UAF BACT Cover Page

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ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Air Permits Program

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION ADDENDUM
for
University of Alaska
University of Alaska Fairbanks Campus

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Reviewed by: Moses Coss
Final Date: October 21, 2024

https://stateofalaska.sharepoint.com/sites/DEC/AIR/np/serioussip/Shared Documents/Revised-Amended Serious SIP/2024 Revised-Amended Serious SIP Section Templates/Adopted Versions/Appendices/BACT/UAF/10.21.24 Final UAF BACT Determination.docx

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Abbreviations/Acronyms

AAC ....Alaska Administrative Code
AAAQS ....Alaska Ambient Air Quality Standards
Department ....Alaska Department of Environmental Conservation
BACT ....Best Available Control Technology
CFB……………………Circulating Fluidized Bed
CFR. ....Code of Federal Regulations
Cyclones………………Mechanical Separators
DFP……………………Diesel Particulate Filter
DLN..............................Dry Low NOx
DOC…………………...Diesel Oxidation Catalyst
EPA ....Environmental Protection Agency
ESP……………………Electrostatic Precipitator
EU.................................Emission Unit
FITR…………………...Fuel Injection Timing Retard
GCPs…………………..Good Combustion Practices
HAP ....Hazardous Air Pollutant
ITR……………………Ignition Timing Retard
LEA……………………Low Excess Air
LNB……………………Low NOx Burners
MR&Rs ....Monitoring, Recording, and Reporting
NESHAPS ....National Emission Standards for Hazardous Air Pollutants
NSCR…………………Non-Selective Catalytic Reduction
NSPS ....New Source Performance Standards
ORL ....Owner Requested Limit
PSD................................Prevention of Significant Deterioration
PTE................................Potential to Emit
RICE, ICE ....Reciprocating Internal Combustion Engine, Internal Combustion Engine
SCR ....Selective Catalytic Reduction
SIP ....Alaska State Implementation Plan
SNCR…………………Selective Non-Catalytic Reduction
ULSD ....Ultra Low Sulfur Diesel

Units and Measures

gal/hr.............................gallons per hour
g/kWh ....grams per kilowatt hour
g/hp-hr ....grams per horsepower hour
hr/day.............................hours per day
hr/yr ....hours per year
hp...................................horsepower
lb/hr ....pounds per hour
lb/MMBtu ....pounds per million British thermal units
lb/1000 gal ....pounds per 1,000 gallons
kW ....kilowatts
MMBtu/hr......................million British thermal units per hour
MMscf/hr.......................million standard cubic feet per hour
ppmv..............................parts per million by volume
tpy.................................tons per year

Pollutants

CO ....Carbon Monoxide
HAP ....Hazardous Air Pollutant
NOx ....Oxides of Nitrogen
SO_2 ....Sulfur Dioxide
$PM_{2.5}$..............................Particulate Matter with an aerodynamic diameter not exceeding 2.5 microns
PM_{10} ....Particulate Matter with an aerodynamic diameter not exceeding 10 microns

1. INTRODUCTION

The University of Alaska Fairbanks (UAF) Campus stationary source has two oil-fired boilers (converted to dual fuel-fired by Minor Permit No. AQ0316MSS02), installed in 1970 and 1987. The power plant also has a 13,266 hp backup diesel generator installed in 1998. The UAF Campus also includes 13 diesel-fired boilers installed between 1985 and 2005, three emergency diesel engines installed between 1998 and 2019, one classroom engine installed in 1987, and one permitted diesel engine installed in 2013. Additional permitted EUs installed in 2016 at the UAF Campus include limestone, sand, and ash handling systems, a circulating fluidized bed with limestone injection (FBLI) dual fuel-fired boiler, and a coal handling system.

In a letter dated April 24, 2015, the Alaska Department of Environmental Conservation (Department) requested the stationary sources expected to be major stationary sources in the particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$) serious nonattainment area perform a voluntary Best Available Control Technology (BACT) review in support of the state agency's required SIP submittal once the nonattainment area is re-classified as a Serious $PM_{2.5}$ nonattainment area. The designation of the area as "Serious" with regard to nonattainment of the 2006 24-hour $PM_{2.5}$ ambient air quality standards was published in Federal Register Vol. 82, No. 89, May 10, 2017, pages 21703-21706, with an effective date of June 9, 2017.[1]

The initial BACT Determination for UAF was included in Part 3 of Appendix III.D.7.07 Control Strategies Chapter, in the State Air Quality Control Plan adopted on November 19, 2019, with amendments adopted on November 18, 2020, as part of a complete SIP package.[2] The *EPA's Air Plan Partial Approval and Partial Disapproval; AK, Fairbanks North Star Borough; 2006 24-hour $PM_{2.5}$ Serious Area and 189(d) Plan*[3] published in the Federal Register on December 5, 2023 (*88 Fed. Reg. 84657*) disapproved of Alaska's initial BACT determinations for $PM_{2.5}$ and SO_2 controls.

Since preparing the SIP amendments adopted on November 18, 2020, the Department conducted extensive modeling and found that SO_2 emissions from stationary sources do not significantly contribute to ground level $PM_{2.5}$ concentrations, and that SO_2 BACT emission limits are therefore not required for major stationary sources in the Fairbanks North Star Borough. SO_2 BACT determinations have, however, been included in this BACT Determination Addendum because the SO_2 major source precursor demonstration has not yet been approved by EPA.

This BACT addendum addresses the significant EUs listed in Title V Operating Permit AQ0316TVP03 and Minor Permit AQ0316MSS08. The BACT addendum also accounts for EPA's

[1] Federal Register, Vol. 82, No. 89, Wednesday May 10, 2017 (**https://dec.alaska.gov/air/anpms/comm/docs/2017-09391-CFR.pdf**).

[2] Background and detailed information regarding Fairbanks $PM_{2.5}$ State Implementation Plan (SIP) can be found at **http://dec.alaska.gov/air/anpms/communities/fbks-pm2-5-serious-sip/**.

[3] The EPA's Air Plan Partial Approval and Partial Disapproval; AK, Fairbanks North Star Borough; 2006 24-hour $PM_{2.5}$ Serious Area and 189(d) Plan can be found at **https://www.regulations.gov/document/EPA-R10-OAR-2022-0115-0426**.

comments listed in Memorandum dated August 24, 2022 from Zach Hedgpeth, R10/LSASD/ECB and Larry Sorrels OAQPS/HEID/AEG to Matthew Jentgen, ARD.[4] This BACT Addendum provides the Department's review of the BACT analysis for $PM_{2.5}$, and the BACT analysis for sulfur dioxide (SO_2) emissions, which is a precursor pollutant that can form $PM_{2.5}$ in the atmosphere post combustion.

Note that the section for oxides of nitrogen (NOx), which is also a precursor pollutant that can form $PM_{2.5}$ in the atmosphere post combustion, has been removed from this addendum because the EPA has approved[3] of the Department's comprehensive NOx precursor demonstration under 40 C.F.R. 51.1006(a)(1) and 51.1010(a)(2)(ii).

The following sections review UAF's BACT analysis for technical accuracy and adherence to accepted engineering cost estimation practices.

2. BACT EVALUATION

A BACT analysis is an evaluation of all available control options for equipment emitting the triggered pollutants and a process for selecting the best option based on feasibility, economics, energy, and other impacts. 40 CFR 52.21(b)(12) defines BACT as a site-specific determination on a case-by-case basis. The Department's goal is to identify BACT for the permanent emission units (EUs) at the UAF Campus that emit $PM_{2.5}$ and SO_2, establish emission limits which represent BACT, and assess the level of monitoring, recordkeeping, and reporting (MR&Rs) necessary to ensure UAF applies BACT for the EUs. The Department based the BACT review on the five-step top-down approach set forth in Federal Register Volume 61, Number 142, July 23, 1996 (Environmental Protection Agency). Table A presents the EUs subject to BACT review.

Table A: Emission Units Subject to BACT Review

EU ID[1]	Description of EU	Rating / Size		Fuel Type	Installation or Construction Date
3	Dual-Fired Boiler	180.9	MMBtu/hr	Diesel	1970
4	Dual-Fired Boiler	180.9	MMBtu/hr	Dual Fuel	1987
8	Peaking/Backup Diesel Generator	13,266	hp	Diesel	1999
9A	Medical/Pathological Waste Incinerator	83	lb/hr	Medical / Infectious Waste	2006
17	Diesel Boiler	4.93	MMBtu/hr	Diesel	2003
18	Diesel Boiler	4.93	MMBtu/hr	Diesel	2003
19	Diesel Boiler	6.13	MMBtu/hr	Diesel	2004
20	Diesel Boiler	6.13	MMBtu/hr	Diesel	2004
21	Diesel Boiler	6.13	MMBtu/hr	Diesel	2004
22	Diesel Boiler	8.5	MMBtu/hr	Diesel	2005
24	Diesel Generator Engine	72	hp	Diesel	2001
~~26~~	~~Diesel Generator Engine~~	~~64~~	~~hp~~	~~Diesel~~	~~1987~~
27	Diesel Generator Engine	500	hp	Diesel	2013
29	Diesel Generator Engine	314	hp	Diesel	2013

[4] Document 000008_EPA Technical Support Document – UAF BACT TSD v20220824: **https://www.regulations.gov/document/EPA-R10-OAR-2022-0115-0215**.

EU ID[1]	Description of EU	Rating / Size	Fuel Type	Installation or Construction Date
34	Diesel Generator Engine	324 hp	Diesel	2015
35	Diesel Generator Engine	1,220 hp	Diesel	2019
105	Limestone Handling System	1,200 acfm	N/A	2019
107	Sand Handling System	1,600 acfm	N/A	2019
109	Ash Handling System	1,000 acfm	N/A	2019
110	Ash Handling System Vacuum	2,000 acfm	N/A	2019
111	Ash Loadout to Truck	N/A	N/A	2019
113	Dual Fuel-Fired Circulating Fluidized Bed (CFB) Boiler	295.6 MMBtu/hr	Coal/Woody Biomass	2019
114	Dry Sorbent Handling Vent Filter Exhaust	5 acfm	N/A	2019
128	Coal Silo No. 1 with Bin Vent	1,650 acfm	N/A	2019
129	Coal Silo No. 2 with Bin Vent	1,650 acfm	N/A	2019
130	Coal Silo No. 3 with Bin Vent	1,650 acfm	N/A	2019

Table Notes:
[1] Since the previous BACT analysis for UAF was adopted on November 19, 2019, amendments adopted November 19, 2020, EUs 23, 26, and 28 have been permanently removed from the stationary source and EUs 34 and 35 have been added.

Five-Step BACT Determinations
The following sections explain the steps used to determine BACT for $PM_{2.5}$ and SO_2 for the applicable equipment.

Step 1 Identify All Potentially Available Control Technologies
The Department identifies all available control technologies for the EUs and the pollutant under consideration. This includes technologies used throughout the world or emission reductions through the application of available control techniques, changes in process design, and/or operational limitations. To assist in identifying available controls, the Department reviews available technologies listed on the Reasonably Available Control Technology (RACT), BACT, and Lowest Achievable Emission Rate (LAER) Clearinghouse (RBLC). The RBLC is an EPA database where permitting agencies nationwide post imposed BACT for PSD sources. In addition to the RBLC search, the Department used several search engines to look for emerging and tried technologies used to control $PM_{2.5}$ and SO_2 emissions from equipment similar to those listed in Table A.

Step 2 Eliminate Technically Infeasible Control Technologies:
The Department evaluates the technical feasibility of each control technology based on source specific factors in relation to each EU subject to BACT. Based on sound documentation and demonstration, the Department eliminates control technologies deemed technically infeasible due to physical, chemical, and engineering difficulties.

Step 3 Rank the Remaining Control Technologies by Control Effectiveness
The Department ranks the remaining control technologies in order of control effectiveness with the most effective at the top.

Step 4 Evaluate the Most Effective Controls and Document the Results as Necessary

The Department reviews the detailed information in the BACT analysis about the control efficiency, emission rate, emission reduction, cost, environmental, and energy impacts for each option to decide the final level of control. The analysis must present an objective evaluation of both the beneficial and adverse energy, environmental, and economic impacts. A proposal to use the most effective option does not need to provide the detailed information for the less effective options. If cost is not an issue, a cost analysis is not required. Cost effectiveness for a control option is defined as the total net annualized cost of control divided by the tons of pollutant removed per year. Annualized cost includes annualized equipment purchase, erection, electrical, piping, insulation, painting, site preparation, buildings, supervision, transportation, operation, maintenance, replacement parts, overhead, raw materials, utilities, engineering, start-up costs, financing costs, and other contingencies related to the control option. Sections 4 and 5 present the Department's BACT Determinations for $PM_{2.5}$ and SO_2.

Step 5 Select BACT

The Department selects the most effective control option not eliminated in Step 4 as BACT for the pollutant and EU under review and lists the final BACT requirements determined for each EU in this step. A project may achieve emission reductions through the application of available technologies, changes in process design, and/or operational limitations. The Department reviewed UAF's BACT analysis and made BACT determinations for $PM_{2.5}$ and SO_2 for the University of Alaska Campus . These BACT determinations are based on the information submitted by UAF in their analysis, information from vendors, suppliers, sub-contractors, RBLC, and an exhaustive internet search.

3. BACT DETERMINATION FOR NO_X

As discussed in the Section 1 Introduction, this BACT addendum has removed the previous NOx BACT determinations included in the State Air Quality Control Plan adopted on November 19, 2019, with amendments adopted on November 18, 2020,[2] because the optional comprehensive precursor demonstration (as allowed under 40 C.F.R. 51.1006(1) and 51.1010(a)(2)(ii)) for the precursor gas NOx for point sources illustrates that NOx controls are not needed. The Department submitted with the Serious SIP a final comprehensive precursor demonstration as justification not to require post emission controls for NOx. Please see the precursor demonstration for NOx in the Serious SIP Modeling Chapter III.D.7.8. [2] The $PM_{2.5}$ NAAQS Final SIP Requirements Rule states if the state determines through a precursor demonstration that controls for a precursor gas are not needed for attaining the standard, then the controls identified as BACT/BACM or Most Stringent Measure for the precursor gas are not required to be implemented.[5] The Department's NOx precursor demonstration was approved in *EPA's Air Plan Partial Approval and Partial Disapproval; AK, Fairbanks North Star Borough; 2006 24-hour $PM_{2.5}$ Serious Area and 189(d) Plan*[3] published in the Federal Register on December 5, 2023 (*88 Fed. Reg. 84657*).

[5] https://www.gpo.gov/fdsys/pkg/FR-2016-08-24/pdf/2016-18768.pdf

4. BACT DETERMINATION FOR $PM_{2.5}$

The Department based its $PM_{2.5}$ assessment on BACT determinations found in the RBLC, internet research, and BACT analyses submitted to the Department by GVEA for the North Pole Power Plant and Zehnder Facility, Aurora for the Chena Power Plant, US Army for Fort Wainwright, and UAF for the Combined Heat and Power Plant.

4.1 $PM_{2.5}$ BACT for the Large Dual Fuel-Fired Boiler (EU 113)

Possible $PM_{2.5}$ emission control technologies for large dual fuel-fired boilers were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 11.110, Coal Combustion in Industrial Size Boilers and Furnaces. The search results are listed in Table 4-1.

Table 4-1. RBLC Summary of $PM_{2.5}$ Control for Industrial Coal-Fired Boilers

Control Technology	Number of Determinations	Emission Limits (lb/MMBtu)
Pulse Jet Fabric Filters	4	0.012 – 0.024
Electrostatic Precipitators	2	0.02 – 0.03

RBLC Review

A review of similar units in the RBLC indicates that fabric filters and electrostatic precipitators are the principle particulate matter control technologies installed on large dual fuel-fired boilers. The lowest $PM_{2.5}$ emission rate listed in RBLC is 0.012 lb/MMBtu.

Step 1 - Identification of $PM_{2.5}$ Control Technologies for the Large Dual Fuel-Fired Boiler

From research, the Department identified the following technologies as available for control of $PM_{2.5}$ emissions from the large dual fuel-fired boiler:

(a) Fabric Filters

Fabric filters or baghouses are comprised of an array of filter bags contained in housing. Air passes through the filter media from the "dirty" to the "clean" side of the bag. These devices undergo periodic bag cleaning based on the build-up of filtered material on the bag as measured by pressure drop across the device. The cleaning cycle is set to allow operation within a range of design pressure drop. Fabric filters are characterized by the type of cleaning cycle: mechanical-shaker,[6] pulse-jet,[7] and reverse-air.[8] Fabric filter systems have control efficiencies of 95% to 99.9%, and are generally specified to meet a discharge concentration of filterable particulate (e.g., 0.01 grains per dry standard cubic feet). The Department considers fabric filters a technically feasible control technology for the large dual fuel-fired boiler.

(b) Wet and Dry Electrostatic Precipitators (ESP)

ESPs remove particles from a gas stream by electrically charging particles with a discharge electrode in the gas path and then collecting the charged particles on grounded plates. The

[6] https://www3.epa.gov/ttn/catc/dir1/ff-shaker.pdf
[7] https://www3.epa.gov/ttn/catc/dir1/ff-pulse.pdf
[8] https://www3.epa.gov/ttn/catc/dir1/ff-revar.pdf

inlet air is quenched with water on a wet ESP to saturate the gas stream and ensure a wetted surface on the collection plate. This wetted surface along with a periodic deluge of water is what cleans the collection plate surface. Wet ESPs typically control streams with inlet grain loading values of 0.5 – 5 gr/ft^3 and have control efficiencies between 90% and 99.9%.[9] Wet ESPs have the advantage of controlling some amount of condensable particulate matter. The collection plates in a dry ESP are periodically cleaned by a rapper or hammer that sends a shock wave that knocks the collected particulate off the plate. Dry ESPs typically control streams with inlet grain loading values of 0.5 – 5 gr/ft^3 and have control efficiencies between 99% and 99.9%.[10] The Department considers ESP a technically feasible control technology for the large dual fuel-fired boiler.

(c) Wet Scrubbers
Wet scrubbers use a scrubbing solution to remove PM/PM_{10}/$PM_{2.5}$ from exhaust gas streams. The mechanism for particulate collection is impaction and interception by water droplets. Wet scrubbers are configured as counter-flow, cross-flow, or concurrent flow, but typically employ counter-flow where the scrubbing fluid is in the opposite direction as the gas flow. Wet scrubbers have control efficiencies of 50% - 99%.[11] One advantage of wet scrubbers is that they can be effective on condensable particulate matter. A disadvantage of wet scrubbers is that they consume water and produce water and sludge. For fine particulate control, a venturi scrubber can be used, but typical loadings for such a scrubber are 0.1-50 grains/scf. The Department considers the use of wet scrubbers to be a technically feasible control technology for the large dual fuel-fired boiler.

(d) Cyclone
Cyclones are used in industrial applications to remove particulate matter form exhaust flows and other industrial stream flows. Dirty air enters a cyclone tangentially and the centrifugal force moves the particulate matter against the cone wall. The air flows in a helical pattern from the top down to the narrow bottom before exiting the cyclone straight up the center and out the top. Large and dense particles in the stream flow are forced by inertia into the walls of the cyclone where the material then falls to the bottom of the cyclone and into a collection unit. Cleaned air then exits the cyclone either for further treatment or release to the atmosphere. The narrowness of the cyclone wall and the speed of the air flow determine the size of particulate matter that is removed from the stream flow. Cyclones are most efficient at removing large particulate matter (PM_{10} or greater). Conventional cyclones are expected to achieve 0 to 40 percent $PM_{2.5}$ removal. High efficiency single cyclones are expected to achieve 20 to 70 percent $PM_{2.5}$ removal. The Department considers cyclones a technically feasible control technology for the large dual fuel-fired boiler.

[9] **https://www3.epa.gov/ttn/catc/dir1/fwespwpi.pdf**
https://www3.epa.gov/ttn/catc/dir1/fwespwpl.pdf
[10] **https://www3.epa.gov/ttn/catc/dir1/fdespwpi.pdf**
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[11] **https://www3.epa.gov/ttn/catc/dir1/fcondnse.pdf**
https://www3.epa.gov/ttn/catc/dir1/fiberbed.pdf
https://www3.epa.gov/ttn/catc/dir1/fventuri.pdf

(e) Settling Chamber

Settling chambers appear only in the biomass fired boiler RBLC inventory for particulate control, not in the coal fired boiler RBLC inventory. This type of technology is a part of the group of air pollution control collectively referred to as "pre-cleaners" because the units are often used to reduce the inlet loading of particulate matter to downstream collection devices by removing the larger, abrasive particles. The collection efficiency of settling chambers is typically less than 10 percent for PM_{10}. The EPA fact sheet does not include a settling chamber collection efficiency for $PM_{2.5}$. The Department does not consider settling chambers a technically feasible control technology for the large dual fuel-fired boiler.

(f) Good Combustion Practices (GCPs)

GCPs typically include the following elements:

1. Sufficient residence time to complete combustion;
2. Providing and maintaining proper air/fuel ratio;
3. High temperatures and low oxygen levels in the primary combustion zone;
4. High enough overall excess oxygen levels to complete combustion and maximize thermal efficiency.

Combustion efficiency is dependent on the gas residence time, the combustion temperature, and the amount of mixing in the combustion zone. GCPs are accomplished primarily through combustion chamber design as it relates to residence time, combustion temperature, air-to-fuel mixing, and excess oxygen levels. Proper management of the combustion process will result in a reduction of $PM_{2.5}$ emissions. The Department considers GCPs a technically feasible control technology for the large dual fuel-fired boiler.

Step 2 - Elimination of Technically Infeasible $PM_{2.5}$ Control Technologies for the Large Dual Fuel-Fired Boiler

As explained in Step 1 of Section 4.1, the Department does not consider a settling chamber a technically feasible control technology to control $PM_{2.5}$ emissions from the large dual fuel-fired boiler.

Step 3 - Rank the Remaining $PM_{2.5}$ Control Technologies for the Large Dual Fired Boiler

The following control technologies have been identified and ranked by efficiency for the control of $PM_{2.5}$ from the dual fuel-fired boiler:

(a)	Fabric Filters	(99.9% Control)
(b)	Electrostatic Precipitator	(99.6% Control)
(c)	Scrubber	(50% - 99% Control)
(d)	Cyclone	(20% - 70%)
(f)	Good Combustion Practices	(Less than 40%)

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF proposes the following as BACT for $PM_{2.5}$ emissions from the large dual fuel-fired boiler:

(a) $PM_{2.5}$ emissions shall be controlled by installing, operating, and maintaining a fabric filter; and

(b) $PM_{2.5}$ emissions shall not exceed 0.012 lb/MMBtu.

Step 5 - Selection of $PM_{2.5}$ BACT for the Large Dual Fuel-Fired Boiler

The Department's finding is that BACT for $PM_{2.5}$ emissions from the large dual fuel-fired boiler is as follows:

(a) $PM_{2.5}$ emissions from EU 113 shall be controlled by operating and maintaining fabric filters at all times of operation;

(b) $PM_{2.5}$ emissions from EU 113 shall be controlled by maintaining good combustion practices at all times the units are in operation;

(c) $PM_{2.5}$ emissions from EU 113 shall not exceed 0.012 lb/MMBtu[12] averaged over a three-hour period;

(d) Initial compliance with the proposed $PM_{2.5}$ emission limit will be demonstrated by conducting a performance test for $PM_{2.5}$, including condensable PM; and

(e) Maintain compliance with State opacity standards listed under 50.055(a)(1).

Table 4-2 lists the $PM_{2.5}$ BACT determination for this facility along with those for other industrial coal-fired boilers in the Serious $PM_{2.5}$ nonattainment area.

Table 4-2. Comparison of $PM_{2.5}$ BACT for Coal-Fired Boilers at Nearby Power Plants

Facility	Process Description	Capacity	Limitation	Control Method
UAF	One Dual Fuel-Fired Boiler	295.6 MMBtu/hr	0.012 lb/MMBtu[12]	Fabric Filters; Good Combustion Practices
Fort Wainwright	Six Coal-Fired Boilers	1,380 MMBtu/hr	0.045 lb/MMBtu[13]	Full Steam Baghouse; Good Combustion Practices
Chena	4 Coal-Fired Boilers	497 MMBtu/hr (combined)	0.045 lb/MMBtu[13]	Full Stream Baghouse; Good Combustion Practices

4.2 $PM_{2.5}$ BACT for the Mid-Sized Diesel-Fired Boilers (EUs 3 and 4)

Possible $PM_{2.5}$ emission control technologies for mid-sized diesel-fired boilers were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 12.220, Industrial Size Distillate Fuel Oil Boilers (>100 MMBtu/hr and ≤ 250 MMBtu/hr). The search results for mid-sized diesel-fired boilers are summarized in 4-3.

[12] Boiler manufacturer Babcock & Wilcox's $PM_{2.5}$ emission guarantee, used to calculate potential to emit in Air Quality Permit AQ0316MSS06.

[13] The 0.045 lb/MMBtu emission rate is calculated using EPA AP-42 Tables 1.1-50.04 lb/MMBtu for spreader stoker boilers with a baghouse) and 1.1-6 (0.01A lb/ton for $PM_{2.5}$ sized particles for a boiler with a baghouse converted to lb/MMBtu using the typical gross as received heat value of 7,560 Btu/lb and an ash content (A) of 7 percent). Heat and ash content of the Usibelli coal is identified in the coal data sheet at: http://usibelli.com/coal/data-sheet.

Table 4-3. RBLC Summary of $PM_{2.5}$ Control for Mid-Sized Boilers Firing Diesel

Control Technology	Number of Determinations	Emission Limits (lb/MMBtu)
No Control Specified	7	0.0066 – 0.02
Good Combustion Practices	3	0.007 – 0.015

Possible $PM_{2.5}$ emission control technologies for mid-sized natural gas-fired boilers were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 12.310, Industrial Size Gaseous Fuel Boilers (>100 MMBtu/hr and ≤ 250 MMBtu/hr). The search results for mid-sized natural gas-fired boilers are summarized in Table 4-4.

Table 4-4. RBLC Summary of $PM_{2.5}$ Control for Mid-Sized Boilers Firing Natural Gas

Control Technology	Number of Determinations	Emission Limits (lb/MMBtu)
Limited Operation	2	0.0074 – 0.3
Good Combustion Practices	42	0.0019 – 0.008
No Control Specified	19	0.0074 – 0.01

RBLC Review
A review of similar units in the RBLC indicates limited operation and good combustion practices are the principle $PM_{2.5}$ control technologies installed on mid-sized boilers. The lowest $PM_{2.5}$ emission rate listed in the RBLC is 0.0019 lb/MMBtu.

Step 1 - Identification of $PM_{2.5}$ Control Technology for the Mid-Sized Diesel-Fired Boilers
From research, the Department identified the following technologies as available for $PM_{2.5}$ control of mid-sized diesel-fired boilers:

(a) Fabric Filters
The theory behind fabric filters was discussed in detail in the $PM_{2.5}$ BACT for the large dual fuel-fired boiler and will not be repeated here. The Department considers fabric filters a technically feasible control technology for the mid-sized diesel-fired boilers.

(b) Electrostatic Precipitators
The theory behind ESPs was discussed in detail in the $PM_{2.5}$ BACT for the large dual fuel-fired boiler and will not be repeated here. The Department considers ESPs a technically feasible control technology for the mid-sized diesel-fired boilers.

(c) Scrubber
The theory behind scrubbers was discussed in detail in the $PM_{2.5}$ BACT for the large dual fuel-fired boiler and will not be repeated here. The Department considers scrubbers a technically feasible control technology for the mid-sized diesel-fired boilers.

(d) Cyclone
The theory behind cyclones was discussed in detail in the $PM_{2.5}$ BACT for the large dual fuel-fired boiler and will not be repeated here. The Department considers cyclones a technically feasible control technology for the mid-sized diesel-fired boilers.

(e) Natural Gas
The theory behind the use of natural gas for the mid-sized diesel-fired boilers was discussed in detail in the NOx BACT for the mid-sized diesel-fired boilers. The Department does not consider switching to natural gas a technically feasible control technology for the mid-sized diesel-fired boilers.

(f) Limited Operation
EU 4 currently operates under a combined annual NOx emission limit with EU 8. Limiting the operation of emissions units reduces the potential to emit of those units. The Department considers limited operation a technically feasible control technology for the mid-sized diesel-fired boilers.

(g) Good Combustion Practices
The theory of GCPs was discussed in detail in the $PM_{2.5}$ BACT section for the large dual fuel-fired boiler and will not be repeated here. Proper management of the combustion process will result in a reduction of $PM_{2.5}$ emissions. The Department considers GCPs a technically feasible control technology for the mid-sized diesel-fired boilers.

Step 2 - Eliminate Technically Infeasible $PM_{2.5}$ Control Technologies for the Mid-Sized Diesel-Fired Boilers
As explained in Step 1 of Section 4.2, the Department does not consider natural gas as a technically feasible technology to control particulate matter emissions from the mid-sized diesel-fired boilers.

Additionally, due to the residue from the diesel combustion in the exhaust gas, fabric filters, scrubbers, ESPs, and cyclones are not technically feasible control technologies.

EU 3 is used as a backup to EU 113 if it fails. As the backup EU, it is not technically feasible to use an operational limit to control $PM_{2.5}$ emissions.

Step 3 - Rank the Remaining $PM_{2.5}$ Control Technologies for the Mid-Sized Diesel-Fired Boilers
UAF has selected the only remaining control technologies, therefore, ranking is not required.

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF proposes the following as BACT for the mid-sized diesel-fired boilers:

(a) $PM_{2.5}$ emissions from EU 3 and 4 shall not exceed 0.016 lb/MMBtu while firing diesel fuel;

(b) $PM_{2.5}$ emissions from EU 4 shall not exceed 7.6 lb/MMscf while firing natural gas; and

(c) $PM_{2.5}$ emissions from EU 4 will be limited by complying with the combined annual NOx emission limit of 40 tons per 12 month rolling period for EUs 4 and 8.

Step 5 - Selection of $PM_{2.5}$ BACT for the Mid-Sized Diesel-Fired Boilers
The Department's finding is that BACT for $PM_{2.5}$ emissions from EUs 3 and 4 is as follows:

(a) $PM_{2.5}$ emissions from EUs 3 and 4 shall not exceed 0.012 lb/MMBtu[14] averaged over a 3-hour period while firing diesel fuel;

(b) $PM_{2.5}$ emissions from EU 4 shall not exceed 0.0075 lb/MMBtu[15] averaged over a 3-hour period while firing natural gas;

(c) $PM_{2.5}$ emissions from EU 4 shall be controlled by limiting combined NOx emissions of EU 4 and 8 to no more than 40 tons per 12-month rolling period;

(d) Initial compliance with the proposed $PM_{2.5}$ emission limits will be demonstrated by conducting a performance test on EU IDs 3 or 4 on diesel fuel and EU ID 4 on natural gas; and

(e) Maintain good combustion practices at all times by following the manufacturer's operation and maintenance procedures.

Table 4-5 lists the BACT determination for the facility along with those for other mid-sized boilers in the Serious $PM_{2.5}$ nonattainment area.

Table 4-5. Comparison of $PM_{2.5}$ BACT Limits for the Mid-Sized Diesel-Fired Boilers

Facility	EU ID	Process Description	Capacity	Fuel	Limitation	Control Method
UAF	3	Dual Fuel-Fired Boilers	100 – 250 MMBtu/hr	Diesel	0.012 lb/MMBtu[14]	Good Combustion Practices
	4			Diesel	0.012 lb/MMBtu[14]	Limited Operation Good Combustion Practices
				Natural Gas	0.0075 lb/MMBtu[15]	

4.3 $PM_{2.5}$ BACT for the Small Diesel-Fired Boilers (EUs 17 through 22)

Possible $PM_{2.5}$ emission control technologies for small diesel-fired boilers were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 13.220, Commercial/Institutional Size Boilers (<100 MMBtu/hr). The search results for diesel-fired boilers are summarized in Table 4-6.

Table 4-6. RBLC Summary of $PM_{2.5}$ Control for Small Diesel-Fired Boilers

Control Technology	Number of Determinations	Emission Limits
Good Combustion Practices	3	0.25 lb/gal
		0.1 tpy
		2.17 lb/hr

[14] Emission factor from AP-42 Table's 1.3-2 (total condensable particulate matter from No. 2 oil, 1.3 lb/1,000 gal) and 1.3-6 ($PM_{2.5}$ size-specific factor from distillate oil, 0.25 lb/1,000 gal) converted to lb/MMBtu.

[15] Emission factor from AP-42 Table 1.4-2 for total particulate matter and converted to lb/MMBtu.

RBLC Review
A review of similar units in the RBLC indicates good combustion practices are the principle $PM_{2.5}$ control technologies installed on diesel-fired boilers. The lowest $PM_{2.5}$ emission rate listed in the RBLC is 0.1 tons per year (tpy).

Step 1 - Identification of $PM_{2.5}$ Control Technology for the Small Diesel-Fired Boilers
From research, the Department identified the following technologies as available for control of $PM_{2.5}$ emissions from the small diesel-fired boilers:

(a) Scrubbers
The theory behind scrubbers was discussed in detail in the $PM_{2.5}$ BACT for the large dual fuel-fired boiler and will not be repeated here. The Department considers scrubbers as a technically feasible control technology for the small diesel-fired boilers.

(b) Limited Operation
The theory behind limited operation was discussed in detail in the $PM_{2.5}$ BACT section for the mid-sized diesel-fired boilers and will not be repeated here. The Department considers limited operation a technically feasible control technology for the small diesel-fired boilers.

(c) Good Combustion Practices
The theory of GCPs was discussed in detail in the $PM_{2.5}$ BACT section for the large dual fuel-fired boiler and will not be repeated here. Proper management of the combustion process will result in a reduction of $PM_{2.5}$ emissions. The Department considers GCPs a technically feasible control technology for the small diesel-fired boilers.

Step 2 - Eliminate Technically Infeasible $PM_{2.5}$ Control Technologies for the Diesel-Fired Boilers
All identified control devices are technically feasible for the small diesel-fired boilers.

Step 3 - Rank the Remaining $PM_{2.5}$ Control Technologies for the Small Diesel-Fired Boilers
The following control technologies have been identified and ranked by efficiency for the control of $PM_{2.5}$ emissions from the small diesel-fired boilers:

(a) Scrubber (70% - 90% Control)
(c) Good Combustion Practices (Less than 40% Control)
(b) Limited Operation (0% Control)

Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF provided an economic analysis of the installation of a scrubber. A summary of the analysis is shown below:

Table 4-7. UAF Economic Analysis for Technically Feasible $PM_{2.5}$ Controls

Control Alternative	Captured Emissions (tpy)	Emission Reduction (tpy)	Capital Cost ($)	Total Annualized Costs ($/year)	Cost Effectiveness ($/ton)
Scrubber	0.01	0.93	$300,000	$42,713	$47,939
Capital Recovery Factor = 0.1424 (7% for a 10 year life cycle)					

UAF contends that the economic analysis indicates the level of $PM_{2.5}$ reduction does not justify the use of a scrubber to be used in conjunction with limited operation on the small diesel-fired boilers based on the excessive cost per ton of $PM_{2.5}$ removed per year.

UAF proposes the following as BACT for $PM_{2.5}$ emissions for the small diesel-fired boilers:

(a) $PM_{2.5}$ emissions from the operation of the small diesel-fired boilers EUs 19 through 22 will be controlled by limiting the combined operation to no more than 18,739 hours per 12-month rolling period; and

(b) $PM_{2.5}$ emissions from the small diesel-fired boilers shall not exceed 7.06 g/MMBtu.

Department Evaluation of BACT for $PM_{2.5}$ Emissions from the Small Diesel-Fired Boilers.

The Department reviewed UAF's proposal and finds that the 6 small diesel-fired boilers have a combined potential to emit (PTE) of less than 2 tpy for $PM_{2.5}$ based on unrestricted operation of EUs 17 and 18 and a limit of 18,739 combined hours of operation per 12 month rolling period for EUs 19 through 22. The Department does not agree with all of the assumptions made by UAF in its cost analysis. However, the Department believes that at less than 2 tpy of $PM_{2.5}$ emissions spread across six boilers, the cost effectiveness in terms of dollars per ton for add-on pollution control for these units is economically infeasible.

Step 5 - Selection of $PM_{2.5}$ BACT for the Small Diesel-Fired Boilers

The Department's finding is that BACT for $PM_{2.5}$ emissions from the diesel-fired boilers is as follows:

(a) $PM_{2.5}$ emissions from the operation of the small diesel-fired boilers EUs 19 through 22 will be controlled by limiting the combined operation to no more than 18,739 hours per 12-month rolling period; [16]

(b) $PM_{2.5}$ emissions from EUs 17 through 22 shall not exceed 0.016 lb/MMBtu (3-hour average);[17] and

(c) Maintain good combustion practices at all times by following the manufacturer's operation and maintenance procedures.

Table 4-8 lists the $PM_{2.5}$ BACT determination for this facility along with those for other small diesel-fired boilers rated at less than 100 MMBtu/hr in the Serious $PM_{2.5}$ nonattainment area.

[16] Limit established in Minor Permit AQ0316MSS07 to avoid minor permitting under 18 AAC 50.502(c)(3)(A)(iii).

[17] Emission factor corrected from 2019 SIP: AP-42 Table's 1.3-2 (total condensable particulate matter from No. 2 oil, 1.3 lb/1,000 gal) and 1.3-7 ($PM_{2.5}$ size-specific factor from distillate oil, 0.83 lb/1,000 gal) converted to lb/MMBtu. Note that the E.F. has been corrected from the previous SIP because the small boilers are considered "commercial" under Table 1.3-7 and not "industrial" under Table 1.3-6.

Table 4-8. $PM_{2.5}$ BACT Limits for the Small Diesel-Fired Boilers

Facility	Process Description	Capacity	Limitation	Control Method
UAF	6 Diesel-Fired Boilers	< 100 MMBtu/hr	0.016 lb/MMBtu[14]	Limited Operation Good Combustion Practices
Fort Wainwright	4 Diesel-Fired Boilers	< 100 MMBtu/hr	0.016 lb/MMBtu[14]	Good Combustion Practices
Zehnder Facility	2 Diesel-Fired Boilers	< 100 MMBtu/hr	0.016 lb/MMBtu[14]	Good Combustion Practices

4.4 $PM_{2.5}$ BACT for the Large Diesel-Fired Engines (EUs 8 and 35)

Possible $PM_{2.5}$ emission control technologies for large diesel-fired engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process codes 17.110-17.190, Large Internal Combustion Engines (>500 hp). The search results for large diesel-fired engines are summarized in Table 4-9.

Table 4-9. RBLC Summary of $PM_{2.5}$ Control for the Large Diesel-Fired Engines

Control Technology	Number of Determinations	Emission Limits (g/hp-hr)
Federal Emission Standards	12	0.03 – 0.02
Good Combustion Practices	28	0.03 – 0.24
Limited Operation	11	0.04 – 0.17
Low Sulfur Fuel	14	0.15 – 0.17
No Control Specified	14	0.02 – 0.15

RBLC Review

A review of similar units in the RBLC indicates that good combustion practices, compliance with the federal emission standards, low ash/sulfur diesel, and limited operation are the principle $PM_{2.5}$ control technologies installed on large diesel-fired engines. The lowest $PM_{2.5}$ emission rate in the RBLC is 0.02 g/hp-hr.

Step 1 - Identification of $PM_{2.5}$ Control Technology for the Large Diesel-Fired Engines

From research, the Department identified the following technologies as available for control of $PM_{2.5}$ emissions diesel-fired engines rated at 500 hp or greater:

(a) Diesel Particulate Filter (DPF)
DPF is a control technology that are designed to physically filter particulate matter from the exhaust stream. Several designs exist which require cleaning and replacement of the filter media after soot has become caked onto the filter media. Regenerative filter designs are also available that burn the soot on a regular basis to regenerate the filter media. The Department considers DPF a technically feasible control technology for the large diesel-fired engines.

(b) Positive Crankcase Ventilation
Positive crankcase ventilation is the process of re-introducing the combustion air into the cylinder chamber for a second chance at combustion after the air has seeped into and collected in the crankcase during the downward stroke of the piston cycle. This process allows any unburned fuel to be subject to a second combustion opportunity. Any combustion products act as a heat sink during the second pass through the piston, which will lower the temperature of combustion and reduce the thermal NOx formation. Positive crankcase ventilation is included in the design of EU 8. The Department considers positive crankcase ventilation a technically feasible control technology for the large diesel-fired engines.

(c) Low Ash Diesel
Residual fuels and crude oil are known to contain ash forming components, while refined fuels are low ash. Fuels containing ash can cause excessive wear to equipment and foul engine components. EU 8 is fired exclusively on distillate fuel which is a form of refined fuel. The potential $PM_{2.5}$ emissions are based on emission factors for distillate fuel. EU 8 is capable of firing either diesel or heavy fuel oil (non-low ash fuel) according to manufacturer specifications. The Department considers low ash diesel as a technically feasible control technology for the large diesel-fired engines.

(d) Federal Emission Standards
The NSPS 40 CFR 60 Subpart IIII applies to stationary compression ignition internal combustion engines that are manufactured or reconstructed after July 11, 2005. EU 8 was manufactured prior to July 11, 2005 and has not been reconstructed since. Therefore, EU 8 is not subject to NSPS Subpart IIII. EU 8 is considered an institutional emergency engine and is therefore exempt from NESHAP 40 CFR 63 Subpart ZZZZ. For these reasons federal emission standards will not be carried forward as a control technology for EU 8. EU 35 was installed in 2019 and is subject to the requirements of 40 C.F.R. 60 Subpart IIII, which is considered the baseline level of control for this emission unit.

(e) Limited Operation
EU 8 currently operates under a combined annual NOx emission limit with EU 4. Limiting the operation of emissions units reduces the potential to emit of those units. EU 35 is regulated under NSPS Subpart IIII requirements for emergency engines, which limits non-emergency operating hours. Therefore, the Department considers limited operation a technically feasible control technology for the large diesel-fired engines.

(f) Good Combustion Practices
The theory of GCPs was discussed in detail in the $PM_{2.5}$ BACT section for the large dual fuel-fired boiler and will not be repeated here. Proper management of the combustion process will result in a reduction of $PM_{2.5}$ emissions. The Department considers GCPs a technically feasible control technology for the large diesel-fired engines.

Step 2 - Eliminate Technically Infeasible $PM_{2.5}$ Control Technologies for the Large Engines
As explained in Step 1 of Section 4.4, the Department does not consider meeting the federal emission standards as a technically feasible technology to control $PM_{2.5}$ emissions from EU 8.

Additionally, EU 8 is equipped with SCR for controlling NOx emissions, which creates a backpressure. This backpressure does not allow for the operation of a DPF. Therefore, a DPF is not a technically feasible $PM_{2.5}$ control option for EU 8. The use of a DPF and federal emissions standards remains as effective control options for EU 35.

Step 3 - Rank the Remaining $PM_{2.5}$ Control Technologies for the Large Diesel-Fired Engines
The following control technologies have been identified and ranked by efficiency for the control of $PM_{2.5}$ emissions from the large diesel-fired engines:

(a)	Diesel Particulate Filter	(85 – 90% Control)
(f)	Good Combustion Practices	(Less than 40% Control)
(b)	Positive Crankcase Ventilation	(~10% Control)
(c)	Low Ash/Sulfur Diesel	(~20% Control)
(f)	Limited Operation	(0% Control)
(d)	Federal Emission Standards	(0% Control)

Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF proposes the following as BACT for $PM_{2.5}$ emissions from the large diesel-fired engine EU 8:[18]

(a) $PM_{2.5}$ emissions from EU 8 shall be controlled by operating with positive crankcase ventilation;

(b) $PM_{2.5}$ emissions from EU 8 shall not exceed 0.32 g/hp-hr (3-hour average);

(c) EU 8 shall combust only low ash diesel; and

(d) $PM_{2.5}$ emissions from EU 8 will be limited by complying with the combined annual NOx emission limit of 40 tons per 12 month rolling period for EUs 4 and 8.

Department Evaluation of BACT for $PM_{2.5}$ Emissions from the Large Diesel-Fired Engines:
Because EU 8 cannot operate with a DPF due to the unacceptable increase in backpressure that the DPF would cause, UAF has proposed the top level of $PM_{2.5}$ controls for the engine. However, for EU 35 a DPF is a technically feasible control option. EU 35 has potential $PM_{2.5}$ emissions of 0.03 tpy, which is an order of magnitude lower than the two other diesel engines EUs 26 and 27 that the Department found DPFs to be economically infeasible in Table's 4-13 and 4-14. Therefore, an economic analysis for implementing DPF on EU 35 would result in an even higher cost effectiveness value. The Department notes that EU 35 is limited to 100 hours per calendar year of non-emergency operation and required to combust ULSD under the existing federal NSPS Subpart IIII requirements.

[18] EU ID 35 was added to the stationary source after the initial submittal of BACT proposals by UAF.

Step 5 - Selection of $PM_{2.5}$ BACT for the Large Diesel-Fired Engines

The Department's finding is that the BACT for $PM_{2.5}$ emissions from the large diesel-fired engines is as follows:

(a) $PM_{2.5}$ emissions from EUs 8 and 35 shall be controlled by operating positive crankcase ventilation, maintaining good combustion practices by following the manufacturer's operation and maintenance procedures, and combusting ULSD at all times the EUs are in operation;

(b) Limit non-emergency operation of EUs 8 and 35 to no more than 100 hours per year;

(c) Combined NOx emissions from EUs 4 and 8 shall not exceed 40 tons per rolling 12-month period;

(d) $PM_{2.5}$ emissions from EU 8 shall not exceed 0.32 g/hp-hr[19] over a 3-hour period; and

(e) $PM_{2.5}$ emissions from EU 35 shall not exceed 0.05 g/hp-hr over a 3-hour period.

Table 4-10 lists the BACT determination for this facility along with those for other diesel-fired engines rated at more than 500 hp located in the Serious $PM_{2.5}$ nonattainment area.

Table 4-10. Comparison of $PM_{2.5}$ BACT for the Large Diesel-Fired Engine at Nearby Power Plants

Facility	Process Description	Capacity	Limitation (*)	Control Method
UAF	Large Diesel-Fired Engines	> 500 hp	0.05 – 0.32 g/hp-hr	Positive Crankcase Ventilation Limited Operation Good Combustion Practices Ultra-Low Sulfur Diesel
Fort Wainwright	Large Diesel-Fired Engines	> 500 hp	0.15 – 0.32 g/hp-hr	Limited Operation Ultra-Low Sulfur Diesel Federal Emission Standards
GVEA North Pole	Large Diesel-Fired Engines	> 500 hp	0.32 g/hp-hr	Limited Operation Good Combustion Practices
GVEA Zehnder	Large Diesel-Fired Engines	> 500 hp	0.32 g/hp-hr	Limited Operation Good Combustion Practices

(*) (3-hour average)

4.5 $PM_{2.5}$ BACT for the Small Diesel-Fired Engines (EUs 24, 26, 27, 29, and 34)

Possible $PM_{2.5}$ emission control technologies for small engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 17.210, Small Internal Combustion Engines (<500 hp). The search results for small diesel-fired engines are summarized in Table 4-11.

[19] Emission factor from AP-42 Table 3.4-1 (0.0007 lb/hp-hr) converted to g/hp-hr

Table 4-11. RBLC Summary for $PM_{2.5}$ Control for the Small Diesel-Fired Engine

Control Technology	Number of Determinations	Emission Limits (g/hp-hr)
Federal Emission Standards	3	0.15
Good Combustion Practices	19	0.15 – 0.4
Limited Operation	7	0.15 – 0.17
Low Sulfur Fuel	7	0.15 – 0.3
No Control Specified	14	0.02 – 0.09

RBLC Review

A review of similar units in the RBLC indicates low ash/sulfur diesel, compliance with federal emission standards, limited operation, and good combustion practices are the principle $PM_{2.5}$ control technologies installed on small diesel-fired engines. The lowest $PM_{2.5}$ emission rate listed in the RBLC is 0.02 g/hp-hr.

Step 1 - Identification of $PM_{2.5}$ Control Technology for the Small Diesel-Fired Engines

From research, the Department identified the following technologies as available for control of $PM_{2.5}$ emissions from the diesel-fired engines rated at 500 hp or less:

(a) Diesel Particulate Filter
The theory behind DPF was discussed in detail in the $PM_{2.5}$ BACT for the large diesel-fired engine and will not be repeated here. The Department considers DPF a technically feasible control technology for the small diesel-fired engines.

(b) Low Ash Diesel
Residual fuels and crude oil are known to contain ash forming components, while refined fuels are low ash. Fuels containing ash can cause excessive wear to equipment and foul engine components. The Department considers low ash diesel a technically feasible control technology for the small diesel-fired engines.

(c) Federal Emission Standards
The theory behind federal emission standards for the small diesel-fired engine was discussed in detail in the $PM_{2.5}$ BACT section for the large diesel-fired engines and will not be repeated here. The Department considers federal emission standards a technically feasible control technology for the small diesel-fired engines.

(d) Limited Operation
The theory behind limited operation for the small diesel-fired engine was discussed in detail in the $PM_{2.5}$ BACT section for the large diesel-fired engine and will not be repeated here. The Department considers limited operation a technically feasible control technology for the small diesel-fired engines.

(e) Good Combustion Practices
The theory of GCPs was discussed in detail in the $PM_{2.5}$ BACT section for the large dual fuel-fired boiler and will not be repeated here. Proper management of the combustion process will result in a reduction of $PM_{2.5}$ emissions. The Department considers GCPs a technically feasible control technology for the small diesel-fired engines.

Step 2 - Eliminate Technically Infeasible $PM_{2.5}$ Control Technologies for the Small Engines
All identified control technologies are technically feasible for the small diesel-fired engines.

Step 3 - Rank the Remaining $PM_{2.5}$ Control Technologies for the Small Diesel-Fired Engines
The following control technologies have been identified and ranked by efficiency for the control of $PM_{2.5}$ emissions from the small diesel-fired engines:

(a) Diesel Particulate Filter (85% - 90% Control)
(b) Low Ash/ Sulfur Diesel (25% Control)
(e) Good Combustion Practices (Less than 40% Control)
(c) Federal Emission Standards (0% Control)
(d) Limited Operation (0% Control)

Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF provided an updated economic analysis on August 16, 2023, for the installation of a DPF on EU 27. The updated cost analysis included a new annual interest rate of 8.5% and a 20-year equipment life, as well as a new capital investment value of $78,210. The updated capital investment value for a DPF was provided by NC Power Systems on April 14, 2023, and replaces the old quote from a preliminary vendor that was obtained in 2015. UAF did not include direct annual costs, including operating labor, maintenance labor, and maintenance materials. Therefore, they note that their cost estimate is considered conservatively low. A summary of the analysis is shown below:

Table 4-12. UAF Economic Analysis for Technically Feasible $PM_{2.5}$ Controls

Control Alternative	Potential to Emit (tpy)	Emission Reduction (tpy)	Total Capital Investment ($)	Total Annualized Costs ($/year)	Cost Effectiveness ($/ton)
DPF	0.36	0.31	$78,210	$8,115	$26,539
Capital Recovery Factor = 0.1038 (8.25% interest rate for a 20-year equipment life)					

UAF contends that the economic analysis indicates the level of $PM_{2.5}$ reduction does not justify the use of DPF for EU 27 based on the excessive cost per ton of $PM_{2.5}$ removed per year.

UAF proposes the following as BACT for $PM_{2.5}$ emissions from the small diesel-fired engine EU 27:

(a) $PM_{2.5}$ emissions from EU 27 will be controlled by limiting the operation to no more than 4,380 hours per 12-month rolling period;

(b) Comply with the federal emission standards of NSPS Subpart IIII, Tier 3; and

(c) $PM_{2.5}$ emissions from EU 27 will not exceed 0.15 g/hp-hr.

Department Evaluation of BACT for $PM_{2.5}$ Emissions from the Small Diesel-Fired Engines

The Department revised the updated cost analysis provided by UAF for the installation of a DPF on EU 27. In addition, the Department added a new cost analysis for the installation of DPF on EU 26, which has the highest baseline emissions of the various small diesel-fired engines at UAF. The Department used the updated NC Power Systems capital investment quote of $78,210 for both engines, updated the annual interest rate to the current bank prime interest rate of 8.5%, updated the potential emissions to those found in the TAR of Minor Permit AQ0316MSS08 and assumed a maximum control efficiency of 90%, and left the 20-year equipment life unchanged for EU 27 and assumed a 15-year equipment life for EU 26. The Department notes that emissions for EU 26 and EU 27 are calculated at 8,760 and 4,380 hours per year respectively. Therefore, the estimated equipment life of 15 and 20 years is a conservative estimate considering EPA's estimate of the typical lifespan of a DPF is 10,000 hours or more.[20] The Department also excluded annual costs related to labor and maintenance of the DPF, which continues the trend of ensuring a conservatively low-cost estimate. A summary of the analyses are shown below:

Table 4-13. Department's Economic Analysis for Technically Feasible $PM_{2.5}$ Controls on EU 26

Control Alternative	Potential to Emit (tpy)	Emission Reduction (tpy)	Capital Cost ($)	Total Annualized Costs ($/year)	Cost Effectiveness ($/ton)
DPF	0.61	0.55	$78,210	$9,418	$17,099
Capital Recovery Factor = 0.1204 (8.5% interest rate for a 15-year equipment life)					

Table 4-14. Department Economic Analysis for Technically Feasible $PM_{2.5}$ Controls on EU 27

Control Alternative	Potential to Emit (tpy)	Emission Reduction (tpy)	Capital Cost ($)	Total Annualized Costs ($/year)	Cost Effectiveness ($/ton)
DPF	0.45	0.41	$78,210	$8,265	$20,271
Capital Recovery Factor = 0.1057 (8.5% interest rate for a 20-year equipment life)					

The Department's economic analyses indicate that the level of $PM_{2.5}$ reduction does not justify the use of a DPF for the control of $PM_{2.5}$ emissions from the small diesel-fired engines EUs 24, 26, 27, 29, and 34.

Step 5 - Selection of $PM_{2.5}$ BACT for the Small Diesel-Fired Engines

The Department's finding is that BACT for $PM_{2.5}$ emissions from the small diesel-fired engines is as follows:

[20] EPA's May 2010 technical bulletin on diesel particulate filters, EPA-420-F-10-029: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjI95b27vOAAxWyMn0KHb4kCn0QFnoECBsQAQ&url=https%3A%2F%2Fwww.epa.gov%2Fsites%2Fdefault%2Ffiles%2F2016-03%2Fdocuments%2F420f10029.pdf&usg=AOvVaw0i3wXeZ0Jd1oAbcVnvTnPQ&opi=89978449.

(a) Limit operation of EU 27 to no more than 4,380 hours per 12-month rolling period;

(b) Limit non-emergency operation of EUs 24, 29, and 34 to no more than 100 hours per year each;

(c) Maintain good combustion practices by following the manufacturer's operational and maintenance procedures at all times of operation; and

(d) EUs 27 and 34 shall comply with the federal emission standards of NSPS Subpart IIII, Tier 3 listed in Table 4-15.

Table 4-15. Determination of $PM_{2.5}$ BACT Limits for the Small Diesel-Fired Engines

EU	Year	Description	Size	Status	BACT Limit	Proposed BACT
~~26~~[1]	~~1987~~	~~Mitsubishi-Bosh~~	~~64 hp~~	~~AP-42 Table 3.3-1~~	~~1.0 g/hp-hr~~	~~Good Combustion Practices~~
27	2013	Caterpillar C-15	500 Hp	Certified Engine	0.19 g/hp-hr	Limit Operation to 4,380 hours per year and Good Combustion Practices
24	2001	Cummins	72 hp	AP-42 Table 3.3-1	1.0 g/hp-hr	Limit Operation for non-emergency use (100 hours each per year) and Good Combustion Practices
29	2013	Cummins	314 hp	Certified Engine	0.023 g/hp-hr	
34	2015	Cummins	324 hp	Certified Engine	0.19 g/hp-hr	

[1] As of March 23, 2023, UAF reported to EPA that EU 26 has been permanently removed from service at the stationary source. However, the Department left the EU in the BACT determination because it had already performed a cost analysis for DPF on this EU and relied upon it to show that DPF's are not cost effective for lesser emitting units. The Department has however removed this EU from Minor Permit AQ0316MSS08 Rev. 1.

Table 4-16 lists the BACT determination for this facility along with those for other diesel-fired engines rated at less than 500 hp located in the Serious $PM_{2.5}$ nonattainment area.

Table 4-16. Comparison of $PM_{2.5}$ BACT for the Small Engines at Nearby Power Plants

Facility	Process Description	Capacity	Limitation	Control Method
UAF	Small Diesel-Fired Engines	< 500 hp	**<u>0.023</u>** – 1.0 g/hp-hr	Good Combustion Practices Limited Operation
Fort Wainwright	Small Diesel-Fired Engines	< 500 hp	0.015 – 1.0 g/hp-hr	Good Combustion Practices Limited Operation

4.6 $PM_{2.5}$ BACT for the Pathogenic Waste Incinerator (EU 9A)

Possible $PM_{2.5}$ emission control technologies for waste incinerators were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 21.300 for Hospital, Medical and Infectious Waste Incinerators. The search results for pathogenic waste incinerators are summarized in Table 4-17.

Table 4-17. RBLC Summary of $PM_{2.5}$ Control for Pathogenic Waste Incinerator

Control Technology	Number of Determinations	Emission Limits (lb/hr)
Multiple Chamber Design	1	0.0400

RBLC Review
A review of similar units in the RBLC indicates multiple chamber design is the principle $PM_{2.5}$ control technology installed on pathogenic waste incinerators. The lowest emission rate listed in the RBLC is 0.0400 lb/hr

Step 1 - Identification of $PM_{2.5}$ Control Technology for the Pathogenic Waste Incinerator
From research, the Department identified the following technologies as available for control of $PM_{2.5}$ emissions from pathogenic waste incinerators:

(a) Fabric Filters
The theory behind fabric filters was discussed in detail in the $PM_{2.5}$ BACT for the large dual fuel-fired boiler and will not be repeated here. The Department considers fabric filters a technically feasible control technology for the pathogenic waste incinerator.

(b) ESPs
The theory behind ESPs was discussed in detail in the $PM_{2.5}$ BACT for the large dual fuel-fired boiler and will not be repeated here. The Department considers ESPs a technically feasible control technology for the pathogenic waste incinerator.

(c) Multiple Chambers
A multiple chamber incinerator introduces the waste material and a portion of the combustion air in the primary chamber. The waste material is combusted in the primary chamber. The secondary chamber introduces the remaining air to complete the combustion of all incomplete combustion products. Many of the volatile organic compounds from waste material are completely combusted in the secondary chamber. Solid waste incinerators can reduce PM_{10} emissions up to 70 percent using multiple chambers. The expectation is that less than 70 percent control of $PM_{2.5}$ would be removed. The Department considers multiple chambers a technically feasible control technology for the pathogenic waste incinerator.

(d) Limited Operation
The theory behind the limited operation for EU 9A was discussed in detail in the $PM_{2.5}$ BACT section for the pathogenic waste incinerator and will not be repeated here. The Department considers limited operation a technically feasible control technology for the pathogenic waste incinerator.

(e) Good Combustion Practices
The theory of GCPs was discussed in detail in the $PM_{2.5}$ BACT section for the large dual fuel-fired boilers and will not be repeated here. Proper management of the combustion process will result in a reduction of $PM_{2.5}$ emissions. The Department considers GCPs a technically feasible control technology for the pathogenic waste incinerator.

Step 2 - Eliminate Technically Infeasible $PM_{2.5}$ Controls for Pathogenic Waste Incinerator
The applicant provided information from the manufacturer of the pathogenic waste incinerator that an ESP is a technically infeasible $PM_{2.5}$ control for the pathogenic waste incinerator due to the high moisture content of the exhaust.

Step 3 - Rank the Remaining $PM_{2.5}$ Control Technologies for the Pathogenic Waste Incinerator
The following control technologies have been identified and ranked by efficiency for the control of $PM_{2.5}$ emissions from the pathogenic waste incinerator:

(a) Fabric Filter (99.9% Control)
(e) Good Combustion Practices (Less than 40% Control)
(c) Multiple Chambers (0% Control)
(d) Limited Operation (0% Control)

Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF provided an economic analysis for the installation of a fabric filter. A summary of the analysis is shown below:

Table 4-18. UAF Economic Analysis for Technically Feasible $PM_{2.5}$ Controls

Control Alternative	Captured Emissions (tpy)	Emission Reduction (tpy)	Capital Cost ($)	Total Annualized Costs ($/year)	Cost Effectiveness ($/ton)
Fabric Filter	0.01	0.24	$1,300,000	$217,011	$761,441
Capital Recovery Factor = 0.1424 (7% interest rate for a 10 year equipment life)					

UAF contends that the economic analysis indicates the level of $PM_{2.5}$ reduction does not justify the use of a fabric filter in conjunction with the multiple chamber design and limited operation based on the excessive cost per ton of $PM_{2.5}$ removed per year.

UAF proposes the following as BACT for $PM_{2.5}$ emissions from the pathogenic waste incinerator:

(a) $PM_{2.5}$ emissions from the operation of EU 9A will be controlled with a multiple chamber design and by limiting operation to no more than 109 tons of waste combusted per 12-month rolling period;

(b) $PM_{2.5}$ emissions from EU 9A shall not exceed 4.67 lb/ton; and

(c) Compliance with the operating hours limit will be demonstrated by monitoring and recording the weight of waste combusted on a monthly basis.

Step 5 - Selection of $PM_{2.5}$ BACT for the Pathogenic Waste Incinerator
The Department's finding is that BACT for $PM_{2.5}$ emissions from the pathogenic waste incinerator is as follows:

(a) $PM_{2.5}$ emissions from EU 9A shall be equipped with a multiple chamber design;

(b) Total PM emissions from EU 9A shall not exceed 4.67 lb/ton;[21]

(c) Limit the operation of EU 9A to 109 tons of waste combusted per 12-month rolling period; and

(d) Maintain good combustion practices at all times by following the manufacturer's operation and maintenance procedures.

Table 4-19 lists the BACT determination for this facility along with those for other waste incinerators located in the Serious $PM_{2.5}$ nonattainment area.

Table 4-19. Comparison of $PM_{2.5}$ BACT for Pathogenic Waste Incinerators at Nearby Power Plants

Facility	Process Description	Capacity	Limitation	Control Method
UAF	One Pathogenic Waste Incinerator	83 lb/hr	4.67 lb/ton 109 tons of waste per 12-month period	Multiple Chambers Good Combustion Practices Limited Operation

4.7 $PM_{2.5}$ BACT for the Material Handling Units (EUs 105, 107, 109 through 111, 114, and 128 through 130)

Possible $PM_{2.5}$ emission control technologies for material handling were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process codes 99.100 - 190, Fugitive Dust Sources. The search results for material handling units are summarized in Table 4-20.

Table 4-20. $PM_{2.5}$ Control for Material Handling Units

Control Technology	Number of Determinations	Emission Limits
Fabric Filter / Baghouse	10	0.05 gr/dscf
Electrostatic Precipitator	3	0.032 lb/MMBtu
Wet Suppressants / Watering	3	29.9 tpy
Enclosures / Minimizing Drop Height	4	0.93 lb/hr

RBLC Review

A review of similar units in the RBLC indicates good operational practices, enclosures, fabric filters, and minimizing drop heights are the principle $PM_{2.5}$ control technologies for material handling operations.

Step 1 - Identification of $PM_{2.5}$ Control Technology for the Material Handling Units

From research, the Department identified the following technologies as available for $PM_{2.5}$ control of the material handling units:

(a) Fabric Filters

[21] AP-42 Table 2.3-2. Emission factors for total particulate matter, lead, and TOC for controlled air medical waste incinerators for uncontrolled devices

The theory behind fabric filters was discussed in detail in the $PM_{2.5}$ BACT for the large dual fuel-fired boiler and will not be repeated here. The Department considers fabric filters a technically feasible control technology for EUs 105, 107, 109, 110, 114, and 128 through 130. The ash unloading to disposal trucks (EU 111) occurs in a building with large doors. During ash unloading the doors remain closed to prevent the release of fugitive emissions. Therefore, the Department does not consider a fabric filter a technically feasible control technology for EU 111.

(b) Scrubbers
The theory behind scrubbers was discussed in detail in the $PM_{2.5}$ BACT for the large dual fuel-fired boiler and will not be repeated here. The Department considers scrubbers a feasible control technology for the material handling units, except for EU 111. EU 111 does not have collected emissions and therefore a scrubber is not considered a technically feasible control technology.

(c) Suppressants
The use of dust suppression to control particulate matter can be effective for stockpiles and transfer points exposed to the open air. Applying water or a chemical suppressant can bind the materials together into larger particles which reduces the ability to become entrained in the air either from wind or material handling activities. The Department considers the use of suppressants a technically feasible control technology for all of the material handling units.

(d) Enclosures
An enclosure prevents the release of fugitive emissions into the ambient air by confining all fugitive emissions within a structure and preventing additional fugitive emissions from being generated from winds eroding stockpiles and lifting particulate matter from conveyors. Often enclosures are paired with fabric filters. The RBLC does not identify a control efficiency for an enclosure that is not associated with another control option. The Department considers enclosures a technically feasible control technology for the material handling units.

(e) Wind Screens
A wind screen is similar to a solid fence which is used to lower wind velocities near stockpiles and material handling sites. As wind speeds increase, so do the fugitive emissions from the stockpiles, conveyors, and transfer points. The use of wind screens is appropriate for materials not already located in enclosures. Due to all of the material handling units being operated in enclosures the Department does not consider wind screens a technically feasible control option for the material handling units.

(f) Vents/Closed System Vents/Negative Pressure Vents
Vents can control fugitive emissions by collecting fugitive emissions from enclosed loading, unloading, and transfer points and then venting emissions to the atmosphere or back into other equipment such as a storage silo. Other vent control designs include enclosing emission units and operating under a negative pressure. The Department considers vents to be a technically feasible control technology for the material handling

units, except for EU 111. EU 111 does not have collected emissions and the vent system would be ineffective when trucks enter and depart the loading area.

Step 2 - Eliminate Technically Infeasible $PM_{2.5}$ Controls for the Material Handling Units
As explained in Step 1 of Section 4.7, the Department does not consider fabric filters, scrubbers, and vents as technically feasible $PM_{2.5}$ control technologies for EU 111. The Department does not consider wind screens as technically feasible $PM_{2.5}$ control technologies for the material handling units.

Step 3 - Rank the Remaining $PM_{2.5}$ Control Technologies for the Material Handling Units
The following control technologies have been identified and ranked for control of particulates from the material handling equipment:

(a)	Fabric Filters	(50 - 99% Control)
(d)	Enclosures	(50 - 99% Control)
(b)	Scrubber	(50% - 99% Control)
(e)	Cyclone	(20% - 70% Control)
(c)	Suppressants	(less than 90% Control)
(f)	Vents	(less than 90% Control)

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF proposes the following as BACT for $PM_{2.5}$ emissions from the material handling units:

(a) $PM_{2.5}$ emissions from EUs 105, 107, 109 through 111, 114, and 128 through 130 will be controlled by enclosing each EU.

(b) $PM_{2.5}$ emissions from the operation of the material handling units, except EU 111, will be controlled by installing, operating, and maintaining fabric filters and vents.

(c) $PM_{2.5}$ emissions from EUs 105, 107, 109, 110, and 128 through 130 shall not exceed 0.003 gr/dscf.

(d) $PM_{2.5}$ emissions from EU 111 shall not exceed $5.5x10^{-5}$ lb/ton.

(e) $PM_{2.5}$ emissions from EU 114 shall not exceed 0.05 gr/dscf.

Step 5 - Selection of $PM_{2.5}$ BACT for the Material Handling Units
The Department's finding is that BACT for $PM_{2.5}$ emissions from the material handling equipment is as follows:

(a) $PM_{2.5}$ emissions from EUs 105, 107, 109 through 111, 114, and 128 through 130 will be controlled by enclosing each EU;

(b) $PM_{2.5}$ emissions from the operation of the material handling units, except EU 111, will be controlled by installing, operating, and maintaining fabric filters and vents; and

(c) Comply with the numerical emission limits listed in Table 4-21:

Table 4-21. $PM_{2.5}$ BACT Control Technologies for the Material Handling Units

EU ID	Process Description	Capacity	Limitation	Control Method
105, 107, 109, 110, & 128 - 130	7 Material Handling Units	Varies	0.003 gr/dscf (*)	Fabric Filter & Enclosure & Vent
111	Ash Loadout to Truck	N/A	5.50E-05 lb/ton	Enclosure
114	Dry Sorbent Handing Vent Filter Exhaust	5 acfm	0.05 gr/dscf (*)	Fabric Filter & Enclosure & Vent

(*) 3-hour average.

5. BACT DETERMINATION FOR SO_2

The Department based its SO_2 assessment on BACT determinations found in the RBLC, internet research, and BACT analyses submitted to the Department by GVEA for the North Pole Power Plant and Zehnder Facility, Aurora for the Chena Power Plant, US Army for Fort Wainwright, and UAF for the University of Alaska Fairbanks Campus.

5.1 SO_2 BACT for the Large Dual Fuel-Fired Boiler (EU 113)

Possible SO_2 emission control technologies for the large dual fuel-fired boiler were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 11.110, Coal Combustion in Industrial Size Boilers and Furnaces. The search results are summarized in Table 5-1.

Table 5-1: RBLC Summary of SO_2 Control for Industrial Coal-Fired Boilers

Control Technology	Number of Determinations	Emission Limits (lb/MMBtu)
Flue Gas Desulfurization / Scrubber / Spray Dryer	10	0.06 – 0.12
Limestone Injection	10	0.055 – 0.114
Low Sulfur Coal	4	0.06 – 1.2

RBLC Review
A review of similar units in the RBLC indicates flue gas desulfurization and low sulfur coal are the principle SO_2 control technologies installed on large dual fuel-fired boilers. The lowest SO_2 emission rate in the RBLC is 0.055 lb/MMBtu.

Step 1 - Identification of SO_2 Control Technology for the Large Dual Fuel-Fired Boiler
From research, the Department identified the following technologies as available for control of SO_2 emissions from the large dual fuel-fired boiler:

(a) Flue Gas Desulfurization (FGD)
FGD is a set of technologies used to remove SO_2, acid gases such as hydrogen chloride (HCL), and hazardous air pollutants (e.g., mercury (Hg)), from exhaust flue gases. FGD is a common add-on control technology that uses chemical processes to remove of SO_2 at coal-fired power plants. FGD control systems include wet flue gas desulfurization (WFGD, also called wet scrubbers), spray dry adsorption (SDA), circulating dry scrubber (CDS),

and dry sorbent injection (DSI). These four control technologies are discussed below in detail using information submitted from UAF's BACT analysis and Section 5 – SO_2 and Acid Gas Controls of the EPA Air Pollution Control Cost Manual (EPA CCM).[22]

1. WFGD (Wet Scrubbers)

A Wet FGD system controls SO_2 emissions using solutions containing alkali reagents. Wet FGD systems may use limestone, lime, sodium-based alkaline, or dual alkali-based sorbents. Wet FGD systems can also be categorized as "once-through" or "regenerable" depending on how the waste solids generated are handled. In a once-through system the spent sorbent is disposed as waste. Regenerable systems recycle the sorbent back into the system and recover the salts for sale as byproduct (e.g., gypsum). Regenerable systems have higher capital costs than once-through systems due to the additional equipment required to separate and dry the recovered salts. However, regenerable systems may be the best option for plants where disposal options are limited or nearby markets for byproducts are available.

Most WFGD systems use a limestone slurry sorbent which reacts with the SO_2 and falls to the bottom of the absorber tower where it is collected. Wet FGD systems generally have the highest control efficiencies. New wet FGD systems can achieve SO_2 removal of 99% and HCl removal of over 95%. Packed tower wet FGD systems may achieve efficiencies as high as 99.9% for some pollutant-solvent systems.[23]

WFGD systems are typically located downstream of any particle collection system (baghouse, electrostatic precipitator) and the induced draft fan. WFGD systems are typically located immediately before the flue gas stack. This location allows for fly ash to be removed prior to the absorber thus reducing the amount of solids collected by the falling slurry. This configuration also allows for a "dry" induced draft fan, saving significant capital and maintenance costs given the conditions of the flue gas stream leaving the absorber.

A wet flue gas desulfurization system has a significant amount of auxiliary equipment in addition to the absorber and slurry recirculation system. This equipment varies greatly between plants depending on the specific needs of the plant and the availability of different forms of the reagents being used. In general, the auxiliary equipment necessary to store, prepare, and handle the reagent includes dry reagent storage silos, weigh feeders, mills, classifiers, and blowers. Spent reagent is typically collected as a slurry from the reservoir and dewatered using vacuum table filters, or similar equipment. The waste solids are either then transported to a landfill or sold for secondary uses (such as in the manufacture of wallboard). The water recovered from the spent reagent is reused in

[22] EPA Air Pollution Control Cost Manual and associated and associated cost spreadsheets are available at the following website: https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution.

[23] EPA Air Pollution Control Cost Manual: Section 5 – SO_2 and Acid Gas Controls, Chapter 1, Page 1-9: https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution#cost%20manual.

the process to the extent possible. However, a portion of the water must be purged and replaced with fresh water in order to limit the concentrations of chlorides. UAF's analysis assumes that the purged water can be disposed of in the local sewer system, which may not be the case. In the event that the water cannot be disposed of, a zero liquid discharge (ZLD) system will be required. These systems consist of the equipment necessary to concentrate dissolved solids in wastewater streams and then evaporate any remaining water, leaving only solids for disposal.

UAF contacted several vendors to request equipment quotes for a WFGD system on EU 113. UAF was not able to obtain any vendor quotes for appropriate WFGD system equipment. UAF stated that vendors were unwilling to provide estimates and did not understand the rationale for potentially installing WFGD on a CFB boiler with limestone injection that already controls SO_2 emissions. Vendors indicated that a WFGD would not be practical or cost-effective. UAF and its consultants also believe that vendors were unwilling or unable to provide a study-level cost estimate for WFGD equipment because the vendors did not have an existing design for a system sized appropriately for EU 113 which is small when compared to typical coal-fired boilers at utility power plants. UAF stated that developing a study-level cost estimate would have required the investment of significant resources, which the vendors appeared to be unwilling to do. UAF noted, the WFGD cost estimating tool that EPA provides as part of the EPA CCM[24]is intended for boilers that are at least three times the size of EU 113. The lack of vendor input raises doubts as to whether UAF would realistically be able to procure a WFGD system for EU 113 if ultimately required to do so. Given this lack of vendor response, UAF is hesitant to consider WFGD as an available SO_2 emission control technology at this time. However, for the sake of completeness, UAF provided a cost analysis for WFGD using the EPA CCM "Wet and Dry Scrubbers and Acid Gas Control Cost Calculation Spreadsheet."[24] The Department considers WFGD to be a technologically feasible control technology for EU 113.

2. Spray Dry Absorbers (SDA, AKA Dry Lime FGD)
Spray Dry Absorbers are gas absorbers in which a small amount of water is mixed with the sorbent. Lime (CaO) is usually the sorbent used in the spray drying process, but hydrated lime ($Ca(OH)_2$) is also used and can provide greater SO_2 removal. Slurry consisting of lime and recycled solids is atomized/sprayed into the absorber. The SO_2 in the flue gas is absorbed into the slurry and reacts with the lime and fly ash alkali to form calcium salts. The scrubbed gas then passes through a particulate control downstream of the spray drier where additional reactions and SO_2 removal may occur, especially in the filter cake of a fabric filter (baghouse). Spray dryers can achieve SO_2 removal efficiencies up to 95%,[25] depending on the type of coal burned.

[24] EPA Air Pollution Control Cost Manual: https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution#cost%20manual
[25] EPA Air Pollution Control Cost Manual: Section 5 – SO_2 and Acid Gas Controls, Chapter 1, Table 1.3: https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution#cost%20manual.

UAF was unable to obtain any vendor quotes for an SDA system for EU 113. UAF stated that vendors indicated that a CDS system would likely have similar costs to an SDA system but provide more effective SO_2 removal. UAF therefore concluded that control system equipment vendors do not appear to provide new SDA systems at this time. The lack of positive vendor input raises doubts as to whether UAF would realistically be able to procure an SDA system for EU 113 if ultimately required to do so. Based on this vendor information, UAF is hesitant to consider SDA as an available SO_2 emission control technology at this time. Considering that UAF did not submit vendor quote for SDA controls because CDS control technology offers a higher SO_2 removal efficiency at a lower price point, the Department agrees with UAF's assessment that SDA is now technologically obsolete for EU 113 and therefore technologically infeasible.

3. Circulating Dry Scrubbers (CDS)
Similar to other dry flue gas desulfurization systems, the CDS system is located after the air preheater, and byproducts from the system are collected in an integrated fabric filter. Unlike the SDA systems, a CDS system is considered a circulating fluidized bed of hydrated lime reagent to remove SO_2 rather than an atomized lime slurry; however, similar chemical reaction kinetics are used in the SO_2 removal process. In a CDS system, flue gas is treated in type of Dry Lime FGD system in which the waste gas stream passes through an absorber vessel where the flue gas stream flows through a fluidized bed of hydrated lime and recycled byproduct. Water is injected into the absorber through a venturi located at the base of the absorber for temperature control. Flue gas velocity through the vessel is maintained to keep the fluidized bed of particles suspended in the absorber. Water sprayed into the absorber cools the flue gas from approximately 300° F at the inlet to the scrubber to approximately 160° F at the outlet of the fabric filter. The hydrated lime absorbs SO_2 from the gas and forms calcium sulfite and calcium sulfate solids. The desulfurized flue gas passing out of the absorber contains solid sorbent mixed with the particulate matter, including reaction products, unreacted hydrated lime, calcium carbonate, and fly ash. The solid sorbent and particulate matter are collected by the fabric filter. CDS can achieve over 98% reduction in SO_2 and other acid gases. [26]

UAF obtained cost estimates for the installation of a CDS control system from Andritz, Babcock Power Environmental Inc. (BPE), and Tri-Mer Corporation (Tri-Mer). Of the three proposals, the Andritz proposal was the most complete. The Tri-Mer proposal was a similar price to Andritz and also provided significant amounts of information. The BPE proposal appeared to be the low bid, but the price was provided in 2017 dollars. The final annual 2021 CEPCI value of 708.0 was used to escalate the BPE price to current day dollars, resulting in the BPE offering being significantly more expensive than the other two quotes. Given the similar pricing between Andritz and Tri-Mer, UAF chose the Andritz system as the quotation to be used in the cost-effectiveness evaluation because the Andritz system did not require consuming any sorbent and so would represent the lowest overall cost. Quoted SO_2 removal efficiencies were similar across the three

[26] EPA Air Pollution Control Cost Manual: Section 5 – SO_2 and Acid Gas Controls, Chapter 1, Page 1-11: https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution#cost%20manual.

proposals. All three OEMs provided removal efficiencies that were slightly lower than the typical values in the EPA CCM[24], largely because of the very low influent concentration of SO_2. As influent concentrations declines, sorbent particles have more difficulty interacting with the SO_2 molecules and the overall capture efficiency declines. Therefore SO_2 removal efficiency was calculated at 90% for the CDS. The Department considers CDS to be a technologically feasible control technology for EU 113.

4. Dry Sorbent Injection (DSI)
Unlike the three other FGD systems, dry sorbent injection (DSI) is not a stand-alone, add-on air pollution control system but a modification to the combustion unit or ductwork. DSI systems inject a powdered alkaline reagent directly into the flue gas duct ahead of the particle collection device. Where hydrated lime is used as the reagent, the addition of water may be necessary to complete the chemical reaction. These reagents react with the sulfur (and other acid gases) in-flight and on the surfaces of the particle collection device. The products of reaction, unreacted reagent, and fly ash are collected at the bottom of the particle collection device and disposed of through the plants fly ash collection system. Reagents typically utilized in DSI systems include hydrated lime, Trona, and sodium bicarbonate. According to the EPA CCM[27] DSI can achieve SO_2 control efficiencies ranging from 50 to 70% and has been used in power plants, biomass boilers, and industrial applications (e.g., metallurgical industries). However, Solvay, a supplier of sodium bicarbonate and trona based sorbent material for DSI systems, commented on the Fairbanks $PM_{2.5}$ Serious Nonattainment SIP indicating that they have received vendor quotes stating that a 95% reduction in SO_2 emissions can be achieved on coal fired boilers in Alaska. UAF's updated vendor quotes include a 90% control efficiency for DSI via Tri-Mer, and 85% control efficiency via BACT, Inc. The Department considers DSI to be a technologically feasible control technology for EU 113.

(b) Fluidized Bed Limestone Injection (FBLI)
FBLI is considered separate from the other FGD control technologies because the limestone is injected into the boiler as part of the combustion process, as opposed to being injected into the flue gas after the combustion process has been completed. Section 5 (SO_2 and Acid Gas Controls) of the EPA CCM[24] includes a section on FBLI that specifically references EU 113 at the University of Alaska Fairbanks. FBLI is also considered an integral part of the design of EU 113. The FBLI process involves crushed coal and a fluidizing materials such as ground limestone, along with recirculated ash, which are suspended in the boiler by an upward stream of hot air. The coal is combusted in this fluidized mixture. The limestone reacts with SO_2 to form solids (effectively gypsum) that can be captured by the baghouse. FBLI is an available control technology and is already in use on EU 113. The circulating fluidized bed (CFB) technology of EU 113, including FBLI, is considered the base case for this BACT analysis. The initial baseline emissions rate used in the Permittee's analysis is the existing EU 113 SO_2 PTE of 258.9 tpy, the

[27] EPA Air Pollution Control Cost Manual: Section 5 – SO_2 and Acid Gas Controls, Chapter 1, Page 1-11: https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution#cost%20manual.

rolling 12-month emission limit in Conditions 36.1 and 61.2 of Permit AQ0316TVP03. The limit is based on the New Source Performance Standards (NSPS) SO_2 emission standard of 0.20 pounds per million British thermal unit (lb/MMBtu) in 40 CFR 60.42b(k)(1). As demonstrated by the continuous emissions monitoring system (CEMS) information submitted by the Permittee with their semi-annual reports, the actual SO_2 emission rates have been considerably lower. The Department considers FBLI to be a technologically feasible control technology for EU 113.

(c) Low Sulfur Coal
UAF purchases coal from the Usibelli Coal Mine located in Healy, Alaska. This coal mine is located 115 miles south of Fairbanks. The coal mined at Usibelli is sub-bituminous coal and has a relatively low sulfur content with guarantees of less than 0.4 percent by weight. Usibelli Coal Data Sheets indicate a range of 0.08 to 0.28 percent Gross As Received (GAR) percent Sulfur (%S). According to the U.S. Geological Survey, coal with less than one percent sulfur is classified as low sulfur coal. The Department considers the use of low sulfur coal a technically feasible control technology for the large dual fuel-fired boiler. Because the Permittee already combusts low sulfur coal, this control option represents the baseline emissions rate, or a 0% emissions control.

(d) Good Combustion Practices
The theory of GCPs was discussed in detail in the $PM_{2.5}$ BACT section for the large dual fuel-fired boiler and will not be repeated here. Proper management of the combustion process will result in a reduction of SO_2 emissions. The Department considers GCPs a technically feasible control technology for the large dual fuel-fired boiler.

Step 2 - Eliminate Technically Infeasible SO_2 Controls for the Large Dual Fuel-Fired Boiler
As discussed in Step 1, the Department considers SDA to be technologically infeasible for controlling SO_2 emissions from the large dual fuel-fired boiler at UAF.

Step 3 - Rank the Remaining SO_2 Control Technologies for the Large Dual Fuel-Fired Boiler
The following control technologies have been identified and ranked by efficiency[28] for control of SO_2 emissions from the large dual fuel-fired boiler:

(a-1)	Wet Scrubber	(95% Control)
(a-3)	Circulating Dry Scrubbers	(90% Control)
(a-4)	Dry Sorbent Injection	(85% - 90% Control)
(b)	Fluidized Bed Limestone Injection	(Less than 85% Control)
(d)	Good Combustion Practices	(Less than 40% Control)
(c)	Low Sulfur Coal	(0% Control, Baseline)

Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

[28] In ranking the different control efficiencies, the Department used vendor data provided by UAF for EU 113 in a document titled, "Sulfur Dioxide Best Available Control Technology Analysis for Emission Unit 113, January 2023."

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF provided updated economic analyses on February 21, 2023, for the installation of WFGD, CDS, and DSI control technologies. With the updated analyses, UAF obtained new quotes from vendors for the installation of DSI and CDS and was unable to obtain any vendor quotes for WFGD and SDA as the vendors said that these control technologies would not be cost effective compared to DSI and CDS for EU 113.UAF provided a cost analysis for WFGD using the EPA CCM "Wet and Dry Scrubbers and Acid Gas Control Cost Calculation Spreadsheet."[24] UAF's analyses used control efficiencies of 95% for WFGD, 90 for CDS, 90% for DSI via the Tri-Mer quote, and 85% for DSI via the BACT, Inc. quote. Additionally, UAF also performed an incremental cost analysis for the different SO_2 control technologies. For a particular control technology, the incremental cost analysis compares the difference in total annual cost between that technology and the next lowest-ranked technology and divides that value by the difference in emissions reductions between the two technologies. For this analysis, UAF assumed the baseline emission rates to be the current permit limit of 0.20 lb/MMBtu, with the operation of the coal-fired boiler using FBLI. Summaries of these two analyses are shown below in Table 5-2 for the standard cost effectiveness results and Table 5-3 for the incremental cost-effectiveness results. Both analyses include the name of the vendor who provided the quote for the CDS and DSI control systems.

Table 5-2. UAF Economic Analysis for Technically Feasible SO_2 Controls

Control Alternative	Potential to Emit (tpy)	Emission Reduction (tpy)	Total Capital Investment ($)	Total Annualized Costs ($/year)	Cost Effectiveness ($/ton)
WFGD	258.9	246.0	$52,968,345	$7,589,888	$30,859
CDS (Andritz)	258.9	233.0	$32,505,815	$5,757,437	$24,709
DSI (Tri-Mer)	258.9	233.0	$5,794,396	$5,193,086	$22,287
DSI (BACT, Inc)	258.9	220.1	$11,565,826	$3,121,966	$14,187
Capital Recovery Factor = 0.0847 (7.5% interest rate for a 30-year equipment life)					

Table 5-3. UAF Incremental Economic Analysis for Technically Feasible SO_2 Controls

Control Alternative	Potential to Emit (tpy)	Emission Reduction (tpy)	Total Capital Investment ($)	Total Annualized Costs ($/year)	Incremental Cost Effectiveness ($/ton)
WFGD	258.9	246.0	$52,968,345	$7,589,888	$141,557
CDS (Andritz)	258.9	233.0	$32,505,815	$5,757,437	$203,590
DSI (Tri-Mer)	258.9	233.0	$5,794,396	$5,193,086	$159,994
DSI	258.9	220.1	$11,565,826	$3,121,966	$14,187

(BACT, Inc)					
FBLI – Base	258.9	0.0	0.0	0.0	-
Capital Recovery Factor = 0.0847 (7.5% interest rate for a 30-year equipment life)					

UAF contends that the economic analysis indicates the level of SO_2 reduction does not justify the use of WFGD, CDS, or DSI for the dual fuel-fired boiler based on the excessive cost per ton of SO_2 removed per year. However, UAF has proposed a new enforceable limit for EU 113 which has been achieved in practice at the facility using FBLI.

UAF proposes the following as BACT for SO_2 emissions from the dual fuel-fired boiler:

(a) SO_2 emissions from the operation of EU 113 will be controlled by the operation of FBLI at all times the unit is in operation;

(b) SO_2 emissions from EU 113 will be controlled by burning low sulfur coal at all times the dual fuel-fired boiler is combusting coal; and

(c) SO_2 emissions from EU 113 will not exceed 0.125 lb/MMBtu on 30-day rolling average basis.

Department Evaluation of BACT for SO_2 Emissions from the Dual Fuel-Fired Boiler

The Department revised the cost analyses provided for the installation of wet scrubbers, circulating dry scrubbers, and both dry sorbent injection analyses. For all the analyses, the Department left the 30-year control equipment life unchanged, updated the annual interest rate to 8.5% (current bank prime interest rate), and updated the baseline emissions rate to 0.10 lb/MMBtu. This emissions rate was selected by the Department after evaluating the semi-annual CEMS data for SO_2 emissions from EU 113 for 2022 and 2023. During that time-period, the highest 30-day average rolling emissions occurred during the period of July 1 to December 31 of 2022, with a value of 0.06 lb/MMBtu. The Department chose the SO_2 emissions rates of 0.1 lb/MMBtu after performing a statistical analysis using the highest 30-day average rolling emissions that occurred during each of the semi-annual periods from 2022 through 2023 and using a 99% confidence interval, which resulted in a value of 0.092 lb/MMBtu. The Department rounded up from the 99% confidence interval to a 0.10 lb/MMBtu, which is half of the 0.2 lb/MMBtu existing NSPS Subpart Db limit for EU 113, and matches the limit found on GVEA's Healy EU 2, which is equipped with both DSI and SDA, and is the most stringent SO_2 limit found on a coal-fired boiler in the state of Alaska. The Department notes that UAF proposed a revised SO_2 limit for EU 113 of 0.125 lb/MMBtu in a December 22, 2023, submittal. In UAF's submittal, they noted that EU 113 has had daily average SO_2 emissions as high as 0.564 lb/MMBtu and that the sulfur content of the coal delivered from the Usibelli Coal Mine can vary from 0.08 – 0.28 percent by weight and has averaged 0.129 percent by weight since January 2020. The Department took this into consideration when selecting 0.10 lb/MMBtu as the SO_2 emissions rate. The Department notes that although the daily average emissions rate has been higher than 0.10 lb/MMBtu, that there has been two years' worth of CEMS data that shows an ample margin of compliance with the selected emissions rate on a 30-day rolling basis, which is the averaging period selected for the CEMS equipped EU 113.

Although the Department changed the baseline emissions rate for EU 113, the final controlled emissions rates were left unchanged from the emissions guarantees provided by UAF's vendors, which resulted in a lower assumed control efficiency. No other changes were made to the CDS analysis. For the WFGD analysis, the Department updated the Chemical Engineering Plant Cost Index (CEPCI) to the latest value of 816.0[29] for 2022 prices. Additionally, for the WFGD analysis, in order to demonstrate a conservative approach, the Department used the default values from the EPA CCM for limestone cost, water cost, electricity cost, waste disposal cost, and labor rate. For the two DSI cost analyses, the Department removed the 25% increase in assumed cost for the DSI installation which is accounted for elsewhere in the analysis. Also for the two DSI cost analyses, in order to demonstrate a conservative approach, the Department used the assumed cost percentages from the EPA CCM for the instrumentation, freight, foundations and support, handling and erection, electrical, piping, insulation, painting, engineering, construction and field expenses, contractor fees, start-up, performance tests, contingency, operating and maintenance labor hours, overhead, property tax, and administrative changes and insurance. A summary of the analysis is shown below in Table 5-4.

Table 5-4. Department Economic Analysis for Technically Feasible SO_2 Controls

Control Alternative	Potential to Emit (PTE)	Emission Reduction (tpy)	Total Capital Cost ($)	Total Annualized Costs ($/year)	Cost Effectiveness ($/ton)
WFGD	129.5	116.5	$60,051,550	$7,939,734	$68,137
CDS (Andritz)	129.5	103.6	$32,505,815	$6,029,814	$58,215
DSI (Tri-Mer)	129.5	103.6	$3,668,667	$4,223,707	$40,778
DSI (BACT, Inc)	129.5	90.6	$14,411,039	$3,203,706	$35,349
Capital Recovery Factor = 0.0931 (8.5% interest rate for a 30-year equipment life)					

The Department's economic analysis indicates the level of SO_2 reduction does not justify the use of any additional SO_2 controls as BACT for the dual fuel-fired boiler located in the Serious $PM_{2.5}$ nonattainment area. However, because the Department assumed a different baseline emissions rate for the cost analyses with the operation of FBLI, that is now selected as BACT.

Step 5 - Selection of SO_2 BACT for the Large Dual Fuel-Fired Boiler

The Department's finding is that BACT for SO_2 emissions from the dual fuel-fired boiler is as follows:

(a) SO_2 emissions from EU 113 shall be controlled by operating and maintaining FBLI at all times the unit is in operation;

(b) EU 113 shall not exceed a SO_2 emission rate of 0.10 lb/MMBtu[30] determined on a 30-day rolling average; and

[29] The CEPCI for 2022 is located at the following website: https://toweringskills.com/financial-analysis/cost-indices/.

[30] See the discussion above on how the Department selected an SO_2 emissions rate in Step 4 -Department Evaluation of BACT for SO_2 Emissions from the Dual Fuel-Fired Boiler.

(c) Maintain good combustion practices at all times of operation by following the manufacturer's operating and maintenance procedures.

Table 5-5 lists the SO_2 BACT determination for this facility along with those for other coal-fired boilers in the Serious $PM_{2.5}$ nonattainment area.

Table 5-5. Comparison of SO_2 BACT for Coal-Fired Boilers at Nearby Power Plants

Facility	Process Description	Capacity	Limitation	Control Method[31]
UAF	Dual Fuel-Fired Boiler	295.6 MMBtu/hr	0.10 lb/MMBtu[30]	Fluidized Bed Limestone Injection Good Combustion Practices
Fort Wainwright	6 Coal-Fired Boilers	1,380 MMBtu/hr (combined)	0.04 lb/MMBtu[32]	Dry Sorbent Injection Operational Limit
Chena	4 Coal-Fired Boilers	497 MMBtu/hr (combined)	0.301 lb/MMBtu[33]	Good Combustion Practices

5.2 SO_2 BACT for the Mid-Sized Diesel-Fired Boilers (EUs 3 and 4)

Possible SO_2 emission control technologies for mid-sized diesel-fired boilers were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 12.220, Industrial Size Distillate Fuel Oil Boilers (>100 MMBtu/hr and ≤ 250 MMBtu/hr). The search results for mid-sized diesel-fired boilers are summarized in Table 5-6.

Table 5-6. RBLC Summary of SO_2 Control for Mid-Sized Boilers Firing Diesel

Control Technology	Number of Determinations	Emission Limits (lb/MMBtu)
No Control Specified	2	0.0006

Possible SO_2 emission control technologies for mid-sized diesel-fired boilers were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 12.310, Industrial Size Gaseous Fuel Boilers (>100 MMBtu/hr and ≤ 250 MMBtu/hr). The search results for mid-sized diesel-fired boilers are summarized in Table 5-7.

Table 5-7. RBLC Summary of SO_2 Control for Mid-Sized Boilers Firing Natural Gas

[31] Note that the Department removed the reference to low sulfur coal, which was never selected as part of the top down BACT determination process and is already the only type of coal available to sources in Alaska.
[32] Fort Wainwright and Chena Power Plants SO_2 emission rates are vendor provided emission guarantees.
[33] BACT limit is the average emissions rate from two recent SO_2 source test accepted by the Department, which occurred on November 19, 2011 and July 12, 2019.

Control Technology	Number of Determinations	Emission Limits
Low Sulfur Fuel	2	0.89 - 11.24 (tpy)
Good Combustion Practices	5	0.03 – 0.18 (lb/hr)
No Control Specified	4	0.01 – 0.09 (lb/hr)

RBLC Review
A review of similar units in the RBLC indicates low sulfur fuel and good combustion practices are the principle SO_2 control technologies installed on mid-sized boilers. The lowest SO_2 emission rate listed in the RBLC is 0.0006 lb/MMBtu.

Step 1 - Identification of SO_2 Control Technology for the Mid-Sized Diesel-Fired Boilers
From research, the Department identified the following technologies as available for SO_2 control for the mid-sized diesel-fired boilers:

(a) Ultra Low Sulfur Diesel
ULSD has a fuel sulfur content of 0.0015 percent sulfur by weight or less. Using ULSD would reduce SO_2 emissions because the mid-sized diesel-fired boilers are combusting standard diesel that has a sulfur content of up to 0.5 percent sulfur by weight. Switching to ULSD could reach a great than 99 percent decrease in SO_2 emissions from the mid-sized diesel-fired boilers. The Department considers ULSD a technically feasible control technology for the mid-sized diesel-fired boilers.

(b) Natural Gas
The theory of operating the mid-sized diesel-fired boilers on natural gas was discussed in detail in the NOx BACT for the mid-sized diesel-fired boilers and will not be repeated here. The Department does not consider operating the mid-sized diesel-fired boilers on natural gas as a technically feasible control technology.

(c) Limited Operation
The theory of limited operation for the mid-sized diesel-fired boilers was discussed in detail in the $PM_{2.5}$ BACT section for the mid-sized diesel-fired boilers and will not be repeated here. The Department considers limited operation a technically feasible control technology for the mid-sized diesel-fired boilers.

(d) Good Combustion Practices
The theory of GCPs was discussed in detail in the $PM_{2.5}$ BACT section for the large dual fuel-fired boiler and will not be repeated here. Proper management of the combustion process will result in a reduction of SO_2 emissions. The Department considers GCPs a technically feasible control technology for the mid-sized diesel-fired boilers.

Step 2 - Eliminate Technically Infeasible SO_2 Control Technologies for the Mid-Sized Diesel-Fired Boilers
Limited operation for EU 3 is a technically infeasible control technology as it is a backup unit.

Step 3 - Rank the Remaining SO_2 Control Technologies for the Mid-Sized Diesel-Fired Boilers
The following control technologies have been identified and ranked by efficiency for the control of SO_2 emissions from themed-sized diesel-fired boilers.

(a) Ultra Low Sulfur Diesel (99% Control)
(d) Good Combustion Practices (Less than 40% Control)
(c) Limited Operation (0% Control)

Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF proposes the following as BACT for SO_2 emissions from the mid-sized diesel-fired boilers:

(a) SO_2 emissions from EUs 3 and 4 shall combust ULSD while firing diesel fuel;

(b) SO_2 emissions from EU 4 shall not exceed 0.60 lb/MMscf while firing natural gas; and

(c) SO_2 emissions from EU 4 will be limited by complying with the combined annual NOx emission limit of 40 tons per 12 month rolling period for EUs 4 and 8.

Step 5 - Selection of SO_2 BACT for the Mid-Sized Diesel-Fired Boilers

The Department's finding is that BACT for SO_2 emissions from the mid-sized diesel-fired boilers is as follows:

(a) SO_2 emissions from EUs 3 and 4 shall be controlled by only combusting ULSD when firing diesel fuel;

(b) SO_2 emissions from EU 4 will be limited by complying with the combined annual SO_2 emission limit of 40 tons per 12 month rolling period for EUs 4 and 8;

(c) SO_2 emissions from EU 4 while firing natural gas shall not exceed 0.60 lb/MMscf; and

(d) Maintain good combustion practices by following the manufacturer's maintenance procedures at all times of operation.

Table 5-8 lists the BACT determination for this facility along with those for other mid-sized diesel-fired boilers located in the Serious $PM_{2.5}$ nonattainment area.

Table 5-8. Comparison of SO_2 BACT for the Mid-Sized Diesel-Fired Boilers at Nearby Power Plants

Facility	EU ID	Process Description	Capacity	Fuel	Limitation	Control Method
UAF	3	Dual Fuel-Fired Boilers	180.90 MMBtu/hr (each)	Diesel	15 ppmw S in fuel	Ultra Low Sulfur Diesel
	4			Diesel	15 ppmw S in fuel	Limited Operation Ultra Low Sulfur Diesel
				Natural Gas	0.60 lb/MMscf	

5.3 SO_2 BACT for the Small Diesel-Fired Boilers (EUs 17 through 22)

Possible SO_2 emission control technologies for small diesel-fired boilers were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 13.220, Commercial/Institutional Size Boilers (<100 MMBtu/hr). The search results for small diesel-fired boilers are summarized in Table 5-9.

Table 5-9. RBLC Summary of SO_2 Control for Small Diesel-Fired Boilers

Control Technology	Number of Determinations	Emission Limits (lb/MMBtu)
Low Sulfur Content	5	0.0036 – 0.0094
Good Combustion Practices	4	0.0005
No Control Specified	5	0.0005

RBLC Review

A review of similar units in the RBLC indicates that good combustion practices and combustion of low sulfur fuel are the principle SO_2 control technologies installed on small diesel-fired boilers. The lowest SO_2 emission rate listed in the RBLC is 0.0005 lb/MMBtu.

Step 1 - Identification of SO_2 Control Technology for the Small Diesel-Fired Boilers

From research, the Department identified the following technologies as available for SO_2 control for the small diesel-fired boilers:

(a) ULSD
The theory of ULSD was discussed in detail in the SO_2 BACT for the mid-sized diesel-fired boilers and will not be repeated here. The Department considers ULSD a technically feasible control technology for the small diesel-fired boilers.

(b) Limited Operation
The theory behind limited operation was discussed in detail in the $PM_{2.5}$ BACT section for the small diesel-fired boilers and will not be repeated here. The Department considers limited operation as a technically feasible control technology for the small diesel-fired boilers.

(c) Good Combustion Practices
The theory of GCPs was discussed in detail in the $PM_{2.5}$ BACT section for the large dual fuel-fired boiler and will not be repeated here. Proper management of the combustion process will result in a reduction of SO_2. The Department considers GCPs a technically feasible control technology for the small diesel-fired boilers.

Step 2 - Eliminate Technically Infeasible SO_2 Control Technologies for the Small Diesel-Fired Boilers

All identified control technologies are technically feasible for the diesel-fired boilers.

Step 3 - Rank the Remaining SO_2 Control Technologies for the Small Diesel-Fired Boilers

The following control technologies have been identified and ranked by efficiency for the control of SO_2 emissions from the small diesel-fired boilers:

(a) Ultra Low Sulfur Diesel (99% Control)
(c) Good Combustion Practices (Less than 40% Control)
(b) Limited Operation (0% Control)

Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF proposes the following as BACT for SO_2 emissions from the small diesel-fired boilers:

(a) SO_2 emissions from the operation of the small diesel-fired boilers EUs 19 through 22 will be controlled by limiting the combined operation to no more than 18,739[34] hours per 12-month rolling period;

(b) SO_2 emissions from the operation of the small diesel-fired boilers shall be controlled by using ULSD (0.0015 sulfur by weight) at all times of operation; and

(c) Compliance with the proposed SO_2 emission limit will be demonstrated through fuel shipment receipts and/or fuel testing for sulfur content.

Step 5 - Selection of SO_2 BACT for the Small Diesel-Fired Boilers

The Department's finding is that BACT for SO_2 emissions from the diesel-fired boilers is as follows:

(a) SO_2 emissions from EUs 19 through 22 will be controlled by limiting the combined operation to no more than 18,739 hours per 12-month rolling period; and

(b) SO_2 emissions from the diesel-fired boilers EUs 17 through 22[35] shall be controlled by combusting only ULSD.

Table 5-10 lists the SO_2 BACT determination for this facility along with those for other small diesel-fired boilers rated at less than 100 MMBtu/hr in the Serious $PM_{2.5}$ nonattainment area.

Table 5-10. Comparison of SO_2 BACT for the Small Diesel-Fired Boilers at Nearby Power Plants

Facility	Process Description	Capacity	Limitation	Control Method
Fort Wainwright	<u>4</u> Diesel-Fired Boilers (*)	< 100 MMBtu/hr	15 ppmw S in fuel	Limited Operation Good Combustion Practices Ultra-Low Sulfur Diesel
UAF	6 Diesel-Fired Boilers	< 100 MMBtu/hr	15 ppmw S in fuel	Limited Operation Ultra-Low Sulfur Diesel
GVEA Zehnder	2 Diesel-Fired Boilers	< 100 MMBtu/hr	15 ppmw S in fuel	Good Combustion Practices Ultra-Low Sulfur Diesel

(*) The number of diesel fired boilers was updated in this BACT Amendment by removing those boilers that are considered insignificant emission units

[34] UAF originally proposed a combined operating limit of 19,650 hr/yr in their original BACT submittal, but this limit was changed to 18,739 combined hours of operation per 12-month rolling period with the issuance of AQ0316MSS07 on August 10, 2021.

[35] EUs 17, 18, and 22 required by Condition 5 of AQ0316MSS07 and 40 of AQ0316TVP03, EUs 19 through 21 required by Condition 9 of AQ0316MSS04 and 30 of AQ0316TVP03.

5.4 SO_2 BACT for the Large Diesel-Fired Engines (EUs 8 and 35)

Possible SO_2 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 - 17.190, Large Internal Combustion Engines (>500 hp). The search results for large diesel-fired engines are summarized in Table 5-11.

Table 5-11. RBLC Summary Results for SO_2 Control for Large Diesel-Fired Engines

Control Technology	Number of Determinations	Emission Limits (g/hp-hr)
Low Sulfur Diesel	27	0.005 – 0.02
Federal Emission Standards	6	0.001 – 0.005
Limited Operation	6	0.005 – 0.006
Good Combustion Practices	3	None Specified
No Control Specified	11	0.005 – 0.008

RBLC Review
A review of similar units in the RBLC indicates combustion of low sulfur fuel, limited operation, and good combustion practices are the principle SO_2 control technologies installed on large diesel-fired engines. The lowest emission rate listed in the RBLC is 0.001 g/hp-hr.

Step 1 - Identification of SO_2 Control Technology for the Large Diesel-Fired Engines
From research, the Department identified the following technologies as available for the control of SO_2 emissions from the large diesel-fired engine:

(a) Ultra Low Sulfur Diesel
The theory of ULSD was discussed in detail in the SO_2 BACT for the mid-sized diesel-fired boilers and will not be repeated here. The Department considers ULSD a technically feasible control technology for the large diesel-fired engine.

(b) Federal Standards
The theory of federal emission standards was discussed in detail in the $PM_{2.5}$ BACT section for the large diesel-fired engines and will not be repeated here. The Department does not consider federal emission standards a technically feasible control technology for the large diesel-fired engine EU 8.

(c) Limited Operation
EU 8 currently operates under a combined annual NOx emission limit with EU 4. Limiting the operation of emissions units reduces the potential to emit of those units. Additionally, EU 35 is currently restricted by the NSPS Subpart IIII requirements for emergency engines. Therefore, the Department considers limited operation a technically feasible control technology for the large diesel-fired engines.

(d) Good Combustion Practices
The theory of GCPs was discussed in detail in the $PM_{2.5}$ BACT section for the large dual fuel-fired boiler and will not be repeated here. Proper management of the combustion

process will result in a reduction of SO_2 emissions. The Department considers GCPs a technically feasible control technology for the large diesel-fired engine.

Step 2 - Eliminate Technically Infeasible SO_2 Control Technologies for the Large Diesel-Fired Engines

As explained in Step 1 of Section 5.4, the Department does not consider federal emission standards as a technically feasible control technology to control SO_2 emissions from the large diesel-fired engine EU 8.

Step 3 - Rank the Remaining SO_2 Control Technologies for the Large Diesel-Fired Engines

(a) Ultra Low Sulfur Diesel (99% Control)
(d) Good Combustion Practices (Less than 40% Control)
(c) Limited Operation (0% Control)

Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF proposes the following as BACT for SO_2 emissions from the large diesel-fired engines:

(a) SO_2 emissions from EU 8 shall be controlled by combusting ULSD (0.0015 weight percent sulfur); and

(b) SO_2 emissions from EU 8 will be limited by complying with the combined annual NOx emission limit of 40 tons per 12 month rolling period for EUs 4 and 8.

Step 5 - Selection of SO_2 BACT for the Large Diesel Fired-Engines

The Department's finding is that BACT for SO_2 emissions from the large diesel-fired engines is as follows:

(a) SO_2 emissions from EUs 8 and 35 shall be controlled by combusting only ULSD (0.0015 weight percent sulfur);

(b) Limit the combined operation of EU 4 and 8 to no more than 40 tons of SO_2 per 12-month rolling average;

(c) Limit non-emergency operation of EUs 8 and 35 to no more than 100 hours per year; and

(d) Maintain good combustion practices by following the manufacturer's maintenance procedures at all times of operation.

Table 5-12 lists the BACT determination for this facility along with those for other diesel-fired engines rated at more than 500 hp located in the Serious $PM_{2.5}$ nonattainment area.

Table 5-12. Comparison of SO_2 BACT for Large Diesel-Fired Engines at Nearby Power Plants

Facility	Process Description	Capacity	Limitation	Control Method
Fort Wainwright	8 Large Diesel-Fired Engines	> 500 hp	15 ppmw S in fuel	Limited Operation

Facility	Process Description	Capacity	Limitation	Control Method
				Good Combustion Practices Ultra-Low Sulfur Diesel
UAF	2 Large Diesel-Fired Engines	> 500 hp	15 ppmw S in fuel	Limited Operation Good Combustion Practices Ultra-Low Sulfur Diesel
GVEA North Pole	Large Diesel-Fired Engine	600 hp	500 ppmw S in fuel15	Good Combustion Practices Ultra-Low Sulfur Diesel
GVEA Zehnder	2 Large Diesel-Fired Engines	11,000 hp	ppmw S in fuel	Good Combustion Practices Ultra-Low Sulfur Diesel

5.5 SO_2 BACT for the Small Diesel-Fired Engines (EUs 24, 26, 27, 29, and 34)

Possible SO_2 emission control technologies for small engines were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 17.210, Small Internal Combustion Engines (<500 hp). The search results for small diesel-fired engines are summarized in Table 5-13.

As of March 23, 2023, UAF reported to EPA that EU 26 has been permanently removed from service at the stationary source.

Table 5-13. RBLC Summary of SO_2 Controls for Small Diesel-Fired Engines

Control Technology	Number of Determinations	Emission Limits (g/hp-hr)
Low Sulfur Diesel	6	0.005 – 0.02
No Control Specified	3	0.005

RBLC Review
A review of similar units in the RBLC indicates combustion of low sulfur fuel is the principle SO_2 control technology for small diesel-fired engines. The lowest SO_2 emission rate listed in the RBLC is 0.005 g/hp-hr.

Step 1 - Identification of SO_2 Control Technology for the Small Diesel-Fired Engines
From research, the Department identified the following technologies as available for control of SO_2 emissions from diesel-fired engines rated at less than 500 hp:

(a) Ultra Low Sulfur Diesel
The theory of ULSD was discussed in detail in the SO_2 BACT for the mid-sized diesel-fired boilers and will not be repeated here. The Department considers ULSD a technically feasible control technology for the small diesel-fired engines.

(b) Limited Operation
The theory of limited operation for EU 27 was discussed in detail in the $PM_{2.5}$ BACT section for the large diesel-fired engine and will not be repeated here. The Department considers limited operation a technically feasible control technology for the small diesel-fired engines.

(c) Good Combustion Practices
The theory of GCPs was discussed in detail in the $PM_{2.5}$ BACT section for the large dual fuel-fired boiler and will not be repeated here. Proper management of the combustion process will result in a reduction of SO_2 emissions. The department considers GCPs a technically feasible control technology for the small diesel-fired engines.

Step 2 - Eliminate Technically Infeasible SO_2 Control Technologies for the Small Engines
All identified control technologies are technically feasible for the small diesel-fired engines.

Step 3 - Rank the Remaining SO_2 Control Technologies for the Small Diesel-Fired Engines
The following control technologies have been identified and ranked by efficiency for the control of SO_2 emissions from the small diesel-fired engines.

(a) Ultra Low Sulfur Diesel (99% Control)
(c) Good Combustion Practices (Less than 40% Control)
(c) Limited Operation (0% Control)

Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF proposes the following as BACT for SO_2 emissions from the small diesel-fired engine EU 27:

(a) SO_2 emissions from the operation of the small diesel-fired engine shall be controlled by using ULSD at all times of operation (0.0015 weight percent sulfur); and

(b) SO_2 emissions from the operation of the small diesel-fired engine will be controlled by limiting operation to no more than 4,380 hours per 12-month rolling period.

Department Evaluation of BACT for SO_2 Emissions from Small Diesel-Fired Engines

The Department reviewed UAF's proposal and found that in addition to combusting only ULSD, and limiting operation of the small diesel-fired engine, good combustion practices is BACT for SO_2.

Step 5 - Selection of SO_2 BACT for the Small Diesel-Fired Engines
The Department's finding is that BACT for SO_2 emissions from the small diesel-fired engines is as follows:

(a) SO_2 emissions from small diesel-fired engines shall be controlled by combusting only ULSD at all times of operation;

(b) SO_2 emissions from the operation of EU 27 will be controlled by limiting operation to no more than 4,380 hours per 12-month rolling period;

(c) Limit non-emergency operation of EUs 24, 29, and 34 to no more than 100 hours per year each; and

(d) Maintain good combustion practices by following the manufacturer's operational procedures at all times of operation.

Table 5-14 lists the BACT determination for this facility along with those for other diesel-fired engines rated at less than 500 hp located in the Serious $PM_{2.5}$ nonattainment area.

Table 5-14. Comparison of SO_2 BACT for Small Diesel-Fired Engines at Nearby Power Plants

Facility	Process Description	Capacity	Limitation	Control Method
Fort Wainwright	Small Diesel-Fired Engines	< 500 hp	15 ppmw S in fuel	Limited Operation Ultra-Low Sulfur Diesel Good Combustion Practices
UAF	Small Diesel-Fired Engines	< 500 hp	15 ppmw S in fuel	Limited Operation[36] Ultra-Low Sulfur Diesel Good Combustion Practices

5.6 SO_2 BACT for the Pathogenic Waste Incinerator (EU 9A)

Possible SO_2 emission control technologies for pathogenic waste incinerators were obtained from the RBLC. The RBLC was searched for all determinations in the last 10 years under the process code 21.300 for Hospital, Medical, and Infectious Waste Incinerators. The search results for pathogenic waste incinerators are summarized in Table 5-15.

Table 5-15. RBLC Summary of SO_2 Control for the Pathogenic Waste Incinerator

Control Technology	Number of Determinations	Emission Limits (lb/hr)
Natural Gas	1	0.0500

RBLC Review

A review of similar units in the RBLC indicates use of natural gas as fuel is the principle SO_2 control technology installed on pathogenic waste incinerators. The lowest emission rate listed in the RBLC is 0.0500 lb/hr.

Step 1 - Identification of SO_2 Control Technology for the Pathogenic Waste Incinerator

From research, the Department identified the following technologies as available for control of SO_2 emissions from pathogenic waste incinerators:

(a) Natural Gas

Natural gas combustion has a lower SO_2 emission rate than standard diesel combustion and can be a preferred fuel for this reason. The availability of natural gas in Fairbanks can be limited. The Department considers natural gas as a technically feasible control option for the pathogenic waste incinerator.

(b) Ultra Low Sulfur Diesel

The theory of ULSD was discussed in detail in the SO_2 BACT for the mid-sized diesel-fired boilers and will not be repeated here. The Department considers ULSD a technically feasible control technology for the pathogenic waste incinerator.

(c) Limited Operation
The theory behind the limited operation for EU 9A was discussed in detail in the $PM_{2.5}$ BACT section for the large dual fuel-fired boilers and will not be repeated here. The Department considers limited operation a technically feasible control technology for the pathogenic waste incinerator.

(d) Good Combustion Practices
The theory of GCPs was discussed in detail in the $PM_{2.5}$ BACT section for the large dual fuel-fired boiler and will not be repeated here. Proper management of the combustion process will result in a reduction of SO_2 emissions. The Department considers GCPs a technically feasible control technology for the pathogenic waste incinerator.

Step 2 - Eliminate Technically Infeasible SO_2 Control Technologies for the Pathogenic Waste Incinerator

Natural gas is eliminated as a technically infeasible SO_2 control technology for the pathogenic waste incinerator due to the limited availability.

Step 3 - Rank the Remaining SO_2 Control Technologies for the Pathogenic Waste Incinerator

The following control technologies have been identified and ranked by efficiency for the control of SO_2 emissions from the pathogenic waste incinerator:

(b)	Ultra Low Sulfur Diesel	(99% Control)
(c)	Good Combustion Practices	(Less than 40% Control)
(c)	Limited Operation	(0% Control)

Control technologies already in practice at the stationary source or included in the design of the EU are considered 0% control for the purpose of the SIP BACT for existing stationary sources.

Step 4 - Evaluate the Most Effective Controls

UAF BACT Proposal

UAF proposes the following as BACT for SO_2 emissions from the pathogenic waste incinerator:

(a) SO_2 emissions from the operation of EU 9A will be controlled by limiting operation to no more than 109 tons of waste combusted per 12-month rolling period;

(b) SO_2 emissions from the operation of EU 9A shall be controlled by combusting ULSD at all times of operation; and

(c) Compliance will be demonstrated with fuel shipment receipts and/or fuel tests for sulfur content.

Department Evaluation of BACT for SO_2 Emissions from the Pathogenic Waste Incinerator

The Department reviewed UAF's proposal and found that in addition to combusting only ULSD, and limiting operation, good combustion practices is BACT for control of SO_2 emissions from the pathogenic waste incinerator.

Step 5 - Selection of SO_2 BACT for the Pathogenic Waste Incinerator

The Department's finding is that BACT for SO_2 emissions from the pathogenic waste incinerator is as follows:

(a) SO_2 emissions from the operation of EU 9A will be controlled by limiting operation to no more than 109 tons of waste combusted per 12-month rolling period;

(b) SO_2 emissions from the operation of EU 9A shall be controlled by combusting ULSD at all times of operation; and

(c) Maintain good combustion practices by following the manufacturer's operational procedures at all times of operation.

6. BACT DETERMINATION SUMMARY

Table 6-1. NOx BACT Limits

<table>
<tr><th>EU ID</th><th>Description</th><th>Capacity</th><th>Proposed BACT Limit</th><th>Proposed BACT Control</th></tr>
<tr><td>All</td><td>N/A</td><td>N/A</td><td colspan="2">EPA approved a comprehensive precursor demonstration for NOx
See details in the Section 1 Introduction</td></tr>
</table>

Table 6-2. $PM_{2.5}$ BACT Limits

EU ID	Description	Capacity	Proposed BACT Limit	Proposed BACT Control
3	Mid-Sized Diesel-Fired Boiler	180.9 MMBtu/hr	0.012 lb/MMBtu, 3-hour average	Good Combustion Practices
4	Mid-Sized Diesel-Fired Boiler	180.9 MMBtu/hr	Diesel: 0.012 lb/MMBtu, 3-hour average NG: 0.0075 lb/MMBtu, 3-hour average	Limited Operation (EUs 4 and 8 combined 40 tons per rolling 12 month period); Good Combustion Practices
8	Large Diesel-Fired Engine	13,226 hp	0.32 g/hp-hr , 3-hour average	Positive Crankcase Ventilation; Good Combustion Practices Limited Operation (EUs 4 and 8 combined 40 tons per rolling 12 month period) and EU 8 to no more than 100 hours of non-emergency operation per year; and ULSD
9A	Pathogenic Waste Incinerator	83 lb/hr	4.67 lb/ton	Multiple Chambers; Limited Operation (109 tons per rolling 12 month period); Good Combustion Practices
17	Small Diesel-Fired Boiler	4.93 MMBtu/hr	0.016 lb/MMBtu	Good Combustion Practices
18	Small Diesel-Fired Boiler	4.93 MMBtu/hr	0.016 lb/MMBtu	
19	Small Diesel-Fired Boiler	6.13 MMBtu/hr	0.016 lb/MMBtu	Limited Operation (18,739 hours per rolling 12 month period combined) Good Combustion Practices
20	Small Diesel-Fired Boiler	6.13 MMBtu/hr	0.016 lb/MMBtu	
21	Small Diesel-Fired Boiler	6.13 MMBtu/hr	0.016 lb/MMBtu	
22 (*)	Small Diesel-Fired Boiler	8.5 MMBtu/hr	0.016 lb/MMBtu	
~~26~~	~~Small `Diesel-Fired Engine~~	~~45 kW~~	~~1.0 g/hp-hr~~	~~Good Combustion Practices~~
27	Caterpillar C-15	500 hp	0.19 g/hp-hr	Good Combustion Practices Limited Operation (4,380 hours per year)
24	Cummins	72 hp	1.0 g/hp-hr	Limit Operation for non-emergency use (100 hours each per year) Good Combustion Practices
29	Cummins	314 hp	0.023 g/hp-hr	
34	Cummins	324 hp	0.19 g/hp-hr	

35	Cummins	1,220 hp	0.015 g/hp-hr , 3-hour average	Limit Operation for non-emergency use (100 hours each per year), Positive Crankcase Ventilation, ULSD, and Good Combustion Practices
105	Material Handling Unit	1,200 acfm	0.003 gr/dscf	Fabric Filters Enclosures Vents
107	Material Handling Unit	1,600 acfm	0.003 gr/dscf	
109	Material Handling Unit	1,000 acfm	0.003 gr/dscf	
110	Material Handling Unit	2,000 acfm	0.003 gr/dscf	
111	Material Handling Unit	N/A	$5.5x10^{-5}$ lb/ton	Enclosure
113	Large Dual Fuel-Fired Boiler	295.6 MMBtu/hr	0.012 lb/MMBtu, 3-hour average	Fabric Filters Good Combustion Practices
114	Material Handling Unit	5 acfm	0.05 gr/dscf	Fabric Filters Enclosures Vents
128	Material Handling Unit	1,650 acfm	0.003 gr/dscf	
129	Material Handling Unit	1,650 acfm	0.003 gr/dscf	
130	Material Handling Unit	1,650 acfm	0.003 gr/dscf	

(*) UAF reported that this EU has been permanently removed from service

Table 6-3. SO_2 BACT Numerical Limits

EU ID	Description	Capacity	Proposed BACT Limit	Proposed BACT Control
3	Mid-Sized Diesel-Fired Boiler	180.9 MMBtu/hr	15 ppmw S in Fuel	Ultra-Low Sulfur Diesel Good Combustion Practices.
4	Mid-Sized Diesel-Fired Boiler	180.9 MMBtu/hr	Diesel: 15 ppmw S in Fuel NG: 0.60 lb/MMscf	Ultra-Low Sulfur Diesel Limited Operation (EUs 4 and 8 combined 40 tons per rolling 12 month period) Good Combustion Practices.
8	Large Diesel-Fired Engine	13,226 hp	15 ppmw S in Fuel	Limited Operation (EUs 4 and 8 combined 40 tons per rolling 12 month period) and EU 8 to no more than 100 hours of non-emergency operation per year Good Combustion Practices and ULSD

EU ID	Description	Capacity	Proposed BACT Limit	Proposed BACT Control
9A	Pathogenic Waste Incinerator	83 lb/hr	15 ppmw S in Fuel	Ultra-Low Sulfur Diesel Limited Operation (109 tons per rolling 12 month period) Good combustion practices
17	Small Diesel-Fired Boiler	4.93 MMBtu/hr	15 ppmw S in Fuel	Ultra-Low Sulfur Diesel
18	Small Diesel-Fired Boiler	4.93 MMBtu/hr	15 ppmw S in Fuel	
19	Small Diesel-Fired Boiler	6.13 MMBtu/hr	15 ppmw S in Fuel	Limited Operation (18,739 hours per rolling 12 month period combined) Ultra-Low Sulfur Diesel
20	Small Diesel-Fired Boiler	6.13 MMBtu/hr	15 ppmw S in Fuel	
21	Small Diesel-Fired Boiler	6.13 MMBtu/hr	15 ppmw S in Fuel	
22	Small Diesel-Fired Boiler	8.5 MMBtu/hr	15 ppmw S in Fuel	Ultra-Low Sulfur Diesel
~~26 (*)~~	~~Small `Diesel-Fired Engine~~	~~45 kW~~	~~15 ppmw S in Fuel~~	~~Good Combustion Practices and ULSD~~
27	Caterpillar C-15	500 hp	15 ppmw S in Fuel	Good Combustion Practices and ULSD Limited Operation (4,380 hours per year)
24	Cummins	51 kW	15 ppmw S in Fuel	Limit Operation for non-emergency use (100 hours each per year), Good Combustion Practices and ULSD
29	Cummins	314 hp	15 ppmw S in Fuel	
34	Cummins	324 hp	15 ppmw S in Fuel	
35	Cummins	1,220 hp	15 ppmw S in Fuel	
113	Large Dual Fuel-Fired Boiler	295.6 MMBtu/hr	0.10 lb/MMBtu (30-day rolling average)	Good Combustion Practices, Fluidized Bed Limestone Injection[31]

(*) UAF reported that this EU has been permanently removed from service

Stationary Source: University of Alaska – University of Alaska Fairbanks Campus

Emission Units: EU ID 113 (295.6 MMBtu/hr – Large Dual Fuel-Fired Boiler)

Pollutant of Concern: SO_2	
BACT Control	**Monitoring, Recordkeeping and Reporting Requirements** [1]
0.10 lb/MMBtu (30-day rolling average);	• Compliance with the proposed SO_2 emission rate for the dual fuel-fired boiler will be demonstrated through CEMS monitoring and reporting. • Install, calibrate, maintain, and operate CEMS for measuring SO_2 concentrations and either O_2 or CO_2 concentrations according to the requirements of NSPS 40 CFR Subpart Db for CEMS that may be used to meet the SO_2 emission monitoring requirements of 40 C.F.R. 60.47b. • Record the CEMS data and include the recorded data in each semi-annual operating report.
Good Combustion Practices.	• Perform regular maintenance according to the manufacturer's and the operator's maintenance requirements and procedures. • Keep records of any maintenance that would have a significant effect on emissions. The records may be kept in electronic format. • Keep a copy of the manufacturer's and the operator's recommended maintenance procedures. • Report a summary of the maintenance that would have a significant effect on emissions in each operating report.
Control emissions with fluidized bed with limestone injection (FBLI) at all times of operation.	• Certify in semi-annual Operating Report that the FBLI system is operated at all times the boiler is in operation. • Operate, maintain, and inspect according to the manufacturer's instructions and recommendations. • Include a summary of inspections and maintenance conducted in each semi-annual operating report.

Emission Units: EU ID 3 (180.9 MMBtu/hr – Mid-Sized Diesel-Fired Boiler) and EU ID 4 (180.9 MMBtu/hr – Mid-Sized Dual Fuel-Fired Boiler)

Pollutant of Concern: SO_2	
BACT Control	**Monitoring, Recordkeeping and Reporting Requirements** [1]
Combust only Ultra Low Sulfur Diesel (ULSD) at no more than 0.0015 percent sulfur by weight.	• For each shipment of fuel, keep receipts that specify fuel grade and amount. • Include the fuel receipt records in each operating report.
0.60 lb/MMscf for EU ID 4 (while firing natural gas);	• Obtain a semiannual statement providing the H_2S concentration in ppmv. If not available, analyze semiannually a representative sample of the natural gas to determine the H_2S content. • Keep records of statement and/or analysis.

[1] While the substantive requirements are described here, for any permit containing the requirement, the actual language may differ in non-substantive ways and include additional details.

	• Report statement and/or analysis results. • Report whenever limit exceeded or whenever requirements not met.
Limit the combined SO_2 emissions from EUs 4 and 8 to no more than 40 tons per 12-month rolling period.	• Demonstrate compliance with this BACT measure by complying with Condition 3 through 3.6 of Minor Permit No. AQ0316MSS05.
Good Combustion Practices.	• Perform regular maintenance according to the manufacturer's and the operator's maintenance requirements and procedures. • Keep records of any maintenance that would have a significant effect on emissions. The records may be kept in electronic format. • Keep a copy of the manufacturer's and the operator's recommended maintenance procedures. • Report a summary of the maintenance that would have a significant effect on emissions in each operating report.

Emission Units: EU IDs 17 through 22 (<100 MMBtu/hr – Small Diesel-Fired Boilers)

Pollutant of Concern: SO_2	
BACT Control	**Monitoring, Recordkeeping and Reporting Requirements** [1]
Combust Only Ultra Low Sulfur Diesel (ULSD) at no more than 0.0015 percent sulfur by weight.	• For each shipment of fuel, keep receipts that specify fuel grade and amount. • Include the fuel receipt records in each operating report.
For EUs 19 through 22, limit the combined operation to no more than 18,739 hours per 12-month rolling period.	• Demonstrate compliance with this BACT measure by complying with Condition 7.1 through 7.2 of Minor Permit No. AQ0316MSS07.

Emission Units: EU IDs 8 and 35 (>500 hp – Large Diesel-Fired Engines)

Pollutant of Concern: SO_2	
BACT Control	**Monitoring, Recordkeeping and Reporting Requirements** [1]
Combust Only Ultra Low Sulfur fuel at no more than 0.0015 percent sulfur by weight.	• For each shipment of fuel, keep receipts that specify fuel grade and amount. • Include the fuel receipt records in each operating report.
Limited NO_x emissions from EUs 4 and 8 to no more than 40 tons per 12-month rolling period.	• Demonstrate compliance by complying with Conditions 3 through 3.6 of Minor Permit No. AQ0316MSS05.
Limited non-emergency operation of EUs 8 and 35 to no more than 100 hours per year, each.	• Maintain and operate a non-resettable hour meter, capable of recording the total hours of operation.

	• By the end of each calendar month, record the total operating hours of the EU for the previous calendar month; and for the previous 12 consecutive months. • Report the operating hours record for each engine in each operating report.
Good Combustion Practices.	• Perform regular maintenance according to the manufacturer's and the operator's maintenance requirements and procedures. • Keep records of any maintenance that would have a significant effect on emissions. The records may be kept in electronic format. • Keep a copy of the manufacturer's and the operator's recommended maintenance procedures. • Report a summary of the maintenance that would have a significant effect on emissions in each operating report.

Emission Units: EU IDs 24, 27, 29, and 34 (<500 hp – Small Diesel-Fired Engines)

Pollutant of Concern: SO_2	
BACT Control	**Monitoring, Recordkeeping and Reporting Requirements** [1]
Combust Only Ultra Low Sulfur fuel at no more than 0.0015 percent sulfur by weight.	• For each shipment of fuel, keep receipts that specify fuel grade and amount. • Include the fuel receipt records in each operating report.
Limited operation for EU 27 to no more than 4,380 hours per 12-month rolling period.	• Demonstrate compliance with this BACT measure by complying with Conditions 4 through 4.1 of Minor Permit No. AQ0316MSS03.
Limited non-emergency operation for EUs 24, 29, and 34 to no more than 100 hours per year, each.	• Maintain and operate a non-resettable hour meter, capable of recording the total hours of operation. • By the end of each calendar month, record the total operating hours of the EU for the previous calendar month; and for the previous 12 consecutive months. • Report the operating hours record for each engine in each operating report.
Good Combustion Practices.	• Perform regular maintenance according to the manufacturer's and the operator's maintenance requirements and procedures. • Keep records of any maintenance that would have a significant effect on emissions. The records may be kept in electronic format. • Keep a copy of the manufacturer's and the operator's recommended maintenance procedures. • Report a summary of the maintenance that would have a significant effect on emissions in each operating report.

Emission Units: EU ID 9A (Pathogenic Waste Incinerator)

Pollutant of Concern: SO_2	
BACT Control	**Monitoring, Recordkeeping and Reporting Requirements** [1]

Combust Only Ultra Low Sulfur fuel at no more than 0.0015 percent sulfur by weight.	• For each shipment of fuel, keep receipts that specify fuel grade and amount. • Report in each semi-annual operating report, the fuel receipts records for the reporting period.
Limit operation of EU 9A to no more than 109 tons of waste combusted per 12-month rolling period.	• Demonstrate compliance with this BACT measure by complying with Condition 10.1c of Minor Permit No. AQ0316MSS08 Rev. 1.
Good Combustion Practices.	• Demonstrate compliance with this BACT measure by complying with Condition 10.1a of Minor Permit No. AQ0316MSS08 Rev. 1. •

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AIR QUALITY CONTROL MINOR PERMIT

Minor Permit: AQ0316MSS08 Revision 1 **Final Date - October 31, 2024**
Rescinds Permit: AQ0316MSS08

The Alaska Department of Environmental Conservation (Department), under the authority of AS 46.14 and 18 AAC 50, issues Air Quality Control Minor Permit AQ0316MSS08 Revision 1 to the Permittee listed below.

Permittee:	**University of Alaska Fairbanks (UAF)** PO Box 757920 Fairbanks, AK 99775
Stationary Source:	**University of Alaska Fairbanks Campus (UAF Campus)**
Location:	802 Alumni Drive, Fairbanks, Alaska 99709 Latitude: 64° 51' North; Longitude: 147° 51' West
Project:	Serious PM-2.5 State Implementation Plan (SIP)
Permit Contact:	Russ Steiger Phone No.: 907-474-5812 email: rsteiger@alaska.edu

The Permittee submitted an application for Minor Permit AQ0316MSS08 under AS 46.14.130(c)(2) because the Department finds that public health or air quality effects provide a reasonable basis to regulate the stationary source. This finding is contained in the State Air Quality Control Plan adopted on November 19, 2019.

With the issuance of AQ0316MSS08 Revision 1, The Department finds that public health or air quality effects still provide a reasonable basis to regulate the stationary source under AS 46.14.130(c)(2). This finding is contained in the State Air Quality Control Plan adopted on November 19, 2019, for the $PM_{2.5}$ Serious Nonattainment area.

This permit satisfies the obligation of the Permittee to obtain a minor permit under 18 AAC 50. As required by AS 46.14.120(c), the Permittee shall comply with the terms and conditions of this permit.

The Department's Performance Audits for COMS (as adopted by reference in 18 AAC 50.030, August 20, 2008), has been adopted into this minor permit.

The following conditions have been adopted into this minor permit: 3 through 3.6 of Minor Permit AQ0316MSS05 issued on August 4, 2016, 7.1 through 7.2 of Minor Permit AQ0316MSS07 issued on August 10, 2021, and 4 through 4.1 of Minor Permit AQ0316MSS03 issued on January 16, 2013.

P. Moses Coss for

James R. Plosay, Manager
Air Permits Program

Table of Contents

List of Abbreviations and Acronyms

AAAQS..................... Alaska Ambient Air Quality Standards
ADEC......................Alaska Department of Environmental Conservation
AS .... Alaska Statutes
AAC.......................... Alaska Administrative Code
ACEP .... Alaska Center for Energy and Power
BiRD .... Biological Research and Diagnostics Facility
BACM....................... Best Available Control Measures
BACT........................ Best Available Control Technology
C.F.R......................... Code of Federal Regulations
COMS .... Continuous Opacity Monitoring System
CEMS........................ Continuous Emission Monitoring System
Department................ Alaska Department of Environmental Conservation
EF............................. Emission Factor
EU .... Emission Unit
FG .... Fuel Gas
FNSB .... Fairbanks North Star Borough
GHG.......................... Greenhouse gas
LPG.......................... Liquefied Petroleum Gas
NA............................ not applicable
NESHAP .... National Emissions Standards for Hazardous Air Pollutants
NG............................ natural gas
NSPS .... New Source Performance Standards
ORL .... owner requested limit
PSD .... Prevention of Significant Deterioration
PTE .... Potential to Emit
SIP............................ State Implementation Plan
SER .... significant emissions rate
TAR .... Technical Analysis Report
ULSD........................ Ultra-Low Sulfur Diesel

Units and Measures

acfm .... actual cubic feet per minute
dscf............................ dry standard cubic foot
gal/hr .... gallons per hour
gal/yr .... gallons per year
gr/dscm...................... grains per dry standard cubic meter
hp .... horsepower
hr/yr.......................... hours per year
lb/gal .... pounds per gallon
lb/kgal .... pounds per kilogallon
kW............................ kilowatts
lb/hr.......................... pounds per hour
MMBtu/hr .... million British thermal units per hour
ppm .... parts per million
ppmw .... parts per million by weight
scf............................. standard cubic foot
TPY .... tons per year
% .... percent
wt%S_{fuel} .... weight percent of sulfur in Fuel

Pollutants and Chemical Symbols

CO .... Carbon Monoxide
HAP .... hazardous air pollutant
NO_x .... Oxides of Nitrogen
O_2 .... Oxygen
PM............................. Particulate Matter
PM_{10} .... Particulate Matter with an aerodynamic diameter not exceeding 10 microns
$PM_{2.5}$.......................... Particulate Matter with an aerodynamic diameter not exceeding 2.5 microns
SO_2 .... Sulfur Dioxide
VOC .... Volatile Organic Compound

Section 1 Emissions Unit Inventory

Emissions Unit (EU) Authorization. Unless otherwise noted in this permit, the information in Table 1 is for identification purposes only. The specific EU descriptions do not restrict the Permittee from replacing an EU identified in Table 1.

Table 1 – Emissions Unit Inventory[1]

EU ID	Building No.	Emissions Unit Description	Rating/Size	Fuel Type	Installation or Construction Date
Dual Fuel-Fired and Fuel Oil-Fired Boilers					
3	FS802	Dual-Fired Boiler (Zurn)	180.9 MMBtu/hr	Dual Fuel (Gas/Diesel)	1970
4	FS802	Dual-Fired Boiler (Zurn)	180.9 MMBtu/hr	Dual Fuel (Gas/Diesel)	1987
17	FS909	West Ridge Research Bld. Diesel Boiler #1 (Weil McLain/BL1688w-GPr10)	4.93 MMBtu/hr	Diesel	2003
18	FS909	West Ridge Research Bld. Diesel Boiler #2 (Weil McLain/BL1688w-GPr10)	4.93 MMBtu/hr	Diesel	2003
19	FS919	BiRD Rm 100U3 Boiler #1 (Weil McLain/2094W)	6.13 MMBtu/hr	Diesel	2004
20	FS919	BiRD Rm 100U3 Boiler #2 (Weil McLain/2094W)	6.13 MMBtu/hr	Diesel	2004
21	FS919	BiRD Rm 100U3 Boiler #3 (Weil McLain/2094W)	6.13 MMBtu/hr	Diesel	2004
22	FS919	BiRD Rm 100U3 Boiler #4 (Bryan/EB200-S-150-FDGO)	8.5 MMBtu/hr	Diesel	2005
Diesel-Fired Engines					
8	FS817	Peaking/Backup Generator (Morse Colt-Pielstick)	13,266 Hp	ULSD	1999
24	FS423	Old University Park Emergency Generator Engine (Cummins/4B3.9-G2)	72 Hp[2]	#2 Diesel	2001
27	FS814	Alaska Center for Energy and Power Generator Engine No. 2 (Caterpillar C-15)	500 Hp	Diesel	2013
29	FS901	Arctic Health Research Emergency Generator Engine (Cummins/QSB7-G6)	314 Hp	Diesel	2013
34	FS919	BiRD Emergency Diesel Generator Engine No. 1 (Cummins QSB7-G5 NR3 Engine, EPA Tier 3, Model Year 2011)	324 Hp	Diesel	2015
35	SW910	Butrovich Adm. Building Emergency Generator Engine (Cummins QSK23-G7 NR2 Engine, EPA Tier 2, Model Year 2018)	1,220 Hp	ULSD	2019
Pathogenic Waste Incinerator					
9A	FS919	BiRD Incinerator (Therm-Tec/G-30P-1H)	83 lb/hr	Medical/ Infectious Waste	2006

EU ID	Building No.	Emissions Unit Description	Rating/Size	Fuel Type	Installation or Construction Date
Dual Fuel-Fired CFB Boiler (EU ID 113) and Associated Coal and Ash Handling Equipment					
105	FS840	Limestone Handling System for Boiler No. 1	1,200 acfm	NA	2018
107	FS840	Sand Handling System	1,600 acfm	NA	2018
109	FS840	Ash Handling System	1,000 acfm	NA	2018
110	FS840	Ash Handling System Vacuum	2,000 acfm	NA	2018
111	FS840	Ash Loadout to Truck	NA	NA	2018
113	FS840	Dual Fuel-Fired Circulating Fluidized Bed (CFB) Boiler	295.6 MMBtu/hr	Coal/Woody Biomass	2018
114	FS840	Dry Sorbent Handling Vent Filter Exhaust	5 acfm	NA	2018
128	FS840	Coal Silo No. 1 with Bin Vent	1,650 acfm	NA	2018
129	FS840	Coal Silo No. 2 with Bin Vent	1,650 acfm	NA	2018
130	FS840	Coal Silo No. 3 with Bin Vent	1,650 acfm	NA	2018

Table Notes:

[1] Only the EUs with new operating limits and conditions due to this permit appear in Table 1.
[2] Engine rating in Hp is calculated from the electrical output assuming 95 pct. efficiency (i.e., Hp = kW * 1.341/0.95).

1. The Permittee shall comply with all applicable provisions of AS 46.14 and 18 AAC 50 when installing a replacement EU, including any applicable minor or construction permit requirements.

Section 3 State Implementation Plan (SIP) Requirements

Fairbanks $PM_{2.5}$ Serious Nonattainment Area SIP Requirements

5. **Dual Fuel-Fired Boiler Emissions Limits.** The Permittee shall limit the emissions from the dual fuel-fired boiler EU ID 113 as specified in Table 2.

Table 2 - EU ID 113 SIP BACT Limits

Pollutant	BACT Control	BACT Emissions Limit
$PM_{2.5}$	Good Combustion Practices Fabric Filters	0.012 lb/MMBtu (3-hour average) State Visible Emissions Standards 18 AAC 50.055(a)(1)

5.1 For EU ID 113 the Permittee shall

a. Conduct a one-time source test on EU ID 113, after the control device, in accordance with Section 6, within 12 months of permit issuance, to demonstrate compliance with the $PM_{2.5}$ emissions limit listed in Table 2.

(i) Conduct the source test at the maximum achieveable load of the boiler in accordance with the procedures specified in 40 CFR 51, Appendix M, Methods 201 A and, if applicable, Method 202 as provided under Method 201-A.

(ii) Emission results shall be reported as the arithmetic 3-hour average of all valid test runs and shall be in units of lb/MMBtu.

(iii) The Permittee shall report the results of the source test in accordance with Condition 33.

(iv) Include a summary of the source test results in the next operating report that is due after the submittal date of the source test report in accordance with Condition 18.

b. Report the compliance status with the $PM_{2.5}$ emissions limits in Table 2 in accordance with each annual compliance certification described in Condition 19.

c. Operate the EU with fabric filters and maintain good good combustion practices at all times of operation.

(i) Keep records of the date and time identifying each time-period that the EU is operated without a fabric filter.

(ii) Perform regular maintenance according to the manufacturer's and the operator's maintenance requirements and procedures.

(iii) Keep records of any maintenance that would have a significant effect on emissions. The records may be kept in electronic format

(iv) Keep a copy of the manufacturer's and the operator's maintenance procedures.

(v) Operate the EU consistent with manufacturer's recommended combustion settings (e.g., maximum CO, excess air in flue gas, and other relevant parameters) or those established during the source test conducted to demonstrate compliance with the BACT emissions limit in Table 2.

d. Monitor visible emissions to ensure compliance with the State Visible Emissions Standard in Table 2 using a Continuous Opacity Monitoring System (COMS).

(i) The Permittee shall comply with the following procedures when monitoring visible emissions using a COMS:

(A) The COMS must meet the performance specifications in 40 C.F.R. 60, Appendix B, Performance Specification 1;

(B) operate and maintain the COMS in accordance with the manufacturer's written requirements and recommendations;

(C) except during COMS breakdowns, repairs, calibration checks, and zero and upscale adjustments, complete one cycle of sampling and analyzing for each successive 15-second period of emissions unit operation; from this data, calculate and record the average opacity for each successive one-minute period; and

(D) at least once daily, conduct a zero and upscale (span) calibration drifts check in accordance with a written procedure, as described in 40 C.F.R. 60.13(d); adjust whenever the zero or upscale drift error exceeds four percent opacity in a 24-hour period.

(E) The Permittee shall conduct performance audits as follows:

(1) for a COMS that was new, relocated, replaced, or substantially refurbished on or after April 9, 2001, perform an audit that includes the following elements as described in the Department's Performance Audits for COMS (available at https://dec.alaska.gov/air/air-permit/standard-conditions/), adopted by reference in 18 AAC 50.030, at least once in each 12-month period:

1. optical alignment;

2. zero and upscale response assessment;

3. zero compensation assessment;

4. calibration error check; and

5. zero alignment assessment;

(2) for a COMS that was new, relocated, replaced, or substantially refurbished before April 9, 2001, perform the same audits required under Condition 5.1d(i)(E)(1) except that Conditions 5.1d(i)(E)(1)1 through 5.1d(i)(E)(1)4 must be performed at least quarterly; this frequency may be reduced if

1. the Permittee demonstrates, by applying measurable criteria to the results of quarterly audits, that quarterly audits are not necessary; and

2. the Department gives written approval for the reduction in frequency.

e. Report in accordance with Condition

(i) a summary of the maintenance records collected under Condition 5.1c(iii); and

(ii) the highest 6-minute average opacity measured by the COMs during the reporting period under Condition 5.1d.

f. Report in accordance with Conditon 17, whenever

(i) an emissions rate determined by the source test required by Condition 5.1a exceeds the limit in Table 2;

(ii) a boiler is operated without a fabric filter as recorded in Condition 5.1c(i); or

(iii) any of Conditions 5.1a through 5.1e are not met.

6. Mid-Sized Diesel-Fired Boilers. The Permittee shall limit the emissions from the mid-sized diesel-fired boilers EU IDs 3 and 4 as specified in Table 3.

Table 3 - EU IDs 3 and 4 SIP BACT Limits

EU ID	Pollutant	BACT Control	Fuel Type	BACT Emissions Limit
3	$PM_{2.5}$	Good Combustion Practices and Limited Operation	Diesel Fuel	0.012 lb/MMBtu
4			Diesel Fuel	0.012 lb/MMBtu
			Natural Gas	0.0075 lb/MMBtu

6.1 For EU IDs 3 and 4, the Permittee shall:

a. Conduct a one-time source test on EU IDs 3 or 4 on diesel fuel and EU ID 4 on natural gas, in accordance with Section 6, within 12 months of permit issuance, to demonstrate compliance with the $PM_{2.5}$ emissions limit listed in Table 3.

(i) Conduct the source test at the maximum achieveable load of the boiler in accordance with the procedures specified in 40 CFR 51, Appendix M, Method 201A and, if applicable, Method 202 as provided under Method 201A.

(ii) Emission results shall be reported as the arithmetic 3-hour average of all valid test runs and shall be in units of lb/MMBtu.

(iii) The Permittee shall report the results of the source test in accordance with Condition 33.

(iv) Include the the following in the next operating report in accordance with Condition 18, that is due after the submittal date of the source test report:

(A) a summary of the source test results; and

(B) relevant combustion settings (including but not limited to average CO and O_2 concentrations in the flue gas) established during the source test that demonstrates compliance with the BACT $PM_{2.5}$ emissions limit in Table 3.

b. Report the compliance status with the $PM_{2.5}$ emissions limits in Table 3 in accordance with each annual compliance certification described in Condition 19.

c. Maintain good combustion practices at all time the EUs are in operation.

(i) Perform regular maintenance according to the manufacturer's and the operator's maintenance requirements and procedures.

(ii) Keep records of any maintenance that would have a significant effect on emissions. The records may be kept in electronic format.

(iii) Keep a copy of the manufacturer's and the operator's maintenance procedures.

(iv) Report in accordance with Condition 18, a summary of the maintenance records collected under Condition 6.1c(ii).

(v) Operate the EUs consistent with manufacturer's recommended combustion settings (e.g., maximum CO, excess air in flue gas, and other relevant parameters) or those established during the source test conducted to demonstrate compliance with the BACT emissions limit in Table 3.

(A) For each of EU IDs 3 and 4, measure and record the CO and O_2 concentrations in the exhaust stream using a portable handheld combustion analyzer during or within 30 days after the end of a calendar quarter that the EU operates.[1]

(B) Include copies of the records required by Condition 6.1c(v)(A) for the reporting period, in each operating report required by Condition 18.

d. Report in accordance with Conditon 17, whenever

(i) an emissions rate determined by the source test required by Condition 6.1a exceeds the limit in Table 3; or

(ii) any of Conditions 6.1a through 6.1c are not met.

6.2 For EU IDs 4 and 8, the Permittee shall comply with Conditions 3 through 3.6 of Minor Permit AQ0316MSS05, issued August 4, 2016.

7. Diesel-Fired Boilers Emissions Limits. The Permittee shall limit the emissions from the diesel-fired boilers, EU IDs 17 through 22, as specified in Table 4**.**

[1] It is not the Department's intention to require the Permittee to start up an EU just to perform the CO and O_2 concentration measurements.

Table 4 - EU IDs 17 through 22 SIP BACT Limits

Pollutant	BACT Control	Fuel Type	BACT Emissions Limit
$PM_{2.5}$	Good Combustion Practices and Limited Operation	Diesel	0.016 lb/MMBtu (3-hour average)

7.1 For EU IDs 17 through 22, the Permittee shall demonstrate compliance with the $PM_{2.5}$ BACT emissions limit contained in Table 4 as follows:

a. Maintain good combustion practices at all times the EUs are in operation.

(i) Perform regular maintenance according to the manufacturer's and the operator's maintenance requirements and procedures.

(ii) Keep records of any maintenance that would have a significant effect on emissions. The records may be kept in electronic format.

(iii) Keep a copy of the manufacturer's and the operator's maintenance procedures.

b. Report the compliance status with the $PM_{2.5}$ emissions limit in Table 4 in accordance with each annual compliance certification described in Condition 19.

c. Report under Condition 18, a summary of the maintenance records collected under Condition 7.1a(ii).

d. Report in accordance with Condition 17, whenever

(i) an emissions rate exceeds the limit in Table 4; or

(ii) any of Conditions 7.1a through 7.1c are not met.

7.2 For EU IDs 19 through 22, the Permittee shall comply with Conditions 7.1 through 7.2 of Minor Permit AQ0316MSS07, issued August 10, 2021.

8. **Large Diesel-Fired Engines Emissions Limits.** The Permittee shall limit the emissions from the large diesel-fired engines, EU IDs 8 and 35, as specified in Table 5.

Table 5 - EU IDs 8 and 35 SIP BACT Limits

EU ID	Pollutant	BACT Control	BACT Emissions Limit
8	$PM_{2.5}$	Good Combustion Practices, Positive Crankcase Ventilation, Limited Operation, and Combust ULSD	0.32 g/hp-hr (3-hour average)
35			0.05 g/hp-hr (3-hour average)

8.1 For EU IDs 8 and 35, the Permittee shall demonstrate compliance with the $PM_{2.5}$ BACT emissions limits contained in Table 5 as follows:

a. Maintain good combustion practices at all times the EUs are in operation.

(i) Perform regular maintenance according to the manufacturer's and the operator's maintenance requirements and procedures.

(ii) Keep records of any maintenance that would have a significant effect on emissions. The records may be kept in electronic format.

(iii) Keep a copy of the manufacturer's and the operator's maintenance procedures.

b. Combust only ULSD (fuel sulfur limit of 15 ppmw). Monitor, record, and report as follows:

(i) For each shipment of fuel, keep receipts that specify fuel grade and amount.

c. Maintain a positive crankcase ventilation (PCV) system at all times the EUs operate in accordance with the manufacturer's and operator's recommended operating and maintenance procedures.

(i) Submit an initial certification that the PCV systems listed in Table 5 has been installed or is an inherent design to the EUs, in the first operating report due after permit issuance, as required by Condition 18.

d. Limit the maintenance checks, readiness testing, and non-emergency operation of each EU to 100 hours per calendar year.

(i) For EU IDs 8 and 35, monitor, record, and report as follows:

(A) Maintain and operate a non-resettable hour meter, capable of recording the total hours of operation.

(B) By the end of each calendar month, record the total operating hours of the EU

(1) for the previous calendar month; and

(2) for the previous 12 consecutive months, as calculated using the records obtained under Condition 8.1d(i)(B)(1).

e. Report the compliance status with the $PM_{2.5}$ emissions limits in Table 5 in accordance with each annual compliance certification described in Condition 19.

f. Report in accordance with Condition 18

(i) a summary of the maintenance records collected under Condition 8.1a(ii);

(ii) the fuel receipt records required by Condition 8.1b(i); and

(iii) the operating hour records for each engine collected under Condition 8.1d(i)(B)(2).

g. Report in accordance with Condition 17, whenever

(i) an emissions rate exceeds the limit in Table 5; or

(ii) any of Conditions 8.1a through 8.1f are not met.

8.2 For EU ID 8, the Permittee shall comply with Condition 6.2.

9. Small Diesel-Fired Engines Emissions Limits. The Permittee shall limit the emissions from the large diesel-fired engines, EU IDs 24, 27, 29, and 34, as specified in Table 6.

Table 6 - EU IDs 24, 27, 29, and 34 SIP BACT Limits

EU ID	Pollutant	BACT Control	BACT Emissions Limit
24	$PM_{2.5}$	Good Combustion Practices and Limited Operation	1.0 g/hp-hr (3-hour average)
27 & 34			0.19 g/hp-hr (3-hour average)
29			0.023 g/hp-hr (3-hour average)

9.1 For EU IDs 24, 27, 29, and 34, the Permittee shall demonstrate compliance with the $PM_{2.5}$ BACT emissions limits contained in Table 6 as follows:

a. Maintain good combustion practices at all times the EUs are in operation.

(i) Perform regular maintenance according to the manufacturer's and the operator's maintenance requirements and procedures.

(ii) Keep records of any maintenance that would have a significant effect on emissions. The records may be kept in electronic format.

(iii) Keep a copy of the manufacturer's and the operator's maintenance procedures.

b. For EU IDs 24, 29, and 34, Limit the maintenance checks, readiness testing, and non-emergency operation of each EU to 100 hours per calendar year.

(i) For EU IDs 24, 29, and 34 monitor, record, and report as follows:

(A) Maintain and operate a non-resettable hour meter, capable of recording the total hours of operation.

(B) By the end of each calendar month, record the total operating hours of the EU

(1) for the previous calendar month; and

(2) for the previous 12 consecutive months, as calculated using the records obtained under Condition 8.1d(i)(B)(1).

c. Report in accordance with Condition 18

(i) a summary of the maintenance records collected under Condition 9.1a(ii); and

(ii) the operating hour records for each engine collected under Condition 9.1b(i)(B)(2).

d. Report the compliance status with the $PM_{2.5}$ emissions limits in Table 6 in accordance with each annual compliance certification described in Condition 19.

e. Report in accordance with Condition 17, whenever

(i) an emissions rate exceeds the limit in Table 6; or

(ii) Any of Conditions 9.1a through 9.1d are not met.

9.2 For EU ID 27, the Permittee shall comply with Conditions 4 through 4.1 of Minor Permit AQ0316MSS03, issued January 16, 2013.

10. Incinerator Emissions Limits. The Permittee shall limit the $PM_{2.5}$ emissions from the incinerator EU ID 9A as specified in Table 7.

Table 7 - EU ID 9A SIP BACT Limits

Pollutant	BACT Control	BACT Emissions Limit
$PM_{2.5}$	Good Combustion Practices Multi Chamber Design Limited Operation	4.67 lb per ton of waste 109 tons per 12-month rolling period

10.1 For EU ID 9A, the Permittee shall demonstrate compliance with the $PM_{2.5}$ requirements in Table 7 as follows:

a. Maintain good combustion practices at all times the EU is in operation.

(i) Perform regular maintenance according to the manufacturer's and the operator's maintenance requirements and procedures.

(ii) Keep records of any maintenance that would have a significant effect on emissions. The records may be kept in electronic format.

(iii) Keep a copy of the manufacturer's and the operator's maintenance procedures.

b. Control $PM_{2.5}$ emissions by using a multiple chamber designed incinerator.

c. Weigh and record the weight of each batch of waste combusted in EU ID 9A

(i) by the end of each calendar month, calculate and record the total quantity of waste combusted for the previous month in tons; and

(ii) for the previous 12 consecutive months, as calculated using the records obtained under Condition 10.1c(i).

d. Report in accordance with Condition 18

(i) a summary of the maintenance records collected under Condition 10.1a(ii);

(ii) a statement indicating whether EU ID 9A is equipped with at least primary and secondary combustion chambers;

(iii) the quantity of monthly waste combusted under Condition 10.1c(i); and

(iv) the rolling 12-month quantity of waste combusted under Condition 10.1c(ii).

e. Report the compliance status with the $PM_{2.5}$ emissions limits in Table 7 in accordance with each annual compliance certification described in Condition 19.

f. Report in accordance with Condition 17 whenever

(i) a limit in Table 7 is exceeded, or

(ii) whenever any of the requirements in Conditions 10.1a through 10.1e are not met.

11. Material Handling Units Emissions Limits. The Permittee shall limit the $PM_{2.5}$ emissions from the material handling units EU IDs 105, 107, 109, 110, 114, and 128 through 130 as specified in Table 8.

Table 8 - EU IDs 105, 107, 109, 110, 114, and 128 through 130 SIP BACT Limits

<table>
<tr><th>EU IDs</th><th>Pollutant</th><th>BACT Control</th><th>BACT Emissions Limit</th></tr>
<tr><td>105, 107, 109, 110, and 128 through 130</td><td rowspan="2">$PM_{2.5}$</td><td rowspan="2">Fabric Filter, Enclosure, & Vents</td><td>0.003 gr/dscf</td></tr>
<tr><td>114</td><td>0.050 gr/dscf</td></tr>
</table>

11.1 For EU IDs 105, 107, 109, 110, and 128 through 130, the Permittee shall demonstrate compliance with the $PM_{2.5}$ requirements in Table 8 as follows:

a. Operate the EUs with fabric filters and vents at all times of operation.

(i) Keep records of the date and time identifying each time period that an EU is operated without a fabric filter or vent.

(ii) Perform regular maintenance regular maintenance according to the manufacturer's and the operator's maintenance requirements and procedures.

(iii) Keep records of any maintenance that would have a significant effect on emissions. The records may be kept in electronic format.

(iv) Keep a copy of the manufacturer's and the operator's maintenance procedures.

b. Operate the EUs in an enclosure.

(i) Keep records of the date and time identifying each time period that an EU is operated outside of an enclosure.

c. For each of the EUs, the Permittee shall within six months of issuance of this permit either:

(i) provide vendor data documenting that EU IDs 105, 107, 109, 110, 114, and 128 through 130 meet the emission limits of Table 8; or

(ii) perform an initial Method 9 observation. For all Method 9 observations, observe emissions unit exhaust for 18 consecutive minutes to obtain a minimum of 72 consecutive 15-second opacity observations in accordance with Method 9 of 40 C.F.R. 60, Appendix A-4; or

(iii) documentation of the previous submittal where the obligations of Conditions 11.1c(i) or 11.1c(ii) were met.

d. If the 18 consecutive minutes of the initial Method 9 observations conducted under Condition 11.1c(ii) result in an 18-minute average opacity greater than 10 percent for EU IDs 105, 107, 109, 110, or 128 through 130, or 20 percent for EU ID 114, the Permittee shall conduct a $PM_{2.5}$ source test in accordance with the methods and procedures specified in 40 C.F.R. 60 Appendix A and Section 6 to determine the $PM_{2.5}$ emission rate.

(i) If required under Condition 11.1d, the Permittee shall report the results of source test(s) in accordance with Condition 33.

(ii) If required under Condition 11.1c(ii), include copies of the results of initial Method 9 observations conducted under Condition 11.1c(ii) in the first operating report required under Condition 18.

e. Report the the compliance status with the $PM_{2.5}$ emissions limits in Table 8 in accordance with each annual compliance certification described in Condition 19.

f. Report in accordance with Condition 18 a summary of the records collected under Condition 11.1a(iii).

g. Report in accordance with Condition 17, whenever

(i) an emissions rate exceeds a limit in Table 8;

(ii) an EU is operated without a fabric filter as recorded in Condition 11.1a(i);

(iii) an EU is operated outside of an enclosure as recorded in Condition 11.1b(i); or

(iv) whenever any of the requirements in Conditions 11.1a through 11.1f are not met.

12. Ash Loadout to Truck EU ID 111. The Permittee shall limit the $PM_{2.5}$ emissions from the ash loadout to truck EU ID 111 as specified in Table 9.

Table 9 - EU ID 111 SIP BACT Limits

Pollutant	BACT Control	BACT Emissions Limit
$PM_{2.5}$	Enclosure	5.50E-05 pound per ton of ash

12.1 For EU ID 111, the Permittee shall demonstrate compliance with the $PM_{2.5}$ requirements in Table 9 as follows:

a. Operate EU ID 111 in an enclosure during all ash loadout operations.

(i) Monitor that overhead door(s) at coal ash loading building are closed while loading the trucks. Monitor that ash truck bodies are free of ash before they leave the building, and that their loads are tarped before they leave the building area. Minimize fugitive dust from coal ash handling operations.

(ii) Keep records of the date and time identifying each time period that EU ID 111 was not enclosed during ash loadout operations.

b. Report the the compliance status with the $PM_{2.5}$ emissions limit in Table 9 in accordance with each annual compliance certification described in Condition 18.

c. Report in accordance with Condition 17; whenver

(i) a limit in Table 9 is exceeded; or

(ii) whenever any of the requirements in Conditions 12.1a through 12.1b are not met.

Section 4 Recordkeeping, Reporting, and Certification Requirements

13. Recordkeeping Requirements. The Permittee shall keep all records required by this permit for at least five years after the date of collection, including:

13.1 Copies of all reports and certifications submitted pursuant to this section of the permit; and

13.2 Records of all monitoring required by this permit, and information about the monitoring including:

a. the date, place, and time of sampling or measurements;

b. the date(s) analyses were performed;

c. the company or entity that performed the analyses;

d. the analytical techniques or methods used;

e. the results of such analyses; and

f. the operating conditions as existing at the time of sampling or measurement.

14. Certification. The Permittee shall certify any permit application, report, affirmation, or compliance certification submitted to the Department and required under the permit by including the signature of a responsible official for the permitted stationary soruce following the statement: *"Based on information and belief formed after resonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete."* Excess emission reports must be certified either upon submittal or with an operating report for the same reporting period. All other reports and other documents must be certified upon submittal.

14.1 The Department may accept an electronic signature on an electronic application or other electronic record required by the Department if the person providing the electronic signature

a. uses a security procedure, as defined in AS 09.80.190, that the Department has approved; and

b. accepts or agrees to be bound by an electronic record executed or adopted with that signature.

15. Submittals. Unless otherwise directed by the Department or this permit, the Permittee shall submit to the Department one certified copy of reports, compliance certifications, and/or other submittals required by this permit. The Permittee may submit the documents electronically or by hard copy.

15.1 Submit the certified copy of reports, compliance certifications, and/or other submittals in accordance with the submission instructions on the Department's Standard Permit Conditions web page at http://dec.alaska.gov/air/air-permit/standard-conditions/standard-condition-xvii-submission-instructions/.

16. Information Requests. The Permittee shall furnish to the Department, within a reasonable time, any information the Department requests in writing to determine whether cause exists to modify, revoke, reissue, or terminate the permit or to determine compliance with the permit. Upon request, the Permittee shall furnish to the Department copies of records required to be kept by the permit. The Department may require the Permittee to furnish copies of those records directly to the federal administrator.

17. Excess Emissions and Permit Deviation Reports. The Permittee shall report excess emissions and permit deviations as follows:

17.1 **Excess Emissions Reporting.** The Permittee shall report all emissions or operations that exceed emissions standards or limits of this permit as follows:

a. In accordance with 18 AAC 50.240(c), as soon as possible, report

(i) excess emissions that present a potential threat to human health or safety; and

(ii) excess emissions that the Permittee believes to be unavoidable.

b. In accordance with 18 AAC 50.235(a), within two working days after the event commenced or was discovered, report an unavoidable emergency, malfunction, or nonroutine repair that causes emissions in excess of a technology-based emission standard.

c. If a continuous or recurring excess emissions is not corrected within 48 hours of discovery, report within 72 hours of discovery unless the Department provides written permission to report under Condition 17.1d.

d. Report all other excess emissions not described in Conditions 17.1a, 17.1b, and 17.1c within 30 days after the end of the month during which the excess emissions occurred or as part of the next routine operating report in Condition 18 for excess emissions that occurred during the period covered by the report, whichever is sooner.

e. If requested by the Department, the Permittee shall provide a more detailed written report to follow up on an excess emissions report.

17.2 **Permit Deviations Reporting.** For permit deviations that are not "excess emissions," as defined under 18 AAC 50.990:

a. Report all other permit deviations within 30 days after the end of the month during which the deviation occurred or as part of the next routine operating report in Condition 18 for permit deviations that occurred during the period covered by the report, whichever is sooner.

17.3 **Reporting Instructions.** When reporting either excess emissions or permit deviations, the Permittee shall report using the Department's online form for all such submittals, beginning no later than September 7, 2023. The form can be found at the Division of Air Quality's Air Online Services (AOS) system webpage http://dec.alaska.gov/applications/air/airtoolsweb using the Permittee Portal option. Alternatively, upon written Department approval, the Permittee may submit the form contained in Section 7 of this permit. The Permittee must provide all information called for by the form that is used. Submit the report in accordance with the submission instructions on the Department's Standard Permit Conditions webpage found at http://dec.alaska.gov/air/air-permit/standard-conditions/standard-conditions-iii-and-iv-submission-instructions/.

18. Operating Reports. During the life of this permit[2], the Permittee shall submit to the Department an operating report in accordance with Conditions 14 and 15 by August 1 for the period January 1 to June 30 of the current year and by February 1 for the period July 1 to December 31 of the previous year.

18.1 The operating report must include all information required to be in operating reports by other conditions of this permit, for the period covered by the report.

18.2 When excess emissions or permit deviations that occurred during the reporting period are not included with the operating report under Condition 18, the Permittee shall identify

a. the date of the excess emissions or permit deviation;

b. the equipment involved;

c. the permit condition affected;

d. a description of the excess emissions or permit deviation; and

e. any corrective action or preventive measures taken and the date(s) of such actions; or

18.3 when excess emissions or permit deviation reports have already been reported under Condition 17 during the period covered by the operating report, the Permittee shall either

a. include a copy of those excess emissions or permit deviation reports with the operating report; or

b. cite the date(s) of those reports.

18.4 The operating report must include, for the period covered by the report, a listing of emissions monitored under Conditions 11.1d which trigger additional testing or monitoring, whether or not the emissions monitored exceed an emission standard. The Permittee shall include in the report

a. the date of the emissions;

b. the equipment involved;

c. the permit condition affected; and

d. the monitoring result which triggered the additional monitoring.

19. Annual Compliance Certification. Each year by March 31, the Permittee shall compile and submit to the Department an annual compliance certification report according to Condition 15.

19.1 Certify the compliance status of the stationary source over the preceding calendar year consistent with the monitoring required by this permit, as follows:

a. identify each term or condition set forth in Section 2 through Section 6, that is the basis of the certification;

b. briefly describe each method used to determine the compliance status;

[2] *Life of this permit* is defined as the permit effective dates, including any periods of reporting obligations that extend beyond the permit effective dates. For example, if a permit expires prior to the end of a calendar year, there is still a reporting obligation to provide operating reports for the periods when the permit was in effect.

c. state whether compliance is intermittent or continuous; and

d. identify each deviation and take it into account in the compliance certification.

19.2 In addition, submit a copy of the report directly to the Clean Air Act Compliance Manager, US EPA Region 10, ATTN: Air Toxics and Enforcement Section, Mail Stop: 20-C04, 1200 Sixth Avenue, Suite 155, Seattle, WA 98101-3188.

Section 6 General Source Test Requirements

26. Requested Source Tests. In addition to any source testing explicitly required by this permit, the Permittee shall conduct source testing as requested by the Department to determine compliance with applicable permit requirements.

27. Operating Conditions. Unless otherwise specified by an applicable requirement or test method, the Permittee shall conduct source testing

27.1 at a point or points that characterize the actual discharge into the ambient air; and

27.2 at the maximum rated burning or operating capacity of the emissions unit or another rate determined by the Department to characterize the actual discharge into the ambient air.

28. Reference Test Methods. The Permittee shall use the following references for test methods when conducting source testing for compliance with this permit:

28.1 Source testing for the reduction in visibility through the exhaust effluent must be conducted in accordance with the procedures set out in 40 C.F.R. 60, Appendix A, Reference Method 9. The Permittee may use the form in Attachment 1 of this permit to record data.

28.2 Source testing for emissions of total particulate matter, sulfur compounds, nitrogen compounds, carbon monoxide, lead, volatile organic compounds, fluorides, sulfuric acid mist, municipal waste combustor organics, metals and acid gases must be conducted in accordance with the methods and procedures specified in 40 C.F.R. 60, Appendix A.

28.3 Source testing for emissions of PM_{10} and $PM_{2.5}$ must be conducted in accordance with the procedures specified in 40 C.F.R. 51, Appendix M, Methods 201 or 201A and 202.

28.4 Source testing for emissions of any contaminant may be determined using an alternative method approved by the Department in accordance with 40 C.F.R. 63 Appendix A, Method 301.

29. Excess Air Requirements. To determine compliance with this permit, standard exhaust gas volumes must include only the volume of gases formed from the theoretical combustion of the fuel, plus the excess air volume normal for the specific emissions unit type, corrected to standard conditions (dry gas at 68° F and an absolute pressure of 760 millimeters of mercury).

30. Test Deadline Extension. The Permittee may request an extension to a source test deadline established by the Department. The Permittee may delay a source test beyond the original deadline only if the extension is approved in writing by the Department's appropriate division director or designee.

31. Test Plans. Before conducting any source tests, the Permittee shall submit a plan to the Department. The plan must include the methods and procedures to be used for sampling, testing, and quality assurance and must specify how the emissions unit will operate during the test and how the Permittee will document that operation. The Permittee shall submit a complete plan within 60 days after receiving a request under Condition 26 and at least 30 days before the scheduled date of any test unless the Department agrees in writing to some other time period. Retesting may be done without resubmitting the plan.

32. **Test Notification.** At least 10 days before conducting a source test, the Permittee shall give the Department written notice of the date and time the source test will begin.

33. **Test Reports.** Within 60 days after completing a source test, the Permittee shall submit one certified copy of the results in the format set out in the *Source Test Report Outline*, adopted by reference in 18 AAC 50.030. The Permittee shall certify the results in the manner set out in Condition 13. If requested in writing by the Department, the Permittee must provide preliminary results in a shorter period of time specified by the Department.