLANT:** Baldwin, WI- USA
**FREIGHT REQUIREMENTS:** Collectors shipped knocked down, with hoppers / legs skidded separately from main cabinet
**QUOTE VALIDITY:** Through to end of June 2011

**FREIGHT ESTIMATE TO PORT OF VANCOUVER, BC OR TACOMA, WA:** ~$25,000.00 USD
Freight Cost –International Shipment DDP (Incoterms 2000) Vancouver, BC or Tacoma, WA based on four (4) flatdeck truckloads full, based on current rates

**EXPORT CRATING:** ~$7,500.00 to provide complete skeleton style export crating.

## ADDITIONAL COMMERCIAL INFORMATION REQUESTED

Commercial information is to be provided in the format set out in the tables below.

- CONFIRMED: Budgetary price for all engineering, materials, fabrication, testing and recommended spare parts for the equipment +/- 15%. The preferred currency is US dollars.

- CONFIRMED: Budget price(s) forecast to and valid through to end of June 2011.

- Bidder shall supply a history of price fluctuations for this equipment.
    - Average of *approximately* 4% / year price increase, plus upcoming increase for rising steel costs factored in.

- If applicable, any motors and drives normally supplied with this equipment should also be priced and shown as separate items.
    - See break-out costs in proposal section.
    - See estimates on bid form. This is a fairly detailed process that will take some time to work out in order to be more presise, and final manufacturing / skidding factors into this. Estimate: approx five (5) 40' containers will be required. Block & bracing charges ~$5,000.00. We recommend this in lieu of Export Crating.

- Point of manufacture to be defined for main equipment components.
    - Dust collectors & rotary valves: Baldwin, WI
    - Fans: LaPorte, IN

- Shipping weights and dimensions are required on main equipment components, including descriptions of largest items.
    - See bid form.

- Delivery time for equipment.
    - 10-12 weeks to build an order of this size, after approval of drawings and release for manufacture.

Thank you for the opportunity to quote your dust control equipment needs. Please contact this office with any questions.

Michael Meade
Energy Technology Products
A division of Industrial Pollution Control, Inc.
Phone: 604-291-6851
Fax: 604-291-6855
E-mail: mike@etpbc.ca

Authorized Representative: Donaldson Company IAF- Torit® Products

# Limited Warranty

Donaldson warrants to the original purchaser that the major structural components of the goods will be free from defects in materials and workmanship for ten (10) years from the date of shipment, if properly installed, maintained and operated under normal conditions. Donaldson warrants all other Donaldson-built components and accessories including Donaldson Airlocks, TBI Fans, TRB Fans, Fume Collector products, and Donaldson-built Afterfilter housings for twelve (12) months from date of shipment. Donaldson warrants Donaldson-built filter elements to be free from defects in materials and workmanship for eighteen (18) months from date of shipment. Donaldson does not warrant against damages due to corrosion, abrasion, normal wear and tear, product modification or product misapplication. Donaldson also makes no warranty whatsoever as to any goods manufactured or supplied by others including electric motors, fans and control components. After Donaldson has been given adequate opportunity to remedy any defects in material or workmanship, Donaldson retains the sole option to accept return of the goods, with freight paid by the purchaser, and to refund the purchase price for the goods after confirming the goods are returned undamaged and in usable condition. Such a refund will be the full extent of Donaldson's liability. Donaldson shall not be liable for any other costs, expenses or damages whether direct, indirect, special, incidental, consequential or otherwise. The terms of this warranty may be modified only by a special warranty document signed by a Director, General Manager or Vice President of Donaldson. Failure to use genuine Donaldson replacement parts may void this warranty. **THERE EXIST NO OTHER REPRESENTATIONS, WARRANTIES OR GUARANTEES EXCEPT AS STATED IN THIS PARAGRAPH AND ALL OTHER WARRANTIES INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHETHER EXPRESS OR IMPLIED ARE HEREBY EXPRESSLY EXCLUDED AND DISCLAIMED.**

James R. Giertz
Senior Vice President
Commercial & Industrial Group

Donaldson
Filtration Solutions

Donaldson Company, Inc.
Industrial Air Filtration
P.O. Box 1299
Minneapolis, MN
55440-1299 U.S.A

Tel 800-365-1331
dustmktg@mail.donaldson.com
www.donaldsontorit.com

MWG
Rev. 4-1-04

TECHNICAL SPECIFICATION

| LIME HANDLING AND STORAGE SYSTEM | 166549-16-SP-042A |
|---|---|
| Donlin Creek Feasibility Study Update 2 | REV. B |
| Alaska, USA | Project No. 166549 |

## 4.0 BIDDER DATA SHEETS

| **Equipment Number** | | **DC-1-15-DMP-500** |
|---|---|---|
| **Equipment Name** | | **DUMPER/TILTER, LIME CONTAINER** |
| **No. Operating / Spare** | | **One / None** |
| Manufacturer | | Phelps/A-Ward or Equal |
| Model No. | | |
| Platform Dimensions (L x W) | m | 6.405 x 2440 |
| Beam size | | |
| Decking Thickness | | 9.5 mm |
| Materials | | Carbon steel |
| Maximum Tilt Angle | Deg. | 55 Deg. |
| Maximum lift capacity | kg (lbs) | 27272 (60000) |
| Maximum Container size | | 6100 mm long |
| Platform Raise time | Minutes | 83 seconds |
| Platform Lower time | Minutes | 75 seconds |
| **Mounting** | | |
| Cylinder mount type | | PIT Type |
| Pivot pedestal bases provided | Yes / No | Yes |
| Pivot Pin Size / Material | mm / | 50 mm 4140 Heat Treated Steel |
| **Cylinders** | | |
| Cylinder description | | Two (2) 3 Stage Single Acting Telescoping |
| No. Cylinders | | Two |
| Operating pressure | kPa | 1500 psi |
| Max. operating pressure | kPa | 2000 psi |
| Cylinder Diameter | mm | 120 Final Stage |
| **Hydraulic Power Unit** | | |
| Fluid Reservoir capacity | L (usg) | 300 usg |
| Pump manufacturer | | Vickers |
| Pump Model | | |
| Pump size | mm x mm | |
| **Motor**<br>Rating<br>Frame / Encl. / SF / Eff.<br>Volts / Phase / Freq | <br>HP (kW) /RPM<br><br>V / Ph / Hz | <br>40 (30.34) 1800<br><br>480/3/60 |

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| | | |
|---|---|---|
| VFD | Yes / No | No |
| **Coatings** | | |
| Exterior Primer | Type/ DFT/SSPC | 2 mils Red Oxide SSSP-SP6 |
| Exterior Finish | Type/ DFT/SSPC | 2 mils Industrial Enamel |
| Dumper platform weight | kg | 3450 |
| Total Dumper assembly weight | kg | 6850 |
| | | |
| **Equipment Number** | | **DC-1-15-HOP-535** |
| **Equipment Name** | | **HOPPER, LIME STORAGE** |
| **No. Operating / Spare** | | **One / None** |
| Manufacturer | | PCE Sales & Engineering Inc. |
| Model No. | | |
| Hopper Dimensions (LxW or Dia.) | m | 3.0 m x 4.5 m |
| Hopper Height | m | 8.235 |
| Nominal bulk density | $kg/m^3$ | 880 |
| Design moisture content | % wt | Minus 1% |
| Design bulk density | $kg/m^3$ | 965 |
| Design Angle of Repose | Degree | 40 Degrees |
| Hopper Capacity (weight) | tonnes | 2 |
| Hopper Capacity (volume) | $m^3$ | 36 |
| Storage Height-Straight Side | m | 4 |
| Hopper Bottom Angle (Min. $60^o$) | Degree | 60 Degrees |
| Hopper Bottom Opening | mm | 457mm x 4500 mm |
| Bottom Clearance (Flg. to grade) | m | 1.6 |
| **Plate Material** | | Note: corrosion allowance for plates required |
| Type/Grade | ASTM | A 36 |
| Hopper plate thickness | mm | 6 mm |
| Roof plate thickness | mm | N/A |
| Cone plate thickness | mm | 6 mm |
| Skirt plate thickness | mm | N/A |
| Hopper weight (empty) | tonnes | 7.7 |
| **Coatings** | | |
| Interior Hopper | Type/ DFT/SSPC | N/A |
| Interior Skirt | Type/ DFT/SSPC | N/A |
| Exterior Primer | Type/ DFT/SSPC | 3 mils DFT Inorganic Ethyl Zinc |
| Exterior Finish | Type/ DFT/SSPC | 2-3 mils Epoxy |
| **Level Measuring System** | | |

| | | |
|---|---|---|
| Type<br>Manufacturer<br>Description | | |
| **Equipment Number** | | **DC-1-15-FEE-800** |
| **Equipment Name** | | **LIME SCREW FEEDER NO 1** |
| **No. Operating / Spare** | | **One / None** |
| Make/Model | | 18" - SF-6100 |
| CEMA level | | CEMA Standard |
| Design bulk density | $kg/m^3$ | 880 |
| Rated Capacity | kg/h<br>$m^3/h$ | 27000<br>30.68 |
| % Motor Speed at Rated Capacity | % | 75 % |
| Feed Connection | mm | 457 mm x 4500 mm |
| Discharge Connection | mm | 457 mm x 457 mm |
| Trough shape / covers | | "U" Trough |
| Trough material | | Carbon Steel |
| Trough thickness | mm | 6 mm |
| Screw diameter | mm | 457 |
| Screw length | m | 6100 |
| Screw incline | Degree | 0 Degrees |
| Screw flights (description) | | Variable pitch |
| Screw Flights Material | | AR 400 |
| Screw Thickness | mm | 9.5 |
| Screw load % at design capacity | % | 100% |
| Screw speed | RPM | 30 |
| Screw BHP for maximum flow | | 20 |
| **Drive** | | |
| Drive manufacturer | | Dodge |
| **Motor**<br>Rating<br>Frame / Encl. / SF / Eff.<br>Volts / Phase / Freq<br>VFD | <br>HP (kW) /RPM<br><br>V / Ph / Hz<br>Yes / No | <br>20 (14.8) 1800<br><br>480/3/60<br>Yes (by others) |
| Gear reducer type | | Shaft Mount |
| Gear reducer make/model | | Dodge TA Series |

| | | |
|---|---|---|
| Gear ratio / service factor | | 25: 1 – 1.15 |
| V-belt type / service factor | | 1.5 |
| Bearing L-10 life | hours | |
| Sheave diameter (Driver/Driven) | mm / mm | |
| Guards included (Shaft & Belt) | Yes/No | Yes |
| **Coatings** | | |
| Interior | Type/ DFT/SSPC | Shop Primer |
| Exterior Primer | Type/ DFT/SSPC | 2 mils Red Oxide SSSP-SP6 |
| Exterior Finish | Type/ DFT/SSPC | 2 mils Industrial Enamel |
| **Equipment Number** | | **DC-1-15-BLO-810** |
| **Equipment Name** | | **BLOWER, LIME CONVEYING** |
| **No. Operating / Spare** | | **One / None** |
| Manufacturer | | Blower Engineering. |
| Model No. | | TL100V |
| Blower Type | | Tri Lobe Positive Displacement |
| Size (Suction x Discharge) | mm x mm | 150 mm x 150 mm |
| Design Capacity | $m^3/h$ / ACFM | 2550 / 1500 |
| Design Pressure | kPa | 48.26 |
| BHP at design point | HP(kW) | 67.4 (49.8) |
| **Blower Materials**<br>Blade<br>Casing<br>Shaft | | <br>Cast Iron<br>Cast Iron<br> |
| **Blower Motor**<br>Rating<br>Frame / Encl. / SF / Eff.<br>Volts / Phase / Freq<br>VFD | <br>HP (kW) /RPM<br><br>V / Ph / Hz<br>Yes / No | <br>75 (55.5) 1800 RPM<br><br>480/3/60<br>No |
| | | |
| **Equipment Number** | | **DC-1-15-BIN-800** |
| **Equipment Name** | | **SILO, LIME STORAGE** |
| **No. Operating / Spare** | | **One / None** |
| Manufacturer | | CST Storage |
| Model No. | | 15.385 |
| Silo Diameter | m | 4.689 |
| Silo Height | m | 14.630 |

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|---|---|---|
| Nominal bulk density | $kg/m^3$ | 880 |
| Design moisture content | % wt | 0.5% |
| Design bulk density | $kg/m^3$ | 965 |
| Design Angle of Repose | Degree | 40 |
| Silo Capacity (weight) | tonnes | 122 |
| Silo Capacity (volume) | $m^3$ | 139 |
| Storage Height-Straight Side | m | 11.44 |
| Cone Bottom Angle (Min. $60^o$) | Degree | 60 |
| Cone Bottom Opening | mm | 2133 |
| Bottom Clearance (Flg. to grade) | m | 4.267 |
| **Plate Material** | | Note: corrosion allowance for plates required |
| Type/Grade | ASTM | A 36 |
| Silo plate thickness | mm | Min 10GA |
| Roof plate thickness | mm | Min 10GA |
| Cone plate thickness | mm | Min 10GA |
| Skirt plate thickness | mm | Min 10GA |
| Silo weight (empty) | tonnes | |
| Silo vacuum valve setting | | 0.502 |
| Silo relief valve setting | kPa | 0.4502 |
| **Coatings** | | |
| Interior Silo | Type/ DFT/SSPC | 5 mils Epoxy – SSPC-SP10 |
| Interior Skirt | Type/ DFT/SSPC | 5 mils Epoxy – SSPC-SP10 |
| Exterior Primer | Type/ DFT/SSPC | 3 mils Epoxy – SSPC-SP10 |
| Exterior Finish | Type/ DFT/SSPC | 1.5 mils Urethane |
| **Silo Measuring System** | | |
| Type | | Guided Level Radar |
| Manufacturer | | Endress & Hauser |
| Description | | Model FMP 40 |
| | | |
| **Equipment Number** | | **DC-1-15-DCL-700** |
| **Equipment Name** | | **COLLECTOR, LIME STORAGE SILO DUST** |
| **No. Operating / Spare** | | **One / None** |
| **DUST FILTER** | | |
| Make/Model | | Ultra BB-36-58IIG |
| Filter area | $m^2$ | 24 |
| Air to cloth ratio | | 5.79: 1 |

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|---|---|---|
| Filter bag type & material | | 16 oz Polyester Felt |
| Design pressure | mm / in ($H_2O$) | 20" W.G. |
| **Filter Cleaning** | | |
| Type of filter cleaning | | Pulse Jet |
| Compressed air required | $m^3/h$ | 14 |
| | kPa | 620 |
| Dry Air Required | Yes / No | Yes |
| **VENT FAN** | | |
| Manufacturer | | Cincinnati Fan |
| Model | | PB 14A |
| Size (Suction x Discharge) | mm x mm | 150 mm dia. |
| Design Capacity | $m^3/h$ / ACFM | 2540 x 1500 |
| Design Pressure | mm / in (W.C.) | 6" W.G. |
| BHP at design point | HP(kW) | 5.0 (3.7) |
| **Fan Materials** | | |
| Blades | | Cast Aluminum |
| Casing | | Cast Aluminum |
| Shaft | | Steel |
| **Fan Motor** | | |
| Rating | HP (kW) /RPM | 7.5 HP – 3600 RPM |
| Frame / Encl. / SF / Eff. | | |
| Volts / Phase / Freq | V / Ph / Hz | 480/3/60 |
| VFD | Yes / No | No |
| Discharge Dampener | Yes / No | Yes |
| Weight of Blower Assembly | kg | 110 |
| | | |
| **Equipment Number** | | **DC-1-15-MXR-410** |
| **Equipment Name** | | **ACTIVATOR, LIME STORAGE SILO** |
| **No. Operating / Spare** | | **One / None** |
| Make/Model | | Carman GBD-7 |
| Type | | Vibrating |
| Diameter | mm | 2133 |
| Height | mm | 1200 |
| Compressed air flow required | $m^3/h$ | N/A |
| Compressed air pressure | kPa | N/A |
| **Activator Motor** (if required) | | |

| | | |
|---|---|---|
| Rating<br>Frame / Encl. / SF / Eff.<br>Volts / Phase / Freq<br>VFD | HP (kW) /RPM<br><br>V / Ph / Hz<br>Yes / No | 1.5 HP 1800 RPM<br>Shaker Motor<br>480/3/60<br>No |
| Rubber vibration isolator size | | |
| | | |
| **Equipment Number** | | **DC-1-15-FEE-800** |
| **Equipment Name** | | **FEEDER, LIME SCREW NO 2** |
| **No. Operating / Spare** | | **One / None** |
| Make/Model | | |
| CEMA level | | CEMA Standard |
| Design bulk density | $kg/m^3$ | 965 |
| Rated Capacity | kg/h<br>$m^3/h$ | 10,000<br>11.36 |
| % Motor Speed at Rated Capacity | % | 75 % |
| Feed Connection | mm | 300 |
| Discharge Connection | mm | 300 |
| Trough shape / covers | | “U” Trough |
| Trough material | | A-36 |
| Trough thickness | mm | 6 |
| Screw diameter | mm | 355 |
| Screw length | m | 5.49 |
| Screw incline | Degree | 13 |
| Screw flights (description) | | Half & Full Pitch |
| Screw Flights Material | | AR 400 |
| Screw Thickness | mm | 6 |
| Screw load % at design capacity | % | 50 % |
| Screw speed | RPM | 35 |
| Screw BHP for maximum flow | | 6 |
| **Drive** | | |
| Drive manufacturer | | Dodge Reducer |
| **Motor**<br>Rating<br>Frame / Encl. / SF / Eff.<br>Volts / Phase / Freq<br>VFD | <br>HP (kW) /RPM<br><br>V / Ph / Hz<br>Yes / No | <br>7.5 (5.5) 1800<br><br>480/3/60<br>Yes (by others) |

| | | |
|---|---|---|
| Gear reducer type | | Shaft Mount |
| Gear reducer make/model | | Dodge TA Series |
| Gear ratio / service factor | | 25: 1 1.5 |
| V-belt type / service factor | | 1.5 |
| Bearing L-10 life | hours | |
| Sheave diameter (Driver/Driven) | mm / mm | |
| Guards included (Shaft & Belt) | Yes/No | |
| **Coatings** | | |
| Interior | Type/ DFT/SSPC | Shop Primer |
| Exterior Primer | Type/ DFT/SSPC | 2 mils Red Oxide SSSP-SP6 |
| Exterior Finish | Type/ DFT/SSPC | 2 mils Industrial Enamel |
| | | |
| **Equipment Number** | | **DC-1-15-MIL-400** |
| **Equipment Name** | | **MILL, LIME SLAKER BALL** |
| **No. Operating / Spare** | | **One / None** |
| Diameter | m | 2.44 |
| Length | m | 4.05 EGL |
| Total weight | kg | |
| **Mill Drive**<br>Motor manufacturer<br>Rating<br>Frame / Encl. / SF / Eff.<br>Volts / Phase / Freq<br>VFD | <br><br>HP (kW) /RPM<br><br>V / Ph / Hz<br>Yes / No | <br><br>250 kW<br><br>480/3/60<br>No |
| **Shell** | | |
| Shell plate material | | Low Carbon Steel |
| Shell plate thickness | mm | |
| Shell flange material | | |
| Shell flange thickness | mm | |
| Number of shell sections | | |
| **Head** | | |
| Head Material | | Cast AS1831-500-7 |
| Thickness at trunnion | mm | |
| Thickness at shell flange | mm | |
| **Trunnions** | | |
| Material | | |

| | | |
|---|---|---|
| Outside diameter | m | |
| Overall length | mm | |
| **Mill Liners** | | |
| Material / type / thickness | mm | Rubber 70-80 mm w/ 175 mm Lifter Bars |
| Slot width inboard/outboard | mm | |
| Pebble port size | mm | |
| Total open area of pebble ports | $mm^2$ | |
| Total open area of grate sections | $mm^2$ | |
| Thickness | mm | |
| **Feed Chute** | | |
| Feed spout material | | |
| Retractable yes/no? | | |
| **Trunnion bearings** | | |
| Describe type | | Spherical Roller |
| Diameter of bearing surface | mm | |
| Arc of bearing surface | mm | |
| Length of bearing surface | mm | |
| Bearing surface material | | |
| | | |
| **Ring Gear** | | N/A |
| Gear manufacturer | | |
| Pitch diameter | mm | |
| Face width | mm | |
| Type | | |
| Number of teeth | | |
| Material | | |
| **Pinion** | | |
| Manufacturer | | |
| Pitch diameter | mm | |
| Face width | mm | |
| Number of teeth | | |
| Material | | |
| Pinion speed | | |
| Shaft integral | | |
| **Mill Weights** | | |
| Ball mill weight, empty | kg | |

| | | |
|---|---|---|
| Ball mill weight, full | kg | |
| Liner weight | kg | |
| **Trommel** | | |
| Feed chute size | mm | |
| Mill trommel size | mm | |
| Trommel lining | | |
| **Inching Drive** | | Included |
| Speed | RPM | |
| **Motor**<br>Rating<br>Frame / Encl. / SF / Eff.<br>Volts / Phase / Freq<br>VFD | <br>HP (kW) /RPM<br><br>V / Ph / Hz<br>Yes / No | <br>1.5 (1.11) 1800 RPM<br>Shaker Motor<br>480/3/60<br>No |
| **Equipment Number** | | **DC-1-15-PBX-850** |
| **Equipment Name** | | **PUMPBOX, SLAKER CYCLONE FEED** |
| **No. Operating / Spare** | | **One / None** |
| Length x width x depth | m x m x m | 1830 mm dia. x 1058 mm high |
| Freeboard | mm | 305 |
| Plate thickness | mm | 6 |
| Corrosion allowance | mm | NIL |
| Liner material | | Rubber |
| Liner thickness | mm | 6 mm |
| | | |
| **Equipment Number** | | **DC-1-15-AGI-850** |
| **Equipment Name** | | **AGITATOR, SLAKER CYCLONE FEED PUMPBOX** |
| **No. Operating / Spare** | | **One / None** |
| Make/Model | | Lightnin or Equal |
| Type of Impeller | | A-510 Laser foil |
| Impeller Diameter | mm | |
| Shaft Length | mm | 1524 |
| Shaft Dia. | mm | |
| Shaft Material | | Carbon Steel Rubber coated |
| Agitator Operating Speed | rpm | |
| Speed reducer type | | Helical |
| Reduction ratio | | |
| **Agitator Motor** | | |

| | | |
|---|---|---|
| Rating | HP (kW) /RPM | 3.0 (2.22) 1800 RPM |
| Frame / Encl. / SF / Eff. | | |
| Volts / Phase / Freq | V / Ph / Hz | 480/3/60 |
| VFD | Yes / No | No |
| | | |

| | |
|---|---|
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| **Equipment Number** | | **DC-1-15-PPP-605 & -606** |
|---|---|---|
| **Equipment Name** | | **PUMP, LIME BALL MILL CYCLONE FEED SLURRY No1 /No2** |
| **No. Operating / Spare** | | **One / One** |
| Manufacturer | | Wilfley |
| Pump model no. / size | | 3K |
| Curve no. | | |
| Design capacity | $m^3/h$ | 91 |
| Design head | m | 27 |
| BHP at design operating point | HP (kW) | 22 (16) |
| BHP at max. design point | HP (kW) | |
| Pump design speed | RPM | 1400 |
| Design operating Pt. Efficiency | % | |
| Suction flange | mm | 125 |
| Discharge flange | mm | 75 |
| Pump frame length | mm | |
| Impeller type: open/closed/recessed | | |
| Impeller size | mm | |
| Impeller tip speed | m/s | |
| Casing material | | White Iron – 400-600 HBN |
| Casing liner material | | N/A |
| Casing liner hardness | $R_b$ | N/A |
| Casing liner thickness | mm | N/A |
| Impeller material | | White Iron – 400-600 HBN |
| Impeller liner material | | N/A |
| Impeller liner hardness | $R_b$ | N/A |
| Impeller liner thickness | mm | N/A |
| Shaft material | | |
| Hydrostatic test pressure | kPa (ga) | |
| Pump weight / motor weight | kg / kg | 500 |
| Baseplate weight | kg | |
| Total weight | kg | 800 |
| **Pump Motor**<br>Rating<br>Frame / Encl. / SF / Eff. | HP (kW) /RPM | 30 (22.2) |

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| **Equipment Number** | | **DC-1-15-PPP-605 & -606** |
|---|---|---|
| **Equipment Name** | | **PUMP, LIME BALL MILL CYCLONE FEED SLURRY No1 /No2** |
| **No. Operating / Spare** | | **One / One** |
| Manufacturer | | Wilfley |
| Volts / Phase / Freq | V / Ph / Hz | 480/3/60 |
| VFD | Yes / No | Yes |
| Frame Size / Efficiency | | |
| Enclosure | | |
| **Equipment Number** | | **DC-1-15-CYL-400** |
| **Equipment Name** | | **CYCLONE, LIME BALL MILL** |
| **No. Operating / Spare** | | **One / One** |
| Cyclone Size / Model Number | | gMax 10-3/39 |
| Number of Operating Cyclones | | One |
| Number of Standby Cyclones | | Nil |
| Number of Spare Cyclone Connections | | Nil |
| Cyclone Feed Connection Size | mm | 100 |
| Overflow Connection Size | mm | 150 |
| Inlet Area | $mm^2$ | |
| Size of Vortex Finder | mm | |
| Fixed or Variable Apex | | Fixed |
| Recommended Apex Size | mm | |
| **Materials of Construction:** | | |
| Cyclone Body | | Carbon Steel |
| Liner | | Rubber |
| Liner Thickness | mm | 12 mm & 6 mm |
| Vortex Finders | | Included |
| Apexes | | |
| Feed Distributor | | N/A |
| Feed Distributor Liner | | N/A |
| Feed Distributor Liner Thickness | mm | N/A |
| Launder | | By Others |
| Launder Plate Thickness | mm | N/A |
| Launder Liner | | N/A |
| Launder Liner Thickness | mm | N/A |
| Vertical Feed Pipe Diameter | mm | |

| Equipment Number | | DC-1-15-PPP-605 & -606 |
|---|---|---|
| **Equipment Name** | | **PUMP, LIME BALL MILL CYCLONE FEED SLURRY No1 /No2** |
| **No. Operating / Spare** | | **One / One** |
| Manufacturer | | Wilfley |
| Vertical Feed Pipe Liner | | Manufacturer Cyclone : FL Smidth - Rubber |
| Vertical Feed Pipe Liner Thickness | mm | 12 mm |
| **Ancillaries** | | |
| Pressure Gauge Range | kPag | |
| Isolation Valve Manufacturer | | N/A |
| Isolation Valve Model No. / Type | | N/A |
| Isolation Valve Size | mm | N/A |
| Actuator Manufacturer | | N/A |
| Actuator Model No. / Type | | N/A |
| Solenoid Valve Manufacturer | | N/A |
| Solenoid Valve Model No. / Type | | N/A |
| Instrument Air Pressure Required | kPag | N/A |
| **Surface Preparation & Finish** | | SSPC-SP6 |
| Cyclone Primer Type | | Carboline Epoxy |
| Cyclone Primer DFT | mils | 1.5 – 3 mils |
| Cyclone Finish Type | | Carboline 893 and carboline 890 |
| Cyclone Finish DFT | mils | 10-15 mils |
| **Launder Primer Type** | | N/A |
| Launder Primer DFT | mils | N/A |
| Launder Finish Type | | N/A |
| Launder Finish DFT | mils | N/A |
| **Weights & Dimensions** | | |
| Weight of Individual Cyclone | kgs | |
| Empty Weight of Complete Assembly | kgs | |
| Operating Weight of Complete Assembly | kgs | |
| Overall Dimensions | mm | 400 mm x 1750 mm |
| | | |

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|---|---|---|
| **Equipment Name** | | **PUMP, LIME BALL MILL CYCLONE FEED SLURRY No1 /No2** |
| **No. Operating / Spare** | | **One / One** |
| Manufacturer | | Wilfley |
| **Equipment Number** | | **DC-1-15-LUB-600** |
| **Equipment Name** | | **SPRAY UNIT, LIME SLAKER GEAR** |
| **No. Operating / Spare** | | **One / None** |
| Oil tank capacity | liters | |
| Lube type | | |
| Air flow required | $m^3/h$ | |
| Air pressure required | kPa (ga) | |
| Pump manufacturer | | |
| Pump model | | |
| Pump capacity | $m^3/h$ | |
| **Motor**<br>Motor manufacturer<br>Rating<br>Frame / Encl. / SF / Eff.<br>Volts / Phase / Freq | <br><br>HP (kW) /RPM<br><br>V / Ph / Hz | |
| | | |
| | | |
| **Equipment Number** | | **DC-1-15-LUB-601** |
| **Equipment Name** | | **LUBE UNIT, LIME SLAKER** |
| **No. Operating / Spare** | | **One / None** |
| | | |
| Number of pumps required | | |
| Pump manufacturer | | |
| Pump model | | |
| Pump capacity | $m^3/h$ | |
| **Motor**<br>Motor manufacturer<br>Rating<br>Frame / Encl. / SF / Eff.<br>Volts / Phase / Freq | <br><br>HP (kW) /RPM<br><br>V / Ph / Hz | |
| Duplex filters | | |
| Cooler manufacturer | | |

TECHNICAL SPECIFICATION

| | |
|---|---|
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|---|---|---|
| **Equipment Name** | | **PUMP, LIME BALL MILL CYCLONE FEED SLURRY No1 /No2** |
| **No. Operating / Spare** | | **One / One** |
| Manufacturer | | Wilfley |
| Cooler model | | |
| Cooler size | mm | |
| Tubes size / material | mm / | |
| Shell size / material | mm / | |
| **Equipment Number** | | **DC-1-15-SBW-550** |
| **Equipment Name** | | **SCRUBBER, LIME SLAKER VENT** |
| **No. Operating / Spare** | | **One / None** |
| Manufacturer | | Micropul or Equal |
| Model | | 42 |
| Diameter | mm | 1067 |
| Height | mm | 4070 |
| Inlet / Discharge size | mm x mm | 838 mm x 508 mm |
| Wall thickness | mm | 11 GA |
| Scrubber Materials | | 304 Stainless Steel in Contact |
| **Water Requirements**<br>Flow rate<br>Pressure<br>Temp. (range) | <br>$m^3/h$<br>kPa<br>°C | <br>4.5<br>155<br>+ 5°C |
| Number of spray nozzles | | 5 |
| Inlet / Outlet Size | mm | 838 mm x 508 mm |
| Scrubber Assembly Weight | kg | 1400 |
| | | |
| **Equipment Number** | | **DC-1-15-FAN-805** |
| **Equipment Name** | | **LIME SLAKER VENT SCRUBBER FAN** |
| **No. Operating / Spare** | | **One / None** |
| Manufacturer | | Micropul or Equal |
| Model | | |
| Scrubber fan flow | $m^3/h$ | 1067 |
| **Fan Motor**<br>Rating | <br>HP (kW) /RPM | <br>30 (22.2) 1800 RPM |

TECHNICAL SPECIFICATION

| LIME HANDLING AND STORAGE SYSTEM | 166549-16-SP-042A |
|---|---|
| Donlin Creek Feasibility Study Update 2 | REV. B |
| Alaska, USA | Project No. 166549 |

| **Equipment Number** | | **DC-1-15-PPP-605 & -606** |
|---|---|---|
| **Equipment Name** | | **PUMP, LIME BALL MILL CYCLONE FEED SLURRY No1 /No2** |
| **No. Operating / Spare** | | **One / One** |
| Manufacturer | | Wilfley |
| Frame / Encl. / SF / Eff. | | |
| Volts / Phase / Freq | V / Ph / Hz | 480/3/60 |
| VFD | Yes / No | No |
| V-Belt quantity | | |
| V-Belt profile | | |
| V-Belt service factor | | 1.15 |
| Sheave diameter (Driver/Driven) | mm / mm | |
| Vent Fan Assembly Weight | kg | Included with Scrubber |