Technical Analysis Report

For the terms and conditions of
Minor Permit AQ1564MSS02

Issued to Oil Search Alaska, LLC.

For the Pikka Development - Nanushuk Drillsite B

Alaska Department of Environmental Conservation
Air Permits Program

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Preliminary – September 15, 2022

2. INTRODUCTION

This Technical Analysis Report (TAR) provides the Alaska Department of Environmental Conservation's (Department's) basis for issuing Minor Permit AQ1564MSS02 to Oil Search Alaska, LLC (OSA) for the Pikka Development - Nanushuk Drillsite B (ND-B).

On February 11th, 2020, the Department received an application from OSA for Minor Permit AQ1564MSS01, classified under 18 AAC 50.502(c)(1), for construction of a new stationary source with a potential to emit greater than the applicable thresholds for oxides of nitrogen (NOx). The project was also classified under 18 AAC 50.502(c)(2) as a portable oil and gas operation and 18 AAC 50.502(b)(3) for a rock crusher with a rated capacity of at least five tons per hour.

On January 15th, 2022, OSA submitted an application for Minor Permit AQ1564MSS02, classified under: 18 AAC 50.502(c)(3) in order to make a physical change to the method of operation of a stationary source that will cause an increase in potential to emit greater than 10 tons per year (tpy) for NOx; 18 AAC 50.508(5) in order to establish owner requested limits (ORLs) to avoid a permit classification under AS 46.14.130, to avoid Prevention of Significant Deterioration (PSD) for NOx, carbon monoxide (CO), volatile organic compounds (VOCs), and sulfur dioxide (SO_2); and 18 AAC 50.508(6) to revise and rescind the terms and conditions of a Title I permit.

However as of the issue date of this permit, actual construction of ND-B has not begun and the stationary source is not considered an existing stationary source with a potential to emit an air pollutant greater than an amount listed in 18 AAC 50.502(c)(1) for the purposes of permit applicability. Therefore, the Department is considering ND-B a new stationary source with a potential to emit greater than the applicable thresholds for NOx under 18 AAC 50.502(c)(1).

The project is also classified under 18 AAC 50.502(c)(2) as a portable oil and gas operation, 18 AAC 50.502(b)(3) for a rock crusher with a rated capacity of 5 tons or greater per hour, and 18 AAC 50.508(5) in order to establish owner requested limits (ORLs) to avoid a permit classification under AS 46.14.130, to avoid Prevention of Significant Deterioration (PSD) for NOx, CO, VOCs, and SO_2; and 18 AAC 50.508(6) to revise and rescind the terms and conditions of a Title I permit.

3. APPLICATION DESCRIPTION

The ND-B is a proposed project for the construction of a new stationary source. OSA proposes to develop hydrocarbon deposits from its oil and gas leasehold on the Alaska North Slope, located approximately seven miles northeast of Nuiqsut. The proposed project includes construction of the Nanushuk Processing Facility, Nanushuk Drill Sites A, B, and C, the Nanushuk Operations Pad, tie-in pad, import and export pipelines, and infield roads and pipelines. Three drill sites are currently planned to have production and injection wells with 20-foot spacing between wellheads.

The ND-B stationary source will accommodate drilling equipment and support facilities including a drill rig, well testing equipment, well stimulation equipment, well servicing

equipment, drilling mud and cement tanks, production gathering facilities, and diesel fuel storage tanks. The drill site will also include a drilling camp to house worker personnel. The ND-B stationary source will include a natural gas-fired heater to warm production fluids. In addition, a grind and inject (G&I) facility will be constructed and operated onsite.

OSA now proposes to make modifications to the emissions unit (EU) inventory for the ND-B Air Quality Permit No. AQ1564MSS01. These modifications include the following:

- Increasing the rating for Production Heater No. 1 (i.e., Permit No. AQ1564MSS01 EU 1) from 25 million British thermal units per hour (MMBtu/hr) to 30 MMBtu/hr.
- The removal of Production Heaters 2 and 3 (i.e., Permit No. AQ1564MSS01 EUs 2 and 3), rated at 25 MMBtu/hr, each.
- The addition of two stationary power generator engines, rated at 4,000 brake-horsepower (bhp), each.
- The addition of two stationary injection skid engines, rated at 600 bhp, each.
- The addition of one 480-barrel diesel tank to the well pad equipment inventory.
- The addition of one 105-barrel diesel fuel tank and one 500-barrel bleed off/pop off tank to the well servicing equipment inventory.
- The removal of G&I Train 2 (i.e., Permit No. AQ1564MSS01 EUs 103, 105, and 107).
- The removal of the G&I Produced Fluids/Flowback Fluid Tank (i.e., Permit No. AQ1564MSS01 EU 109).
- The removal of eight temporary construction generator engines, rated at 1,105 bhp, each (i.e., Permit No. AQ1564MSS01 EUs 301 through 309).
- The removal of two sand chief engines, rated at 120 bhp, each (i.e., Permit No. AQ1564MSS01 EUs 242 and 243).
- Revising tank capacities for seven storage tanks as identified in Attachment A, Table A-3 of their application to amend Air Quality Minor Permit No. AQ1564MSS01.
- Increasing the rating of one sand chief engine from 120 bhp to 135 electric kilowatts (ekW).

4. CLASSIFICATION FINDINGS

Based on the review of the application, the Department finds that Minor Permit AQ1564MSS02 is classified under:

1. 18 AAC 50.502(b)(3) for a rock crusher with a rated capacity of at least five tons per hour.
2. 18 AAC 50.502(c)(1) for construction of a new stationary source with a potential to emit greater than the applicable thresholds for NOx.
3. 18 AAC 50.502(c)(2) for a portable oil and gas operation.
4. 18 AAC 50.508(5) in order to establish ORLs to avoid a permit classification under AS 46.14.130, to avoid PSD for NOx, CO, VOCs, and SO_2.
5. 18 AAC 50.508(6) to revise and rescind the terms and conditions of a Title I permit.

5. APPLICATION REVIEW FINDINGS

Based on the review of the application, the Department finds that:

1. OSA's minor permit application for the ND-B contains the elements listed in 18 AAC 50.540.
2. OSA's modeling analysis complies with the ambient demonstration requirements of 18 AAC 50.540(c)(2).
3. To protect the annual nitrogen dioxide (NO_2); 24-hour particulate matter with an aerodynamic diameter of 10 microns or less (PM-10); annual particulate matter with an aerodynamic diameter of 2.5 microns or less (PM-2.5); and 1-hour, 3-hour, 24-hour, and annual sulfur dioxide (SO_2) Alaskan ambient air quality standards (AAAQS), OSA is required to construct and maintain vertical, uncapped exhaust stacks for all EUs except for EUs 208-212, 224-227, and 246-248 and to limit the:
    a. hydrogen sulfide (H_2S) content of all fuel gas-fired EUs to 500 ppmv;
    b. sulfur content in all diesel-fired EUs (except EUs 208-212 and 248) to less than 0.0015 percent by weight;
    c. the sulfur content in EUs 208-202 and 248 to no more than 0.05 percent by weight;
    d. cumulative brake horsepower of intermittently used oil field support nonroad engines with a rated capacity greater than or equal to 400 bhp to no greater than 29,780 bhp; and
    e. cumulative fuel gas flared by the well construction flare (EU 213) to 160 million standard cubic feet per 12 consecutive month period.
4. OSA is requesting an ORL to avoid triggering PSD for NOx by limiting the combined fuel consumption for the drill rig camp generator engines (EUs 206 and 207) to no more than 436,989 gallons per year.
5. OSA is maintaining the ORL from Minor Permit No. AQ1564MSS01 to avoid triggering PSD for VOCs by limiting the fuel gas flared by the well construction flare (EU 213) to 160 million standard cubic feet per 12 consecutive month period.

6. EMISSIONS SUMMARY AND PERMIT APPLICABILITY

Table 2 shows the emissions summary and permit applicability with assessable emissions from the stationary source. Emission factors and detailed calculations are provided in Appendix A.

A summary of the potential to emit (PTE) and assessable PTE, as determined by the Department, is shown in Table 2 below.

Table 2 – Emissions Summary and Permit Applicability, tons per year (tpy)

Parameter	NOx	CO	VOC	PM-2.5	PM-10	SO_2
PTE	200.7	133.9	81.9	9.8	10.3	27.9
18 AAC 50.502(c)(1) Permit Thresholds	40	N/A	N/A	10	15	40
18 AAC 50.502(c)(1) Applicable?	Yes	N/A	N/A	No	No	No
Title V Permit Thresholds	100	100	100	100	100	100
Title V Permit Required?	Yes	Yes	No	No	No	No

Parameter	NOx	CO	VOC	PM-2.5	PM-10	SO_2
PSD Applicability Threshold	250	250	250	250	250	250
PSD Applicability Triggered?	No	No	No	No	No	No
Assessable Emissions [a]	201	134	82	-	10	28
Total Assessable [b]	455					

Table Notes:

[a] – Assessable emissions include any pollutant greater than or equal to 10 tpy.

[b] – PM-10 emissions include PM-2.5 emissions. Therefore, PM-2.5 is not counted in total assessable emissions.

7. PERMIT CONDITIONS

The bases for the standard and general conditions imposed in Minor Permit AQ1564MSS02 are described below.

Cover Page

18 AAC 50.544(a)(1) requires the Department to identify the stationary source, Permittee, and contact information. The Department provided this information on the cover page of the permit.

Section 1: Emissions Unit Inventory

The EUs authorized and/or restricted by this permit are listed in Table 1 of the permit. Unless otherwise noted in the permit, the information in Table 1 is for identification purposes only. Condition 1 is a general requirement to comply with AS 46.14 and 18 AAC 50 when installing a replacement EU. Condition 2 is a requirement for permits issued under 18 AAC 50.502(c).

Section 2: Fee Requirements

18 AAC 50.544(a)(2) requires the Department to include a requirement to pay fees in accordance with 18 AAC 50.400 – 499 in each minor permit issued under 18 AAC 50.542. The Department used the Standard Permit Condition (SPC) I language for Minor Permit AQ1564MSS02.

As indicated by Footnote 1, if the stationary source has not commenced construction or operation on or before March 31st, the Permittee is required to submit a transmittal letter certified by the responsible official under 18 AAC 50.205 indicating that the assessable emissions for the source are zero for the previous fiscal year.

Section 3: State Emission Standards

Condition 6, Visible Emissions

This condition ensures compliance with the applicable requirements in 18 AAC 50.055(a). Visible emissions, excluding condensed water vapor, from fuel-burning equipment may not reduce visibility through the effluent by more than 20 percent averaged over six consecutive minutes, under 18 AAC 50.055(a)(1). Per 18 AAC 50.990(39), “fuel-burning equipment” does not include mobile internal combustion engines (e.g., Nonroad Engines).

Diesel-fired engines and boilers have the tendency to exceed the VE standards. As such, the Department has included a requirement to perform Method 9 testing as well as recordkeeping and reporting requirements in Condition 6 to demonstrate continued compliance with the standard. The Department is requiring initial compliance demonstrations within 60 days of startup of EUs 2-5, 101, 206-213, 224-227, and 248.

The Department is not requiring monitoring for the gas-fired production heater (EU 1) since gas-fired heaters generally comply with the visible emission standard. For Gas Flaring (EU 213), the Permittee will need to conduct a Method 9 visible emissions test on a calendar year annual basis. The Department is including ongoing monitoring because it believes that gas flaring may violate the visible emissions standard.

Conditions 7 and 8, Particulate Matter

These conditions ensure compliance with the applicable requirement in 18 AAC 50.055(b). These requirements apply to operation of all fuel-burning equipment. Particulate matter emitted from fuel-burning equipment may not exceed 0.05 grains per cubic foot of exhaust gas (gr/dscf), averaged over three hours, under 18 AAC 50.055(b).

Experience has shown there is a correlation between opacity and particulate matter. 20 percent visible emissions would normally comply with the 0.05 gr/dscf. As such, compliance with opacity limits is included as a surrogate method of assuring compliance with the PM standards.

Condition 8 requires the Permittee to take reasonable precautions to prevent the release of fugitive dust from rock crushing operations. This includes performing all material processing under wet, saturated conditions in an enclosed space without exhaust ports.

Condition 9, Sulfur Compound Emissions

Sulfur compound emissions from an industrial process or fuel burning equipment may not exceed 500 ppm averaged over a period of three hours, under 18 AAC 50.055(c).

Permits classified under 18 AAC 50.502(c) must include terms and conditions requiring performance tests for emission limits under 18 AAC 50.050 – 090.

Calculations show that fuel oil with sulfur content less than 0.74 percent by weight will comply with the state emissions standard. Calculations show that fuel gas with sulfur content less than 4,000 parts per million by volume will comply with the state standards.

Diesel fuel grades that requires less than 0.5 percent fuel sulfur will meet the state emissions standard. Since pipeline quality gas contains less than 500 ppmv H_2S, burning pipeline quality gas would comply with the standard. The permit contains appropriate monitoring for compliance with the standard.

The Permittee will demonstrate compliance with the requirements of Condition 9 by complying with the ambient air quality protection requirements in Condition 10.2, 10.3, and 10.4.

Section 4: Ambient Air Quality Protection Requirements

Conditions 10 -13, Ambient Air Quality Protection Requirements

18 AAC 50.544(a)(3) and 18 AAC 50.544(a)(6) require the Department to include conditions to protect air quality, when warranted. The Department determined that conditions are warranted to protect the annual nitrogen dioxide (NO_2); 24-hour particulate matter with an aerodynamic diameter of 10 microns or less (PM-10); annual particulate matter with an aerodynamic diameter of 2.5 microns or less (PM-2.5); and 1-hour, 3-hour, 24-hour, and annual sulfur dioxide (SO_2) Alaskan ambient air quality standards AAAQS for the reasons described in Appendix B of the TAR.

Section 5: Limit to Avoid PSD Classification/Modification

Conditions 14 -16, Limit to Avoid PSD Classification/Modification

18 AAC 50.544(h) describes the requirements for a permit classified under 18 AAC 50.508(5). Conditions 14 through 16 contain OSA's ORLs to keep the potential NOx, CO, VOC, and SO_2 emissions to less than 250 tpy in order to avoid a PSD permit under 18 AAC 50.306. Conditions 14 and 16 include tons per year limits as required under EPA guidance,[4] for the drill rig camp generators (EUs 206 and 207) and the construction well test flare (EU 213). Compliance will be demonstrated by complying with the listed operational limits.

Condition 15 includes an operational limit pertaining to maintaining the status of NREs according to 40 CFR 1068.30.

Section 6: General Recordkeeping, Reporting, and Certification Requirements

Condition 17, Certification

18 AAC 50.205 requires the Permittee to certify any permit application, report, affirmation, or compliance certification submitted to the Department. This requirement is reiterated as a standard permit condition in 18 AAC 50.345(j). Minor Permit AQ1564MSS02 uses the standard condition language, but also expands it by allowing the Permittee to provide electronic signatures.

Condition 18 Submittals

Condition 18 clarifies where the Permittee should send their reports, certifications, and other submittals required by the permit. The Department included this condition from a practical perspective rather than a regulatory obligation.

Condition 19, Information Requests

AS 46.14.020(b) allows the Department to obtain a wide variety of emissions, design and operational information from the owner and operator of a stationary source. This statutory provision is reiterated as a standard permit condition in 18 AAC 50.345(i). The Department used the standard language in Minor Permit AQ1564MSS02.

[4] *Limiting Potential to Emit (PTE) in New Source Review (NSR) Permitting*; Section III. Types of Limitations that will Restrict Potential to Emit; as revised on February 11, 2011

Condition 20, Recordkeeping Requirements

The condition restates the regulatory requirements for recordkeeping, and supplements the recordkeeping defined for specific conditions in the permit. The records being kept provide an evidence of compliance with this requirement.

Condition 21, Excess Emission and Permit Deviation Reports

This condition reiterates the notification requirements in 18 AAC 50.235(a)(2) and 18 AAC 50.240 regarding unavoidable emergencies, malfunctions, and excess emissions. Also, the Permittee is required to notify the Department when emissions or operations deviate from the requirements of the permit. The Department used the SPC III language, but with updated web-links.

Condition 22, Operating Reports

The Department mostly used the SPC VII language for the operating report condition. However, the Department modified or eliminated the Title V only aspects in order to make the language applicable for a minor permit.

Condition 23, Title V Major Source Application Submittal Date

For a stationary source that directly emits, or has the potential to emit, 100 TPY or more of any air pollutant subject to regulation, the Permittee shall file a complete application to obtain the part 70 Title V Operating Permit within 12 months after commencing operation or exceeding the 100 TPY threshold as required by 40 C.F.R. 70.5.

Condition 24, Air Pollution Prohibited

18 AAC 50.110 prohibits any emission which is injurious to human health or welfare, animal or plant life, or property, or which would unreasonably interfere with the enjoyment of life or property. Condition 20 reiterates this prohibition as a permit condition. The Department used the SPC II language for Minor Permit AQ1564MSS02.

Section 7: Standard Permit Conditions

Conditions 25 – 30, Standard Permit Conditions

18 AAC 50.544(a)(5) requires each minor permit issued under 18 AAC 50.542 to contain the standard permit conditions in 18 AAC 50.345, as applicable. 18 AAC 50.345(a) clarifies that subparts (c)(1) and (2), and (d) through (o), may be applicable for a minor permit.

The Department included all of the minor permit-related standard conditions of 18 AAC 50.345 in Minor Permit AQ1564MSS02. The Department incorporated these standard conditions as follows:

- 18 AAC 50.345(c)(1) and (2) is incorporated as Condition 25 of Section 7 (Standard Permit Conditions);
- 18 AAC 50.345(d) through (h) is incorporated as Conditions 26 through 30, respectively, of Section 7 (Standard Permit Conditions);
- As previously discussed, 18 AAC 50.345(i) is incorporated as Condition 19 and 18 AAC 50.345(j) is incorporated as Condition 17 of Section 6 (Recordkeeping, Reporting, and Certification Requirements); and

- 18 AAC 50.345(k) is incorporated as Condition 31, and 18 AAC 50.345(l) through (o) is incorporated as Conditions 34 through 38, respectively, of Section 8 (General Source Testing Requirements). See the following discussion.

Section 8: General Source Test Requirements

AS 46.14.180 states that monitoring requirements must be, "based on test methods, analytical procedures, and statistical conventions approved by the federal administrator or the department or otherwise generally accepted as scientifically competent." The Department incorporated this requirement as follows:

- Condition 32 requires the Permittee to conduct their source tests under conditions that reflects the actual discharge to ambient air; and
- Condition 33 requires the Permittee to use specific EPA reference methods when conducting a source test.

Section 8 also includes the previously discussed standard conditions for source testing.

8. PERMIT ADMINISTRATION

OSA may proceed with construction of the stationary source upon the issuance of this minor permit. The stationary source has the potential to emit more than 100 tpy of one or more criteria pollutants. Therefore, the stationary source is required to obtain a Title V operating permit. A timely Title V application for the stationary source is due no later than 12 months after the stationary source commences operation. The Department is interpreting 'commences operation' as 'starting to operate any of the emissions units listed in Table 1 of Minor Permit AQ1564MSS02'. The Department based its decision on a reasonable interpretation of 40 CFR 71.5(a)(1)(ii).

APPENDIX A: EMISSIONS CALCULATIONS

Table A-1 presents details of the EUs, their characteristics, and emissions. Potential emissions are estimated using maximum annual operation for all fuel burning equipment as defined in 18 AAC 50.990(39) subject to any operating limits.

Table A-1 – Emissions Summary, in Tons Per Year (tpy)

EU ID	Unit ID/ Description	Maximum Rating or Capacity	Operating Limits	NO_X		CO		VOC		PM-10		SO_2
				EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)	PTE (tpy)
1	Production Heater No. 1	30 MMBtu/hr	8,760 hr/yr	100 lb/MMscf	12.9	84 lb/MMscf	10.8	5.5 lb/MMscf	0.7	7.6 lb/MMscf	1.0	10.86
2	Power Generator Engine No. 1	4,000 Bhp	8,760 hr/yr	8.8 lb/hr	38.5	2.62 lb/hr	11.5	0.10 lb/hr	0.4	0.19 lb/hr	0.8	0.20
3	Power Generator Engine No. 2	4,000 Bhp	8,760 hr/yr	8.8 lb/hr	38.5	2.62 lb/hr	11.5	0.10 lb/hr	0.4	0.19 lb/hr	0.8	0.20
4	Injection Skid Engine No. 1	600 Bhp	8,760 hr/yr	0.40 g/kW-hr [2]	2.6	3.5 g/kW-hr [2]	18.9	0.19 g/kW-hr [2]	1.0	0.02 g/kW-hr	0.1	0.03
5	Injection Skid Engine No. 2	600 Bhp	8,760 hr/yr	0.40 g/kW-hr [2]	2.6	3.5 g/kW-hr [2]	18.9	0.19 g/kW-hr [2]	1.0	0.02 g/kW-hr	0.1	0.03
6	Scale Inhibor Tank	135 bbl	8,760 hr/yr	NA	-	NA	-	0.14 lb/yr	7.0E-05	NA	-	-
7	Corrosion Inhibitor Tank	135 bbl	8,760 hr/yr	NA	-	NA	-	114.6 lb/yr	0.1	NA	-	-
8	Emulsion Breaker Tank	135 bbl	8,760 hr/yr	NA	-	NA	-	26.8 lb/yr	0.01	NA	-	-
9	Antifoam Tank	50 bbl	8,760 hr/yr	NA	-	NA	-	0.1 lb/yr	5.0E-05	NA	-	-
10	Diesel Tank	480 bbl	8,760 hr/yr	NA	-	NA	-	5.1 lb/yr	2.6E-03	NA	-	-
11	Diesel Tank	480 bbl	8,760 hr/yr	NA	-	NA	-	5.1 lb/yr	2.6E-03	NA	-	-
12	Methanol Tank	480 bbl	8,760 hr/yr	NA	-	NA	-	416.1 lb/yr	0.2	NA	-	-
				Grind and Inject Equipment								
101	G&I Emergency Firewater Pump Engine	125 bhp	500 hr/yr	4 g/kW-hr [2]	0.3	5 g/kW-hr [2]	0.3	4 g/kW-hr [2]	0.3	0.3 g/kW-hr [2]	0.02	3.5E-04
102	G&I Train Shaker No. 1	50 tph	8,760 hr/yr	NA	-	NA	-	NA	-	NA	-	-
	G&I Train Shaker No. 2	50 tph	8,760 hr/yr	NA	-	NA	-	NA	-	NA	-	-
	G&I Train Shaker No. 3	50 tph	8,760 hr/yr	NA	-	NA	-	NA	-	NA	-	-
103	G&I Train Hammer Mill	50 tph	8,760 hr/yr	NA	-	NA	-	NA	-	NA	-	-
104	G&I Train Conical Ball Mill	50 tph	8,760 hr/yr	NA	-	NA	-	NA	-	NA	-	-
105	G&I Diesel Fuel Storage Tank	400 bbl	8,760 hr/yr	NA	-	NA	-	4.2 lb/yr	2.1E-03	NA	-	-
106	G&I Tank Farm Fluids Tank No. 1	1,000 bbl	8,760 hr/yr	NA	-	NA	-	88.6 lb/yr	0.04	NA	-	-
107	G&I Tank Farm Fluids Tank No. 2	1,000 bbl	8,760 hr/yr	NA	-	NA	-	88.6 lb/yr	0.04	NA	-	-

EU ID	Unit ID/ Description	Maximum Rating or Capacity	Operating Limits	NO_x		CO		VOC		PM-10		SO_2
				EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)	PTE (tpy)
108	G&I Tank Farm Fluids Tank No. 3	1,000 bbl	8,760 hr/yr	NA	-	NA	-	88.6 lb/yr	0.04	NA	-	-
109	G&I Tank Farm Fluids Tank No. 4	1,000 bbl	8,760 hr/yr	NA	-	NA	-	88.6 lb/yr	0.04	NA	-	-
110	G&I Tank Farm Fluids Tank No. 5	1,000 bbl	8,760 hr/yr	NA	-	NA	-	88.6 lb/yr	0.04	NA	-	-
111	Multi-Purpose Fluids Tank	1,000 bbl	8,760 hr/yr	NA	-	NA	-	7,490.2 lb/yr	3.7	NA	-	-
Drill Rig Equipment												
201	Drill Rig Generator Engine No. 1	2,150 bhp	8,760 hr/yr	5.05 g/hp-hr	104.8	0.41 g/hp-hr	8.5	0.1 g/hp-hr	2.1	0.036 g/hp-hr	0.7	0.1
202	Drill Rig Generator Engine No. 2	2,150 bhp	8,760 hr/yr	5.05 g/hp-hr	104.8	0.41 g/hp-hr	8.5	0.1 g/hp-hr	2.1	0.036 g/hp-hr	0.7	0.1
203	Drill Rig Generator Engine No. 3	2,150 bhp	8,760 hr/yr	5.05 g/hp-hr	104.8	0.41 g/hp-hr	8.5	0.1 g/hp-hr	2.1	0.036 g/hp-hr	0.7	0.1
204	Drill Rig Move/Emergency Engine No. 1	1,502 bhp	8,760 hr/yr	5.76 g/hp-hr	83.5	0.25 g/hp-hr	3.6	0.01 g/hp-hr	0.1	0.02 g/hp-hr	0.3	0.07
205	Drill Rig Move/Emergency Engine No. 2	1,502 bhp	8,760 hr/yr	5.76 g/hp-hr	83.5	0.25 g/hp-hr	3.6	0.01 g/hp-hr	0.1	0.02 g/hp-hr	0.3	0.07
206	Drill Rig Camp Generator Engine No. 1	900 bhp	9,260 hr/yr	5.75 g/hp-hr	52.8	0.46 g/hp-hr	4.2	0.02 g/hp-hr	0.2	0.06 g/hp-hr	0.6	0.05
207	Drill Rig Camp Generator Engine No. 2	900 bhp						0.02 g/hp-hr		0.06 g/hp-hr		
208	Rig Boiler No. 1	200 boiler hp	8,760 hr/yr	20 lb/10^3 gal	5.5	5 lb/10^3 gal	1.4	0.34 lb/10^3 gal	0.09	2.38 lb/10^3 gal	0.7	1.9
209	Rig Boiler No. 2	200 boiler hp	8,760 hr/yr	20 lb/10^3 gal	5.5	5 lb/10^3 gal	1.4	0.34 lb/10^3 gal	0.09	2.38 lb/10^3 gal	0.7	1.9
210	Rig Heater No. 1	4.2 MMBtu/hr	8,760 hr/yr	20 lb/10^3 gal	2.8	5 lb/10^3 gal	0.7	0.34 lb/10^3 gal	0.05	2.38 lb/10^3 gal	0.3	1.0
211	Rig Heater No. 2	4.2 MMBtu/hr	8,760 hr/yr	20 lb/10^3 gal	2.8	5 lb/10^3 gal	0.7	0.34 lb/10^3 gal	0.05	2.38 lb/10^3 gal	0.3	1.0
212	Rig Heater No. 3	4.2 MMBtu/hr	8,760 hr/yr	20 lb/10^3 gal	2.8	5 lb/10^3 gal	0.7	0.34 lb/10^3 gal	0.05	2.38 lb/10^3 gal	0.3	1.0
Drilling Support Equipment												
213	Construction Well Test Flare - Upset	24 MMscf/day	160 MMscf/yr	100 lb/MMBtu	8.0	0.31 lb/MMBtu	25.3	0.66 lb/MMBtu	53.9	40 mg/L	1.8	6.7
	Construction Well Test Flare - Pilot	0.01 Mscf/hr	0.1 MMscf/yr	0.068 lb/MMBtu	0.009	0.31 lb/MMBtu	0.04	0.66 lb/MMBtu	0.03	40 mg/L	0.001	0.6
214	Tank Farm Mud Product Storage Tank No. 1	600 bbl	8,760 hr/yr	NA	-	NA	-	55 lb/yr	0.03	NA	-	-
215	Tank Farm Mud Product Storage Tank No. 2	600 bbl	8,760 hr/yr	NA	-	NA	-	55 lb/yr	0.03	NA	-	-

EU ID	Unit ID/ Description	Maximum Rating or Capacity	Operating Limits	NO_x		CO		VOC		PM-10		SO_2
				EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)	PTE (tpy)
216	Tank Farm Mud Product Storage Tank No. 3	600 bbl	8,760 hr/yr	NA	-	NA	-	55 lb/yr	0.03	NA	-	-
217	Tank Farm Mud Product Storage Tank No. 4	600 bbl	8,760 hr/yr	NA	-	NA	-	55 lb/yr	0.03	NA	-	-
218	Tank Farm Mud Product Storage Tank No. 5	600 bbl	8,760 hr/yr	NA	-	NA	-	55 lb/yr	0.03	NA	-	-
219	Tank Farm Mud Product Storage Tank No. 6	600 bbl	8,760 hr/yr	NA	-	NA	-	55 lb/yr	0.03	NA	-	-
220	Tank Farm Mud Product Storage Tank No. 7	600 bbl	8,760 hr/yr	NA	-	NA	-	55 lb/yr	0.03	NA	-	-
221	Tank Farm Mud Product Storage Tank No. 8	600 bbl	8,760 hr/yr	NA	-	NA	-	55 lb/yr	0.03	NA	-	-
222	Tank Farm Mud Product Storage Tank No. 9	600 bbl	8,760 hr/yr	NA	-	NA	-	55 lb/yr	0.03	NA	-	-
223	Tank Farm Mud Product Storage Tank No. 10	600 bbl	8,760 hr/yr	NA	-	NA	-	55 lb/yr	0.03	NA	-	-
224	Tank Farm Generator Engine No. 1	350 bhp	8,760 hr/yr	0.6 g/kW-hr [2]	1.5	4.375 g/kW-hr [2]	11.0	0.285 g/kW-hr	0.7	0.03 g/kW-hr [2]	0.1	0.02
225	Tank Farm Generator Engine No. 2	350 bhp	8,760 hr/yr	0.6 g/kW-hr [2]	1.5	4.375 g/kW-hr [2]	11.0	0.285 g/kW-hr	0.7	0.03 g/kW-hr [2]	0.1	0.02
226	Tank Farm Boiler No. 1	2.5 MMBtu/hr	164,045 gal/yr	20 lb/103 gal	1.6	5 lb/103 gal	0.4	0.34 lb/10^3 gal	0.03	2.38 lb/10^3 gal	0.2	0.02
227	Tank Farm Boiler No. 2	2.5 MMBtu/hr	164,045 gal/yr	20 lb/103 gal	1.6	5 lb/103 gal	0.4	0.34 lb/10^3 gal	0.03	2.38 lb/10^3 gal	0.2	0.02
228	Cement Pump Engine No. 1	325 bhp	8,760 hr/yr	0.031 lb/hp-hr	44.1	0.0067 lb/hp-hr	9.5	0.00251 lb/hp-hr	3.6	0.0022 lb/hp-hr	3.1	0.02
229	Cement Pump Engine No. 2	325 bhp	8,760 hr/yr	0.031 lb/hp-hr	44.1	0.0067 lb/hp-hr	9.5	0.00251 lb/hp-hr	3.6	0.0022 lb/hp-hr	3.1	0.02
230	Cement Pump Engine No. 3	325 bhp	8,760 hr/yr	0.031 lb/hp-hr	44.1	0.0067 lb/hp-hr	9.5	0.00251 lb/hp-hr	3.6	0.0022 lb/hp-hr	3.1	0.02
Well Servicing Equipment												
231	Super Pump Engine No. 1	2,250 bhp	8,760 hr/yr	6.4 g/kW-hr	103.7	3.5 g/kW-hr	56.7	6.4 g/kW-hr	103.7	0.2 g/kW-hr	3.2	0.11
232	Super Pump Engine No. 2	2,250 bhp	8,760 hr/yr	6.4 g/kW-hr	103.7	3.5 g/kW-hr	56.7	6.4 g/kW-hr	103.7	0.2 g/kW-hr	3.2	0.11

EU ID	Unit ID/ Description	Maximum Rating or Capacity	Operating Limits	NOx		CO		VOC		PM-10		SO_2
				EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)	PTE (tpy)
233	Super Pump Engine No. 3	2,250 bhp	8,760 hr/yr	6.4 g/kW-hr	103.7	3.5 g/kW-hr	56.7	6.4 g/kW-hr	103.7	0.2 g/kW-hr	3.2	0.11
234	Super Pump Engine No. 4	2,250 bhp	8,760 hr/yr	6.4 g/kW-hr	103.7	3.5 g/kW-hr	56.7	6.4 g/kW-hr	103.7	0.2 g/kW-hr	3.2	0.11
235	Super Pump Engine No. 5	2,250 bhp	8,760 hr/yr	6.4 g/kW-hr	103.7	3.5 g/kW-hr	56.7	6.4 g/kW-hr	103.7	0.2 g/kW-hr	3.2	0.11
236	Super Pump Engine No. 6	2,250 bhp	8,760 hr/yr	6.4 g/kW-hr	103.7	3.5 g/kW-hr	56.7	6.4 g/kW-hr	103.7	0.2 g/kW-hr	3.2	0.11
237	Super Pump Engine No. 7	2,250 bhp	8,760 hr/yr	6.4 g/kW-hr	103.7	3.5 g/kW-hr	56.7	6.4 g/kW-hr	103.7	0.2 g/kW-hr	3.2	0.11
238	POD IV Road/Deck Engine	410 bhp	8,760 hr/yr	4 g/kW-hr	11.8	3.5 g/kW-hr	10.3	4 g/kW-hr	11.8	0.2 g/kW-hr	0.6	0.02
239	POD IV Deck Engine	400 bhp	8,760 hr/yr	4 g/kW-hr	11.5	3.5 g/kW-hr	10.1	4 g/kW-hr	11.5	0.2 g/kW-hr	0.6	0.02
240	Treatment Van Engine	25 kW [3]	8,760 hr/yr	5.875 g/kW-hr [2]	1.4	6.875 g/kW-hr [2]	1.5	5.875 g/kW-hr [2]	1.3	0.045 g/kW-hr [2]	0.01	0.00
241	Sand Chief Engine	135 kW	8,760 hr/yr	4 g/kW-hr	5.7	5 g/kW-hr	6.1	4 g/kW-hr	4.9	0.3 g/kW-hr	0.3	0.01
242	Van 35 Engine	35 bhp	8,760 hr/yr	7.5 g/kW-hr	1.9	5.5 g/kW-hr	1.5	7.5 g/kW-hr	1.9	0.6 g/kW-hr	0.2	0.00
243	PCM Engine	475 bhp	8,760 hr/yr	0.6 g/kW-hr [2]	2.1	4.375 g/kW-hr [2]	15.0	0.285 g/kW-hr [2]	1.0	0.03 g/kW-hr [2]	0.1	0.02
244	Liquid Add Engine	300 bhp	8,760 hr/yr	4 g/kW-hr	8.6	3.5 g/kW-hr	7.6	4 g/kW-hr	8.6	0.2 g/kW-hr	0.4	0.01
245	Liquid Add Engine	300 bhp	8,760 hr/yr	4 g/kW-hr	8.6	3.5 g/kW-hr	7.6	4 g/kW-hr	8.6	0.2 g/kW-hr	0.4	0.01
246	Coiled Tubing Unit Power Pack Engine	400 bhp	8,760 hr/yr	0.031 lb/hp-hr	54.3	6.7E-03 lb/hp-hr	11.7	2.5E-03 lb/hp-hr	4.4	2.2E-03 lb/hp-hr	3.9	0.02
247	Coiled Tubing Unit Tractor Pump Engine	430 bhp	8,760 hr/yr	0.031 lb/hp-hr	58.4	6.7E-03 lb/hp-hr	12.6	2.5E-03 lb/hp-hr	4.7	2.2E-03 lb/hp-hr	4.1	0.02
248	Hot Oil Boiler/Heater	623,371 gal/year	8,760 hr/yr	20 lb/10^3 gal	6.2	5 lb/10^3 gal	1.6	0.34 lb/10^3 gal	0.1	2.38 lb/10^3 gal	0.7	2.21
249	Diesel Fuel Storage Tank	105 bbl	8,760 hr/yr	NA	-	NA	-	0.1 lb/yr	5.0E-05	NA	-	-
250	Bleed Off/Pop Off Tank	500 bbl	8,760 hr/yr	NA	-	NA	-	3831.3 lb/yr	1.9	NA	-	-
251	Portable Well Flowback Storage Tank No. 1	400 bbl	8,760 hr/yr	NA	-	NA	-	3056.0 lb/yr	1.5	NA	-	-
252	Portable Well Flowback Storage Tank No. 2	400 bbl	8,760 hr/yr	NA	-	NA	-	3056.0 lb/yr	1.5	NA	-	-
253	Portable Well Flowback Storage Tank No. 3	400 bbl	8,760 hr/yr	NA	-	NA	-	3056.0 lb/yr	1.5	NA	-	-
254	Portable Well Flowback Storage Tank No. 4	400 bbl	8,760 hr/yr	NA	-	NA	-	3056.0 lb/yr	1.5	NA	-	-
255	Portable Well Flowback Storage Tank No. 5	400 bbl	8,760 hr/yr	NA	-	NA	-	3056.0 lb/yr	1.5	NA	-	-
256	Portable Well Flowback Storage Tank No. 6	400 bbl	8,760 hr/yr	NA	-	NA	-	3056.0 lb/yr	1.5	NA	-	-

EU ID	Unit ID/ Description	Maximum Rating or Capacity	Operating Limits	NOx		CO		VOC		PM-10		SO_2
				EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)	PTE (tpy)
257	Portable Well Flowback Storage Tank No. 7	400 bbl	8,760 hr/yr	NA	-	NA	-	3056.0 lb/yr	1.5	NA	-	-
258	Portable Well Flowback Storage Tank No. 8	400 bbl	8,760 hr/yr	NA	-	NA	-	3056.0 lb/yr	1.5	NA	-	-
259	Portable Well Flowback Storage Tank No. 9	400 bbl	8,760 hr/yr	NA	-	NA	-	3056.0 lb/yr	1.5	NA	-	-
260	Portable Well Flowback Storage Tank No. 10	400 bbl	8,760 hr/yr	NA	-	NA	-	3056.0 lb/yr	1.5	NA	-	-
Miscellaneous Equipment												
261	(20) Various Portable Heaters	1,263,146 gal/year	8,760 hr/yr	20 lb/10^3 gal	12.6	5 lb/10^3 gal	3.2	0.34 lb/10^3 gal	0.2	2.38 lb/10^3 gal	1.5	0.13
		160 kW, total [3]	8,760 hr/yr	0.031 lb/hp-hr	29.1	6.7E-03 lb/hp-hr	6.3	0.00251 lb/hp-hr	2.4	2.2E-03 lb/hp-hr	2.1	0.01
262	(20) Various Light Plants	220 bhp, total [3]	8,760 hr/yr	0.031 lb/hp-hr	29.9	6.7E-03 lb/hp-hr	6.4	0.00251 lb/hp-hr	3.2	2.2E-03 lb/hp-hr	2.1	0.01
263	Mixed Use Generator Engine	100 bhp [3]	8,760 hr/yr	0.031 lb/hp-hr	13.6	6.7E-03 lb/hp-hr	2.9	0.00251 lb/hp-hr	1.5	2.2E-03 lb/hp-hr	1.0	0.005
264	Mixed Use Generator Engine	100 bhp [3]	8,760 hr/yr	0.031 lb/hp-hr	13.6	6.7E-03 lb/hp-hr	2.9	0.00251 lb/hp-hr	1.5	2.2E-03 lb/hp-hr	1.0	0.005
Total Potential to Emit					**1791.0**		**694.6**		**892.3**		**61.9**	**29.4**
Total Stationary Source Potential to Emit Emissions					**200.7**		**133.9**		**81.9**		**10.3**	**27.9**

Item

1 EU ID #

2 Not-to-exceed multiplier of 1.25 or 1.5 applied to emission rates, per Eq. 1 of 40 CFR 60.4212(c) or 40 CFR 1039.101(e)(3).

3 Per 18 AAC 50.990(107), construction activities are considered temporary construction activities if they are completed within 24 months from the date construction begins. Per 40 CFR 52.21(b)(4), secondary emissions,

4 Operational limits (gal/yr, hr/yr, MMBtu/yr, etc.)

5 Use EPA's AP-42, vendor, manufacturer, or source test EFs

6 PM-2.5 and PM-10 may need to be split and may contain different EFs

Alaska Department of Environmental Conservation

Air Permit Program

review of

Oil Search (Alaska), LLC's

Ambient Demonstration

for the

Nanushuk Drillsite B

Minor Permit AQ1564MSS02

Prepared by: James Julian Renovatio

August 12, 2022

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1. INTRODUCTION

This report summarizes the Alaska Department of Environmental Conservation's (Department's) findings regarding the ambient demonstration submitted by Oil Search (Alaska), LLC (OSA) for the Nanushuk Drillsite B (ND-B). OSA submitted this analysis in support of their January 25, 2022 application for Minor Permit AQ1564MSS02. OSA adequately demonstrated that operating the ND-B emissions units (EUs) within the restrictions listed in this report will not cause or contribute to a violation of the following Alaska Ambient Air Quality Standards (AAAQS) provided in 18 AAC 50.010:

- annually averaged nitrogen dioxide (NO_2);
- annually averaged particulate matter with an aerodynamic diameter of 2.5 microns or less (PM-2.5);
- 24-hour particulate matter with an aerodynamic diameter of 10 microns or less (PM-10); and
- annually averaged, 24-hour, three-hour, and one-hour sulfur dioxide (SO_2).

2. BACKGROUND

The following sub-sections provide additional background on the proposed project and application materials.

2.1. Project Location

ND-B is a new stationary source on the Alaskan North Slope. OSA's application materials indicate the source is located at 70°20'6.938" N, 150°38'0.184" W. This location is situated approximately 19 kilometers (km) northeast from the community of Nuiqsut.

2.2. Project Description

The ND-B stationary source is part of the greater Pikka Development Project, previously identified as the Nanushuk Project. It is a new stationary source with operations that are characterized by oil and gas exploration/production under both the standard industrial classification (SIC) and North American industrial classification system (NAICS)[1] schemes. The emissions unit (EU) inventory at the source is generally consistent with that of its industrial classification; detail is provided under Section 3.6. The application for Minor Permit AQ1564MSS02 proposes the installation of units with significant ratings and emissions potential, which will result in a net increase of regulated emissions from Minor Permit AQ1564MSS01.

[1] Application materials indicate the stationary source is classified under SIC 1311 and NAICS 211111.

2.3. Project Classification

OSA's application is classified under 18 AAC 50.502(c)(2)(A) for the construction of a portable oil and gas operation. Applicants must provide an AAAQS analysis for SO_2, annually averaged PM-2.5, PM-10, and NO_2 in accordance with the requirements of 18 AAC 50.540(c)(2)(B). OSA fulfilled this requirement by submitting an AAAQS analysis for annually averaged NO_2 with their application, and a demonstration of the remaining pollutants and averaging periods in their June 3, 2022 supplemental submission; see Section 2.5 for detail.

OSA's application is also classified under 18 AAC 50.502(c)(1) for construction of a new stationary source with a potential to emit greater than the applicable thresholds for oxides of nitrogen (NOx). Applicants must provide an AAAQS analysis for each pollutant triggered under this classification in accordance with the requirements of 18 AAC 50.540(c)(2)(A). OSA fulfilled this requirement by submitting an AAAQS analysis for annually averaged NO_2 with their application. Applicants for minor permits are not generally required to demonstrate compliance with the one-hour NO_2 AAAQS in observation of 18 AAC 50.540(l).

OSA's application is also classified under 18 AAC 50.508(5) for establishing owner requested limits (ORLs) to avoid classification as a prevention of significant deterioration (PSD) source. The proposed ORLs limit the emissions of NOx, volatile organic compounds (VOCs), carbon monoxide (CO), and SO_2 to less than 250 tpy. There are no ambient air demonstration requirements associated with this permit classification.

OSA's application is also classified under 18 AAC 50.508(6) for their request to revise terms or conditions previously established in a Title I permit. Applicants must include the effects of revising those terms or conditions on the underlying ambient demonstration in accordance with the requirements of 18 AAC 50.540(k)(3)(C). OSA proposed to remove Condition 21 of Minor Permit AQ1564MSS01. There are no ambient air demonstration requirements associated with this condition.

2.4. Modeling Protocol Submittal

The Department does not typically require a modeling protocol to be submitted[2] with an application for a minor permit. However, a protocol is helpful to ensure that the modeling tools, procedures, input data, and assumptions that are used by an applicant are consistent with both State and Federal guidance.

OSA did not submit a modeling protocol for the ND-B. Their consultant, Boreal Environmental Services (Boreal), discussed modeling concerns inclusive to use of the flare and thermal oxidizer prior to submitting an ambient analysis. A summary of this discussion and Department findings was provided by e-mail[3] in late 2021.

[2] The Department may request an applicant submit a modeling protocol in accordance with 18 AAC 50.540(c)(2).
[3] E-mail from J. Jack (ADEC) to G. Horner (OSA) and I. Bertschi (Boreal), *Determination regarding modeling for ND-B,* December 16, 2021.

2.5. Application Submittal

OSA submitted an application for Minor Permit AQ1564MSS02 to the Department on January 25, 2022. They provided supplemental information, including a revised ambient demonstration, by e-mail on June 3, 2022; detail is provided under Section 3. Boreal prepared the application and ambient analysis on OSA's behalf.

3. SOURCE IMPACT ANALYSIS

OSA used computer analysis (modeling) to predict the ambient air quality impacts from NO_2, PM-2.5, PM-10. They addressed estimated impacts from SO_2 using a qualitative[4] approach in lieu of modeling. The Department's findings regarding OSA's analysis are discussed below.

3.1. Approach

An applicant may use a multi-step approach in performing an ambient demonstration. In this approach, project impacts are first compared to the significant impact levels (SILs) listed in Table 5 of 18 AAC 50.215(d). Impacts less than the SIL are considered negligible. For those pollutants and averaging periods with significant impacts, a cumulative impact analysis is warranted.

OSA performed a cumulative impact analysis[5] given significant impacts from all pollutants and averaging periods. Their analysis observed two scenarios that reflect positioning of the drill rig at the west- and east-most wellheads. These scenarios were modeled to assist in the identification of maximum potential impacts. The Department finds OSA's approach appropriate for the ND-B.

3.2. Model Selection

There are a number of air dispersion models available to applicants and regulators. The U.S. Environmental Protection Agency (EPA) lists these models in their *Guideline on Air Quality Models* (Guideline), which the Department has adopted by reference in 18 AAC 50.040(f). OSA used EPA's AERMOD Modeling System (AERMOD) for their ambient analysis. AERMOD is an appropriate modeling system for this permit application.

The AERMOD Modeling System consists of three major components: AERMAP, used to process terrain data, and develop elevations for the receptor grid and EUs; AERMET, used to process the meteorological data; and the AERMOD dispersion model, used to estimate the ambient pollutant concentrations. OSA used the current version of AERMOD and AERMET, both version 21112. They assumed flat terrain within the modeled domain rather than running AERMAP, which is common practice for new source review modeling on the North Slope coastal plain.

[4] The Department provided case-specific approval to address SO_2 impacts qualitatively in a May 13, 2022 e-mail.
[5] The modeled elements of this analysis did not include an evaluation of SO_2, which was addressed qualitatively.

3.3. Meteorological Data

AERMOD requires hourly meteorological data to estimate plume dispersion. A *minimum* of one-year of site-specific data, or five years of representative National Weather Service (NWS) data is required, per Section 8.3 of the Guideline. When modeling with site-specific data, the Guideline states that up to five years should be used, when available, to account for year-to-year variation in meteorological conditions.

OSA used three years of surface data collected by ConocoPhillips Alaska, Inc. (CPAI) during calendar years 2016, 2017, and 2019 at the Nuiqsut meteorological monitoring station. They used concurrent upper air data collected by the NWS at Utqiagvik. OSA's application materials indicate that the Department found these data representative of the meteorological conditions at the ND-B stationary source due to both station proximity and relatively recent dates of collection. The Department is unable to identify a specific finding or record of communications explicitly supporting the case-specific use of these data. It, therefore, evaluated OSA's use of these meteorological data and found that they are sufficient to represent atmospheric transport conditions at the ND-B stationary source at the time of review. The Department encourages applicants to discuss the proposed use of off-site meteorological data with the Department prior to submission of an application.

The Department notes that OSA re-processed CPAI's meteorological data using the most current version of AERMET. Their revised ambient demonstration, submitted on June 3, 2022, used the MODIFY keyword[6] to perform upper-air quality control checks during AERMET Stage 1 processing. OSA also revised the Stage 1 threshold wind speed value[7] from 0.25 meters per second (m/s) to 0.5 m/s to reflect the minimum detectable wind speed of the Nuiqsut station anemometers. Model year 2019 of their revised demonstration saw an update to AERMET Stage 1 inputs to reflect an instrumentation height of 10 m above ground level.

3.4. Coordinate System

Air quality models need to know the relative location of the EUs, structures, and receptors in order to properly estimate ambient pollutant concentrations. Therefore, applicants must use a consistent coordinate system in their analysis. OSA used the Universal Transverse Mercator (UTM) system, Zone 5

3.5. Terrain

Terrain features can influence the dispersion of exhaust plumes from EUs and the resulting ambient air concentrations of the pollutants being emitted. Digitized terrain elevation data is, therefore, generally included in a modeling analysis, unless the entire modeling domain is over water or the terrain features are so slight that a flat terrain assumption can be made.

[6] Detail regarding the function and recommended use of the MODIFY keyword is found in Section 3.4.9 of the AERMET User's Guide.
[7] The applicant indicates that this value should be assigned as the greater of the threshold for wind speed and wind direction in comport with Section 8.4.6.1 of the Guideline and Section 6.2.3 of EPA's February of 2000 *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (EPA-454/R-99-005).

AERMOD's terrain preprocessor, AERMAP, uses terrain data to obtain the base elevations for the modeled EUs, buildings, and receptors; and to calculate a "hill height scale" for each receptor.

OSA did not include terrain data in their modeling analysis. Their application indicates the project is situated within the North Slope coastal plain, which may be assumed flat for the purposes of modeling. This is an appropriate assumption for the current demonstration at the ND-B stationary source.

3.6. EU Inventory

OSA modeled all of the ND-B EUs in their ambient demonstration except as subsequently noted. They assumed the non-concurrent or combined operation of several units, which is discussed in the following sub-sections. All modeled EUs were characterized as point sources.

3.6.1. Non-Concurrent and Combined Operations

OSA proposed the installation and use of a flare and/or thermal oxidizer, collectively referred to as EU 213. They modeled impacts from the unit assumed to show the greatest emissions potential based upon their pre-application discussions with the Department. OSA's approach is appropriate as contextually described but does not offer a characterization of potential impacts from the contemporaneous operation[8] of both units. The Department is, therefore, observing the non-concurrent operation of these equipment as an enforceable permit condition to protect the annually averaged NO_2; annually averaged PM-2.5; 24-hour PM-10; and annually averaged, 24-hour, three-hour, and one-hour SO_2 AAAQS.

OSA separately requested an ORL of 436,989 gallons per year (gal/yr) combined fuel use between EUs 206 and 207.[9] Their application materials indicate that this limit is equivalent to a combined total of 9,260 hours per year (hr/yr)[10] among both units. The Department is, therefore, observing the combined operation of these equipment as an enforceable permit condition to protect the annually averaged NO_2; annually averaged PM-2.5; 24-hour PM-10; and annually averaged, 24-hour, three-hour, and one-hour SO_2 AAAQS

3.6.1. Non-road Engines

OSA's application materials indicate that 24 of the ND-B EUs are or will be classified as non-road engines (NREs). NRE emissions are not included when determining the classification of a stationary source in accordance with 18 AAC 50.100. A Permittee

[8] The characterization of emissions from flares must represent both their pilot and purge operation in addition to an assumed regime of use from malfunction, process upset, or other episodic operation.
[9] Identified as a pair of 900 bhp drill rig camp generator engines in the application materials.
[10] The Applicant's calculations are predicated upon a brake-specific fuel consumption rate of 7,000 Btu/hp-hr, an assumed factor of 1.341 hp/kW, and fuel heat content of 133,500 Btu/gal.

may, therefore, swap NREs at a stationary source in the absence of conditions that specify the number or rated capacity of authorized NREs.

The total rated capacity of the ND-B NRE EUs is approximately 29,780 horsepower (hp). OSA did not model the impacts from certain NRE EUs citing the use of Department policy; see Section 3.6.2 for detail. The total rated capacity of OSA's NRE inventory is a key aspect of their ambient demonstration. Therefore, the Department is including the total rated capacity of this inventory as an enforceable permit condition to protect the annually averaged NO_2; annually averaged PM-2.5; 24-hour PM-10; and annually averaged, 24-hour, three-hour, and one-hour SO_2 AAAQS.

3.6.2. Intermittently Used Oilfield Support Equipment

Department policy[11] provides for North Slope applicants to exclude certain small and intermittently used equipment from their AAAQS analysis. Observing the guidance within this policy, applicants may exclude intermittently used oilfield support engines rated at less than 400 brake hp (bhp), or boilers/heaters with a heat-input rating of less than 2.8 million British thermal units per hour (MMBtu/hr). This policy is not an exemption from compliance with the ambient air quality standards[12], but a simplification of the ambient demonstration and associated MR&R for subject equipment. EUs excluded from an ambient demonstration under this policy must comply with a limit on the maximum sulfur content of liquid fuels fired of to no greater than 15 parts per million by weight (ppmw). The Department may impose this limit by permit condition.

OSA application materials indicate that they relied upon the Department's policy for intermittently used oilfield support equipment to exclude the EUs listed in Table 1 from their AAAQS analyses:

Table 1. EUs excluded from modeling citing Policy and Procedure 04.02.105

EU ID	Description	Max. Size/Rating
228	Cement Pump Engine No. 1	325 bhp
229	Cement Pump Engine No. 2	325 bhp
230	Cement Pump Engine No. 3	325 bhp
240	Treatment Van Engine	25 kW
241	Sand Chief Engine	135 ekW
242	Van 35 Engine	35 bhp

[11] ADEC Policy and Procedure 04.02.105: *Intermittently Used Oilfield Support Equipment*, November 20, 2006.
[12] The Department is obligated to make reasonable inquiry to assure that emissions from excluded units will not result in violations of the ambient air quality standards. Therefore, use of this policy is reviewed on a case-specific basis.

EU ID	Description	Max. Size/Rating
244	Liquid Add Engine	300 bhp
245	Liquid Add Engine	300 bhp
261	Portable Heaters, Various (x20)	19.3 MMBtu/hr
262	Light Plants, Various (x20)	220 bhp
263	Mixed Use Generator Engine	100 bhp
264	Mixed Use Generator Engine	100 bhp

The Department notes that OSA's application materials indicate that EUs 231 through 239, 243, 246, and 247 were also excluded under the aforementioned policy, though they appropriately included these units in their modeling analyses.

The Department is limiting the sulfur content[13] of fuels fired in the non-modeled units as an enforceable permit condition to protect the annually averaged NO_2; annually averaged PM-2.5; 24-hour PM-10; and annually averaged, 24-hour, three-hour, and one-hour SO_2 AAAQS.

3.7. EU Release Parameters

The assumed emission rates and characterization of how the emissions enter the atmosphere will significantly influence modeled results. Therefore, applicants must provide the stack height, diameter, location, and base elevation, in addition to the pollutant emission rates, exhaust plume exit velocity, and exhaust temperature for each exhaust stack.

3.7.1. Emission Rates

The Department generally found OSA's modeled emission rates to be consistent with the emissions information provided throughout their application. The exceptions, or items that otherwise warrant additional information, are discussed below.

3.7.2.1 Sulfur Compound Emissions

SO_2 emissions are directly related to the sulfur content of the fuel(s) fired. The sulfur content of liquid fuel occurs as elemental sulfur, while that of fuel gas occurs as hydrogen sulfide (H_2S).

OSA's ND-B EUs consist of both liquid- and fuel gas-fired equipment. They assumed most of their liquid fuel-fired inventory use fuels with a sulfur content of 15 ppmw. EUs 208 through 212 and 248, however, were assumed to fire liquid

[13] Management of the ambient impacts from small units under ADEC Policy and Procedure 04.02.105 is achieved through a limitation on the sulfur content of fuels to no greater than 15 ppmw.

fuels with a sulfur content of 500 ppmw. The fuel gas-fired inventory at the stationary source consists of a 30 MMBtu/hr production heater, EU 1, and a flare or thermal oxidizer, EU 213, which may combust either fuel gas or propane. OSA assumed an H_2S content of 500 parts per million by volume (ppmv) for the fuel gas-fired units and 185 ppmv for propane. The Department is, therefore, including limits on the sulfur content of fuels fired at the stationary source as an enforceable permit condition to protect the annually averaged, 24-hour, three-hour, and one-hour SO_2 AAAQS.

The Department notes that OSA did not evaluate their SO_2 impacts using dispersion modeling. Instead, they used a qualitative approach[14] to estimate SO_2 impacts that are anticipated to fall below the respective AAAQS. OSA cites a general reduction in the source-wide emissions of SO_2, relative those estimated in Minor Permit AQ1564MSS01, and the use of low-sulfur fuels in support of their approach. The Department finds this approach sufficient to demonstrate protection of the SO_2 AAAQS for the proposed effort at the ND-B stationary source, though it notes that dispersion modeling is the generally accepted approach.

3.7.2.2 Operational Limits

OSA generally assumed that the ND-B stationary source EUs operate continuously throughout the year at their respective maximum capacities. Exceptions to the former include a firewater pump engine, EU 101, that OSA assumed will operate 500 hr/yr in comport with EPA guidance[15], and EUs 206 and 207, drill rig camp generator engines, which share a fuel limitation described under Section 3.6.1.

3.7.2.3 Weighted Standards as Emission Factors

OSA's revised ambient demonstration, submitted on June 3, 2022, relies upon the EPA's emissions standards for Tier 3 equipment to characterize the NOx and PM emissions from EUs 246 and 247. The Department notes that these standards were developed using the weighted emissions from various class-specific equipment and do not represent a unit-specific maximum, or not-to-exceed factor typically suitable for use in characterizing an EUs maximum emissions potential. Guidance exists to mitigate the uncertainty associated with using these standards in estimating unit-specific emissions. Succinctly, the use of a case-specific multiplication factor to address the not-to-exceed potential is recommended. OSA, however, did not observe this approach. The Department is including enforceable permit conditions that require the Permittee to obtain a certified manufacturer's guarantee that each diesel engine will comply with EPA's Nonroad Tier 3 emission standards (or higher) or perform source testing for these EUs to protect the annually averaged NO_2; annually averaged PM-2.5; and 24-hour PM-10 AAAQS.

[14] The Department provided its case-specific approval to address these impacts qualitatively in a 13 May, 2022 e-mail

[15] Memorandum from J. Seitz, Dir. OAQPS to Regional Air Division Directors, *Calculating Potential to Emit (PTE) for Emergency Engines,* dated September 6, 1995.

3.7.2. Point Source Parameters

In addition to the previously discussed emission rates, applicants must provide the stack height, diameter, location, base elevation, exhaust plume exit velocity, and exhaust temperature for each EU that is characterized as a point source.

The Department generally found the modeled stack parameters to be consistent with the vendor information or expectations for similarly sized EUs. Information that warrants additional discussion is discussed below.

3.7.2.1 Horizontal/Capped Stacks

Capped stacks or horizontal releases warrant additional discussion, because they generally lead to higher impacts in the immediate near-field than would occur from uncapped, vertical releases. Therefore, the non-vertical stacks or those with rain caps require special handling in an AERMOD analysis. EPA describes the proper approach for characterizing these types of stacks in their *AERMOD Implementation Guide*.[16] EPA has also developed options in AERMOD that will automatically revise the stack and exhaust parameters for any releases identified as horizontal or capped by using the POINTHOR and POINTCAP keywords.

OSA used these options to characterize EUs 208-212, 226, 227, and 248 as capped and EUs 224, 225, 246, and 247 as horizontal releases. They considered all other EUs as having uncapped, vertical releases. The Department is, therefore, requiring the construction of exhaust releases as characterized as enforceable permit conditions to protect annually averaged NO_2; annually averaged PM-2.5; 24-hour PM-10; and annually averaged, 24-hour, three-hour, and one-hour SO_2 AAAQS.

3.8. Off-site Source Characterization

OSA considered the impacts from nearby stationary sources in their cumulative analysis. A discussion of their approach for the selection of off-site sources to explicitly model is provided under Section 3.14. OSA's characterization of the modeled off-site EUs is described below.

3.8.1. Off-site Emissions and Stack Parameters

OSA explicitly modeled the following off-site sources in their ambient demonstration:

- OSA Nanushuk Processing Facility;
- OSA Nanushuk Operations Pad;
- CPAI's Alpine CD1; and
- Brooks Range Petroleum Corporation (BRPC) Mustang Development Pad.

They developed the emission rates and stack parameters for their off-site inventory by drawing upon the information provided in the application materials and permitting

[16] *AERMOD Implementation Guide* (EPA-454/B-18-003); April 2018.

documents associated with each stationary source. In modeling the former, the two OSA stationary sources were characterized as a collection of discrete point sources releases representing the assumed EU inventories; the CPAI and BRPC sources were modeled as representative individual point sources. A relevant discussion is provided under Section 2.2 of Attachment D to their January 25, 2022 application.

3.9. Pollutant Specific Considerations

The following pollutants warrant additional discussion.

3.9.1. Ambient NO_2 Modeling

The emissions of NOx from combustion sources include both nitric oxide (NO) and NO_2 constituents. After combustion gases exit a stack, additional NO_2 can be formed due to reactions within the atmosphere. Section 4.2.3.4 of the Guideline describes a three-tiered approach for estimating the ambient concentrations of NO_2 from this process, ranging from the simplest but very conservative assumption that all NO is converted to NO_2, to other more complex methods.

OSA used the Plume Volume Molar Ratio Method (PVMRM) to estimate their ambient NO_2 concentrations. The use of PVMRM is appropriate, but warrants discussion.

3.9.2.1 In-Stack NO_2-to-NOx Ratio

The assumed NO_2-to-NOx in-stack ratio (ISR) is a variable that must be set for each NOx-emitting EU. Source-specific data should be used to define this ratio when available.

OSA used source test information consolidated by the Department[17] to develop assumed ISRs for their modeled EU inventory. These ratios range from 0.1 to 0.3 for the fuel gas-fired heaters, liquid fuel-fired RICE, and liquid fuel-fired heaters and boilers. They used an ISR of 0.5 for the proposed flare/thermal oxidizer citing a lack of source-specific ISR information. They also characterized the modeled off-site sources with an ISR of 0.5. These values are generally representative of the EUs being characterized.

3.9.2.2 Ozone Data

PVMRM requires ambient ozone data to estimate the amount of NO that is converted to NO_2.

OSA used three years of hourly ozone data collected at the Prudhoe Bay A-Pad monitoring station. These data were originally prepared by BP Exploration Alaska,

[17] ADEC spreadsheet: *NO_2-to-NOx ratios per Source Tests Approved by the Alaska Department of Environmental Conservation*, revised August 23, 2013. Available at: http://dec.alaska.gov/air/air-permit/dispersion-modeling/.

Inc. in support of Construction Permit AQ0181CPT06.[18] OSA's use of the A-Pad ozone data are appropriate to estimate ambient NO_2 impacts from the ND-B using PVMRM.

3.9.2. PM-2.5

PM-2.5 may be directly emitted from a source and is also formed through chemical reactions in the atmosphere, i.e. by secondary formation with other pollutants.[19] AERMOD is an acceptable model for performing a near-field analysis of the direct emissions, but EPA has not developed a near-field model that includes the necessary chemistry algorithms for estimating secondary impacts. EPA, therefore, recommends that applicants use existing technical information to assess their secondary PM-2.5 impacts by way of a "Tier 1" analysis[20]. The use of photochemical modeling to assess secondary impacts, i.e. a "Tier 2" analysis, may be appropriate as warranted, though the former approach is typical. OSA's application materials did not include a discussion regarding their characterization of secondary PM-2.5 formation.

EPA has issued guidance regarding the characterization of secondary formation in various PSD scenarios.[21] This guidance was not explicitly developed for minor permit modeling. However, it offers useful information to support regulatory assessments of PM-2.5. EPA notes that the maximum direct impacts and the maximum secondary impacts from a stationary source "*…are not likely well-correlated in time or space*", i.e., they will likely occur in different locations and at different times. This difference occurs because secondary PM-2.5 formation is a complex photochemical process that requires the presence of precursor pollutants in sufficient quantity for significant formation to occur. The conditions for this reaction process meaningfully occur within the immediate ND-B near-field, the location of maximum project impacts, is not anticipated to be likely.

EPA further stated that representative ambient monitoring data could be used to address the secondary formation that occurs from existing sources in a demonstration of the ambient standard. The background data OSA used to in their PM-2.5 AAAQS analysis meets this objective; see Section 3.14.

3.10. Downwash

Downwash refers to the situation where local structures influence the plume from an exhaust stack. Downwash can occur when a stack height is less than a height derived by a procedure called "Good Engineering Practice" (GEP), which is defined in 18 AAC 50.990(42). It is a consideration when there are receptors relatively near the applicant's structures and exhaust stacks.

[18] Detail regarding these data is available in the Department's November 22, 2008 modeling review of BP Exploration Alaska, Inc.'s ambient demonstration for the Liberty Project.
[19] The emissions of NOx, SO_2, VOC, and Ozone are considered "precursor emissions".
[20] EPA's tiered approach to assessing secondary PM-2.5 formation is described in Section 5.4 of the Guideline.
[21] *Guidance for $PM_{2.5}$ Permit Modeling* (EPA-454/B-14-001); May 2014.

EPA developed the "Building Profile Input Program - PRIME" (BPIPPRM) program to determine which stacks could be influenced by nearby structures and to generate the cross-sectional profiles needed by AERMOD to determine the resulting downwash. OSA used the current version of BPIPPRM, version 04274, to determine the building profiles needed by AERMOD.

OSA included all of the modeled point sources in their downwash analysis. The Department used a proprietary 3-D visualization program to review their characterization of the exhaust stacks and structures. The characterization matches the figures provided in their permit application. OSA appropriately accounted for downwash in their modeling analysis. BPIPPRM indicated that the modeled exhaust stacks are within the GEP stack height requirements.

3.11. Ambient Air Boundary

The AAAQS only apply within location of *ambient air*, which has been defined by EPA as "*…that portion of the atmosphere, external to buildings, to which the general public has access*." [22] Applicants may, therefore, exclude areas that they own or lease from an ambient demonstration if they employ "*…measures, which may include physical barriers, that are effective in precluding access to the land by the general public.*" [23] They conversely need to model that portion of their property/lease that has no such restriction, or where there is an easement or public right-of-way. Natural features, such as dense vegetation or topographical features, can provide adequate barriers to public access, although the adequacy of the given features must be evaluated on a case-specific basis.

OSA assumed the edge of the ND-B gravel pad as their ambient air boundary. This is a typical approach and generally suitable North Slope stationary sources on a case-specific basis.

3.12. Worker Housing

OSA will need to house their workers on site due to the project's remote location. Worker housing areas must be treated as ambient air, except under the conditions described in the Department's *Ambient Air Quality Issues at Worker Housing* policy.[24] The conditions are:

1) the worker housing area is located within a secure or remote site;
2) the worker housing area is for official business/worker use only; and
3) the operator has a written policy stating that the on-site workers are on 24-hour call.

[22] The term "ambient air" is defined in 40 CFR 50.1. The Alaska Legislature has also adopted the definition by reference in AS 46.14.990(2).
[23] EPA has authored multiple guidance documents regarding ambient air issues which may be found in their Modeling Clearinghouse Information Storage and Retrieval System at http://cfpub.epa.gov/oarweb/MCHISRS/. This language originates from the December 2, 2019 Memorandum from EPA Administrator Andrew R. Wheeler to Regional Administrators: *Revised Policy on Exclusions from 'Ambient Air*.
[24] ADEC Policy and Procedure 04.02.108: *Worker Housing Aggregation and Modeling*, 5 May, 2021.

OSA did not characterize their worker housing area as a part of ambient air in comport with the aforementioned policy; see Section 2.4 of Attachment D to their January 25, 2022 application for detail. The Department finds OSA's use of this policy is appropriate for the ND-B.

3.13. Receptor Grid

OSA used a rectangular receptor grid of decreasing resolution with distance from the ambient boundary. The receptor resolutions are:

- 25-m or less spacing along the ambient boundary;
- 25-m spacing out to 75m from center of the ND-B stationary source;
- 100-m spacing from 75m to 600m from the center of the source; and
- 500-m spacing from 600 m to 5km from the center of the source.

OSA's grid has sufficient resolution and coverage to determine the maximum impacts.

3.14. Off-Site Impacts

The air quality impact from natural and regional sources, along with long-range transport from far away sources, must be accounted for in a cumulative AAAQS demonstration. The approach for incorporating these impacts must be evaluated on a case-specific basis for each type of assessment and for each pollutant, as applicable.

Section 8.3 of the Guideline discusses how the off-site impacts could be incorporated for purposes of demonstrating compliance with an air quality standard. These impacts must be represented through either ambient monitoring data or through modeling. However, Section 8.3.3(b)(iii) notes, "*The number of nearby sources to be explicitly modeled in the air quality analysis is expected to be few except in unusual situations*." The language in this section further states that "*…sources that cause a significant concentration gradient in the vicinity of the* [applicant's source] *are not likely to be adequately characterized by the monitored data due to the high degree of variability of the source's impacts.*"

OSA's application materials indicate that they do not anticipate any nearby sources to cause significant concentration gradients in the vicinity of the ND-B stationary source. They nevertheless modeled four off-site sources within 20 km of ND-B. The four modeled off-site sources are:

- OSA Nanushuk Processing Facility;
- OSA Nanushuk Operations Pad;
- CPAI's Alpine CD1; and
- BRPC Mustang Development Pad.

The assumed emission rates and release parameters for these sources are discussed under Section 3.8.1. OSA also relied upon 2019 ambient pollutant data from the Prudhoe Bay Unit Central Compressor Plant to represent impacts from non-modeled sources. The use of these background pollutant data, as proposed, may be considered appropriate on a case-specific basis.

3.15. Design Concentrations

EPA generally allows applicants to use modeled concentrations that are consistent with the form of the standard as their design concentration. Applicants must always compare their highest modeled concentrations to the deterministic annually average standards, increments, and SILs.

OSA's assumed design concentrations are summarized in Table 2.

Table 2. Design Concentrations for Minor Permit AQ1564MSS02

Pollutant	Avg. Period	Design Value
NO_2	Annual	The maximum annual concentration from any modeled year
PM-10	24-hour	The high fourth-high 24-hour concentration over one modeled year
PM-2.5	Annual	The multi-year average of the annual modeled concentrations

Table Notes: The Applicant did not use dispersion modeling to evaluate their one-hour, three-hour, 24-hour, and annually averaged ambient SO_2 impacts. The Department provided its case-specific approval to address these impacts qualitatively in a May 13, 2022 e-mail.

4. RESULTS AND DISCUSSION

The maximum modeled NO_2, PM-2.5, and PM-10 impacts from OSA's cumulative analysis is provided in Table 3. The background concentration, total impact, and respective ambient standards are also provided for comparison. The total modeled impacts are less than the respective AAAQS. Therefore, OSA has demonstrated compliance with the AAAQS.

Table 3. Maximum impacts compared to the ambient standards

Pollutant	Avg. Period	Max. Modeled Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	AAAQS ($\mu g/m^3$)
NO_2	Annual	77.1	13.2	**88.3**	100
PM-2.5	Annual	9.6	1.8	**11.4**	12
PM-10	24-hour	80.4	50	**130.4**	150

Table Notes: The Department provided its case-specific approval for the Applicant to address their one-hour, three-hour, 24-hour, and annually averaged SO_2 impacts qualitatively in a 13 May, 2022 e-mail. It found their discussion sufficient to demonstrate protection of the subject AAAQS.

5. CONCLUSION

The Department reviewed OSA's modeling analysis and concludes the following:

1. Emissions from the proposed ND-B stationary source EUs will not cause or contribute to a violation of the annually averaged NO_2; annually averaged PM-2.5; 24-hour PM-10;

and annually averaged, 24-hour, three-hour, and one-hour SO_2 AAAQS listed in 18 AAC 50.010.

2. OSA's modeled analysis complies with the ambient demonstration requirements of 18 AAC 50.540(c)(2) and 18 AAC 50.540(k)(3).

3. OSA performed their modeled analysis in a manner consistent with the Guideline, as required under 18 AAC 50.215(b)(1).

The Department developed conditions in Minor Permit AQ1564MSS02 to ensure OSA complies with the AAAQS. These conditions are summarized as follows:

To protect the annually averaged NO_2; annually averaged PM-2.5; 24-hour PM-10; and annually averaged, 24-hour, three-hour, and one-hour SO_2 AAAQS, the Permittee shall:

- limit the combined fuel combustion in EUs 206 and 207 to no greater than 436,989 gallons per year;
- limit the combined rating of the ND-B NRE EU inventory to no greater than 29,780 hp;
- limit the cumulative fuel gas flared by EU 213 to no more than 160 million standard cubic feet per year;
- do not operate a flare and a thermal oxidizer contemporaneously as EU 213 at any time; and
- construct all EUs using vertical and uncapped exhaust releases, with exceptions for
    - EUs 208-212, 226, 227, and 248, which may be capped; and
    - EUs 224, 225, 246, and 247, which may be horizontal.

To protect the annually averaged NO_2; annually averaged PM-2.5; 24-hour PM-10 AAAQS, the Permittee shall:

- Obtain a certified manufacturer's guarantee or conduct a source test that demonstrates that each of EUs 246 and 247 meet EPA's Tier 3 emissions standards.

To protect the annually averaged, 24-hour, three-hour, and one-hour SO_2 AAAQS, the Permittee shall:

- fire liquid fuels with a sulfur content no greater than 500 ppmw in EUs 208 through 212, and 248;
- fire fuel gas with an H_2S content no greater than 500 ppmv in EUs 1 and 213; and
- fire liquid fuels with a sulfur content no greater than 15 ppmw in the remaining EU inventory.