Oil Search

22 June 2021

Permit Intake Clerk
Alaska Department of Environmental Conservation
Air Permits Program
555 Cordova Street
Anchorage, Alaska 99501

RE: Minor Stationary Source Specific Air Quality Permit Application for the Oil Search (Alaska), LLC Nanushuk Operations Pad

Dear Permit Intake Clerk,

Oil Search (Alaska), LLC (OSA) is submitting this request to the Alaska Department of Environmental Conservation Air Permits Program in accordance with Alaska Statute (AS) Title 46 for approval of activities planned at the OSA Nanushuk Operations Pad. This application is being submitted for the following air quality minor permit classifications:

- A new stationary source with a potential to emit greater than 40 tons per year (tpy) of nitrogen oxides (NO_x) under 18 Alaska Administrative Code (AAC) 50.502(c)(1); and
- A source requiring an Owner Requested Limit (ORL) under 18 AAC 50.508(5) to avoid permit classifications under AS 46.14.130.

The enclosed application for an air quality minor permit addresses all application elements required under 18 AAC 50.502 and 18 AAC 50.540.

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

If you have any questions regarding this submittal, please contact Greg Horner at (907) 570-6562 or by email at greg.horner@oilsearch.com.

Sincerely,

Matt Elmer
Chief Operating Officer
Matthew.Elmer@oilsearch.com

Enclosure

cc: James Plosay, ADEC
Patrick Dunn, ADEC
Aaron Simpson, ADEC
Greg Horner, Oil Search (Alaska), LLC

Nanushuk Operations Pad

Application for an Air Quality Minor Permit

Prepared for:

Oil Search (Alaska), LLC

June 2021

BOREAL

Nanushuk Operations Pad

Application for an Air Quality Minor Permit

Prepared for:

Oil Search (Alaska), LLC

PO Box 240927
Anchorage, AK 99524

Prepared by:

Boreal Environmental Services

PO Box 240167
Anchorage, AK 99524

Alaska Department of Environmental Conservation
Air Quality Minor Permit Application

STATIONARY SOURCE IDENTIFICATION FORM

Section 1 Stationary Source Information

Name: Nanushuk Operations Pad			SIC: 1311
Project Name (if different): Pikka Development Project	Contact: Greg Horner, Permitting Manager		
Physical Address:	City: NA	State: AK	Zip: NA
	Telephone: 907-570-6562		
	E-Mail Address: greg.horner@oilsearch.com		
UTM Coordinates (m) or Latitude/Longitude: UTM	Northing: 7,799.95 km	Easting: 594.8 km	Zone: 5
	Latitude:	Longitude:	

Section 2 Legal Owner

Name: Oil Search (Alaska), LLC		
Mailing Address: PO Box 240927		
City: Anchorage	State: AK	Zip: 99524
Telephone #: 907-375-4600		
E-Mail Address:		

Section 3 Operator *(if different from owner)*

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

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

Name: Greg Horner, Permitting Manager		
Mailing Address: PO Box 240927		
City: Anchorage	State: AK	Zip: 99524
Telephone: 907-570-6562		
E-Mail Address: greg.horner@oilsearch.com		

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

Name: Greg Horner, Permitting Manager		
Mailing Address: PO Box 240927		
City: Anchorage	State: AK	Zip: 99524
Telephone: 907-570-6562		
E-Mail Address: greg.horner@oilsearch.com		

Section 6 Application Contact

Name: Greg Horner, Permitting Manager			
Mailing Address: PO Box 240927	City: Anchorage	State: AK	Zip: 99524
	Telephone: 907-570-6562		
	E-Mail Address: greg.horner@oilsearch.com		

Section 7 Desired Process Method *(Check only one – see 18 AAC 50.542(a) for process descriptions and restrictions)*

☐ Fast track for a permit classification under 18 AAC 50.502 [18 AAC 50.542(b)]

☒ Public comment [18 AAC 50.542(d)]

Section 8 Source Classification(s) *(Check all that apply)*

[18 AAC 50.502(b)]

- ☐ Asphalt Plant [≥ 5 ton per hour]
- ☐ Thermal Soil Remediation Unit [≥ 5 ton per hour]
- ☐ Rock Crusher [≥ 5 ton per hour]
- ☐ Incinerator(s) [total rated capacity ≥ 1000 lb/hour]
- ☐ Coal Preparation Plant
- ☐ Port of Anchorage Facility

If you checked any of the above, is (are) the emission unit(s) ☐ new, ☐ relocated*, or ☐ existing?

[18 AAC 50.502(c)(1)]

New or relocated* stationary source with potential emissions greater than:

- ☒ 40 tons per year (tpy) NOx
- ☐ 40 tpy SO_2
- ☐ 15 tpy PM-10
- ☐ 10 tpy PM-2.5
- ☐ 0.6 tpy lead
- ☐ 100 tpy CO in a nonattainment area

[18 AAC 50.502(c)(2)]

Construction or relocation* of a:

- ☐ Portable oil and gas operation
- ☐ ≥ 10 MMBtu/hr fuel burning equipment in a SO_2 special protection area

* *Relocation does NOT include moving equipment from one place to another within your current stationary source boundary.*

Section 9 Modification Classification(s) (*Check all that apply)*

[18 AAC 50.502(c)(3)]

- ☐ NOx Increase > 10 tpy [and existing PTE > 40 tpy]
- ☐ SO_2 Increase > 10 tpy [and existing PTE > 40 tpy]
- ☐ PM-10 Increase > 10 tpy [and existing PTE > 15 tpy]
- ☐ PM-2.5 Increase > 10 tpy [and existing PTE > 10 tpy]
- ☐ CO Increase > 100 tpy [and existing PTE > 100 tpy in a nonattainment area]

[18 AAC 50.502(c)(4)]

- ☐ NOx Increase > 40 tpy [and existing PTE ≤ 40 tpy]
- ☐ SO_2 Increase > 40 tpy [and existing PTE ≤ 40 tpy]
- ☐ PM-10 Increase > 15 tpy [and existing PTE ≤ 15 tpy]
- ☐ PM-2.5 Increase > 10 tpy [and existing PTE ≤ 10 tpy]
- ☐ CO Increase > 100 tpy [and Existing PTE ≤ 100 tpy in a nonattainment area]

Basis for calculating modification:

- ☐ Projected actual emissions minus baseline actual emissions
- ☐ New potential emissions minus existing potential emissions

Section 10 Permit Action Request (*Check all that apply)*

[18 AAC 50.508]

- ☐ Establish Plant-wide Applicability Limitation (PAL)
- ☐ Establish emission reductions to offset nonattainment pollutant
- ☒ Owner Requested Limit* (ORL)
- ☐ Revise or Rescind Title I Permit Conditions *

Permit Number: Condition No.
Date:

**Which to use? See* http://www.dec.state.ak.us/air/ap/docs/orlrtc.pdf

Section 11 Existing Permits and Limits

For an existing stationary source, do you have an existing:
(Check all that apply)

- ☐ Air quality permit Number(s)*:

- ☐ Owner Requested Limit(s) Permit Number(s):
- ☐ Pre-Approved Emission Limit (PAEL) Number(s)**:

** All active construction, Title V, and minor permit numbers.*
***Optional. Please provide this number if possible.*
http://dec.alaska.gov/Applications/Air/airtoolsweb/

Section 12 Project Description

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

Please use additional copies of this sheet if necessary.

Oil Search (Alaska), LLC (OSA) proposes to construct and operate the Nanushuk Operations Pad (NOP). The NOP will support Pikka Development operations and will include permanent camps, construction camps, offices, warehouses, maintenance buildings, warm and cold storage buildings, and an ultra-low sulfur diesel (ULSD) and gasoline tank farm. The estimated construction area for the pad is 21.8 acres and the estimated operational area is 20.3 acres.

The OSA NOP is classified as an oil and gas exploration and production operation with a Standard Industrial Classification (SIC) Code of 1311 and a Northern American Industrial Classification System (NAICS) code of 211111. The emissions unit inventory for the proposed NOP stationary source includes seven ULSD-fired camp generator engines; two diesel-fired heaters; two ULSD-fired support generator engines; ten diesel fuel storage tanks; two gasoline storage tanks; and various small (i.e., less than 25 bhp, each) non-road generator engines. The OSA NOP stationary source is anticipated to trigger air quality minor permitting requirements under 18 Alaska Administrative Code (AAC) 50.502(c)(1) for oxides of nitrogen (NO_X).

OSA is requesting that the Alaska Department of Environmental Conservation issue a final air quality minor permit no later than March 2022, prior to the expected start construction date.

<u>Application Information</u>

Attachment A provides an air quality permit applicability summary for the proposed NOP stationary source.

Attachment B provides a demonstration of compliance with the state of Alaska emissions standards under 18 AAC 50, per Section 8 of the *Emissions Unit Information Form*.

Attachment C provides information under Section 12 of this form pertaining to owner requested limits (ORLs) for the stationary source.

Attachment D provides an ambient demonstration (dispersion modeling analysis) required under 18 AAC 50.540(c)(2)(A) and includes maps, plans, and aerial photographs as necessary to show the locations and distances of:

- emissions units, buildings, emitting activities and boundaries associated with the stationary source; and
- nearby or adjacent roads, other occupied structures, and general topography within 15 kilometers of the stationary source.

Attachment E includes electronic files that provide:

- coordinates and elevations of each modeled emissions unit, along with parameters necessary to characterize each emissions unit for dispersion modeling; and
- an Excel file of the potential to emit emissions calculations for the OSA NOP.

Section 12 Project Description Continued

For **PALs under Section 10** of this application, include the information listed in 40 C.F.R. 52.21(aa)(3), adopted by reference in 18 AAC 50.040 [18 AAC 50.540(h)].

Not applicable.

For a **limit to establish offsetting emissions under Section 10** of this application, specify the physical or operational limitations necessary to provide actual emission reductions of the nonattainment air pollutant; including [18 AAC 50.540(i)]:

- A calculation of the expected reduction in actual emissions; and

Not applicable.

- The emission limitation representing that quantity of emission reduction.

Not applicable.

Section 12 Project Description Continued

For **ORLs under Section 10** of this application [18 AAC 50.540(j)], include:

A description of each proposed limit, including for each air pollutant a calculation of the effect the limit will have on the stationary source's potential to emit and the allowable emissions [18 AAC 50.225(b)(4)];

See Attachment C.

A description of a verifiable method to attain and maintain each limit, including monitoring and recordkeeping requirements [18 AAC 50.225(b)(5)];

See Attachment C.

Citation to each requirement that the person seeks to avoid, including an explanation of why the requirement would apply in the absence of the limit and how the limit allows the person to avoid the requirement [18 AAC 50.225(b)(6)];

See Attachment C.

A statement that the owner or operator of the stationary source will be able to comply with each limit [18 AAC 50.225(b)(8)];

See Attachment C.

Section 12 Project Description Continued

For **revising or rescinding Title I permit conditions under Section 10** of this application [18 AAC 50.540(k)], include:

An explanation of why the permit term or condition should be revised or rescinded [18 AAC 50.540(k)(2)];

Not applicable.

The effect of revising or revoking the permit term or condition on [18 AAC 50. 540 (k)(3)]:

- Emissions;

Not applicable.

- Other permit terms;

Not applicable.

- The underlying ambient demonstration, if any;

Not applicable.

- Compliance monitoring; and

Not applicable.

For revising a condition that allows avoidance of a permit classification, the information required for that type of permit, unless the revised condition would also allow the owner or operator to avoid the classification. [18 AAC 50.540(k)(4)]

Not applicable.

STATIONARY SOURCE IDENTIFICATION FORM

Section 13 Other Application Material

The information listed below must be included in your air quality control minor permit application. *Note: These must be attached in order for your application to be complete.*

If required to submit an analysis of ambient air quality under 18 AAC 50.540(c)(2), or if otherwise requested by the Department:

☒ Attached are maps, plans, and/or aerial photographs as necessary to show the locations and distances of
- emissions units, buildings, emitting activities and boundaries of the associated with the stationary source, and
- nearby or adjacent residences, roads, other occupied structures and general topography within 15 kilometers.

(Indicate compass direction and scale on each.)

☒ Attached is a document (e.g., spreadsheet) showing coordinates and elevations of each modeled unit, along with parameters necessary to characterize each unit for dispersion modeling.

☒ Attached is an electronic copy of all modeling files.

Section 14 Certification

This certification applies to the Air Quality Control Minor Permit Application for the Nanushuk Operations Pad (Stationary Source Name) submitted to the Department on: June 22, 2021

Type of Application

☒ Initial Application

☐ Change to Initial Application

The application is **NOT** complete unless the certification of truth, accuracy, and completeness on this form bears the signature of a **Responsible Official**. Responsible Official is defined in 18 AAC 50.990. (18 AAC 50.205)

CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS

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

Signature: Matt Elmer	Date: 6/22/2021
Printed Name: Matt Elmer	Title: Chief Operating Officer

Section 15 Attachments

☒ Attachments Included. List attachments:

Attachment A - Emissions Unit Information and Potential to Emit Calculations
Attachment B - Compliance Demonstration
Attachment C - Owner Requested Limits
Attachment D - Ambient Demonstration
Attachment E - Electronic Files

Section 16 Mailing Address

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

Permit Intake Clerk
Alaska Department of Environmental Conservation
Air Permit Program
555 Cordova Street
Anchorage, Alaska 99501
(907) 269-6881

Alaska Department of Environmental Conservation
Air Quality Control Minor Permit Application

EMISSIONS SUMMARY FORM
NEW STATIONARY SOURCE

Section 1 Stationary Source Information

Stationary Source Name: Nanushuk Operations Pad

Section 2 Potential to Emit (PTE) for the Entire Stationary Source

EU ID No.	PTE (tpy)									
	CO	NO_X[4]	PM-2.5[1]	PM-10[1]	PM	SO_2	VOC[2]	Fugitive VOC[3]	Fugitive PM[3]	Lead
1	56.7	56.7	1.6	1.6	1.6	8.81E-02	6.5	0	0	0
2								0	0	0
3								0	0	0
4	75.4	17.3	0.8	0.8	0.8	1.17E-01	4.9	0	0	0
5								0	0	0
6	82.3	150.5	4.7	4.7	4.7	1.28E-01	150.5	0	0	0
7								0	0	0
8	0.4	1.6	0.3	0.3	0.3	5.82E-01	2.79E-02	0	0	0
9	0.4	1.6	0.3	0.3	0.3	5.82E-01	2.79E-02	0	0	0
10	2.2	3.0	0.2	0.2	0.2	2.14E-03	3.0	0	0	0
11	6.2	7.1	0.8	0.8	0.8	6.42E-03	7.1	0	0	0
12	16.1	18.4	0.9	0.9	0.9	2.50E-02	18.4	0	0	0
13	1.0	1.2	0.1	0.1	0.1	1.07E-03	1.2	0	0	0
14	1.0	1.2	0.1	0.1	0.1	1.07E-03	1.2	0	0	0
15	1.0	1.2	0.1	0.1	0.1	1.07E-03	1.2	0	0	0

Section 2 Potential to Emit (PTE) for the Entire Stationary Source (continued)

EU ID No.	PTE (tpy)									
	CO	NO_X[4]	PM-2.5[1]	PM-10[1]	PM	SO_2	VOC[2]	Fugitive VOC[3]	Fugitive PM[3]	Lead
16	1.0	1.2	0.1	0.1	0.1	1.07E-03	1.2	0	0	0
17	1.0	1.2	0.1	0.1	0.1	1.07E-03	1.2	0	0	0
18	1.0	1.2	0.1	0.1	0.1	1.07E-03	1.2	0	0	0
19	0	0	0	0	0	0	1.4E-03	0	0	0
20	0	0	0	0	0	0	1.4E-03	0	0	0
21	0	0	0	0	0	0	1.4E-03	0	0	0
22	0	0	0	0	0	0	1.4E-03	0	0	0
23	0	0	0	0	0	0	1.4E-03	0	0	0
24	0	0	0	0	0	0	1.4E-03	0	0	0
25	0	0	0	0	0	0	1.4E-03	0	0	0
26	0	0	0	0	0	0	1.4E-03	0	0	0
27	0	0	0	0	0	0	1.4E-03	0	0	0
28	0	0	0	0	0	0	1.4E-03	0	0	0
29	0	0	0	0	0	0	0.6	0	0	0
30	0	0	0	0	0	0	0.6	0	0	0
Total tpy[1]	**233.5**	**249.2**	**8.8**	**8.8**	**8.8**	**1.5**	**184.4**	**0**	**0**	**0**

[1] Per 18 AAC 50.100, potential emissions of nonroad engines are not included when determining classification of a stationary source.

☒ Detailed Excel spreadsheet emissions calculations are attached. *These must be attached in order for your application to be complete. Include multiple copies of this page if more space is required.*

☐ *Check this box if fugitive emissions are included in permit applicability under 18 AAC 50.502(i).*

Brief description of why fugitive emissions are included in permit applicability:

Notes:

[1] Include condensable particulate matter for PM-10 and PM-2.5.

[2] If total PTE for volatile organic compounds (VOCs) is at least 10 tpy, include a separate Excel spreadsheet that shows the HAP emissions.

[3] Fugitive VOC and PM emissions are included as assessable emissions regardless of permit applicability.

[4] Fugitive NOx emissions from blasting should be included in the PTE column for NOx.

Have you completed Section 2, above? ☒ Yes ☐ No

If not, please explain:

Alaska Department of Environmental Conservation
Air Quality Control Minor Permit Application

MINOR PERMIT APPLICATION – EMISSION UNIT INFORMATION

FOR A NEW STATIONARY SOURCE: Complete this form for all emissions units.

FOR A MODIFICATION TO AN EXISTING STATIONARY SOURCE:
IF YOU HAVE A TITLE V PERMIT: Complete this form for each emissions unit that is new or that is affected by a physical change or change in the method of operation.
IF YOU DO NOT HAVE A TITLE V PERMIT or APPLICATION CLASSIFIED UNDER 18 AAC 50.508(5): Complete this form for all emissions units.

Section 1 Stationary Source Information

Stationary Source Name: Nanushuk Operations Pad

Section 2 Emissions Unit (EU) Identification (ID) and Description

Note: Do not use this section for emission units associated with asphalt plants, soil remediation, and rock crushers. Use the Supplementary Forms for these units.

EU ID No.	Description	Construction Date	Make / Model		Serial No.	Requested Limit* (specify units)	Max. Rated Capacity (kW, MMBtu), Horsepower (hp) or. Design Throughput
1	Camp A Generator Engine No. 1	TBD	TBD	TBD	TBD	Limit the ULSD fuel consumption for EU IDs 1, 2 and 3 to 827,330 gallons per 12-month period, combined.	800 bhp
2	Camp A Generator Engine No. 2	TBD	TBD	TBD	TBD		800 bhp
3	Camp A Generator Engine No. 3	TBD	TBD	TBD	TBD		800 bhp
4	Camp B Generator Engine No. 1	TBD	TBD	TBD	TBD	Limit the ULSD fuel consumption for EU IDs 4 and 5 to 1,100,035 gallons per 12-month period, combined.	2,350 bhp
5	Camp B Generator Engine No. 2	TBD	TBD	TBD	TBD		2,350 bhp
6	Camp C Generator Engine No. 1	TBD	TBD	TBD	TBD	Limit the ULSD fuel consumption for EU IDs 6 and 7 to 1,200,074 gallons per 12-month period, combined.	2,550 bhp
7	Camp C Generator Engine No. 2	TBD	TBD	TBD	TBD		2,550 bhp

EU ID No.	Description	Construction Date	Make / Model		Serial No.	Requested Limit* (specify units)	Max. Rated Capacity (kW, MMBtu), Horsepower (hp) or. Design Throughput
8	Maintenance Building Heater No. 1	TBD	TBD	TBD	TBD	NA	2.5 MMBtu/hr
9	Maintenance Building Heater No. 2	TBD	TBD	TBD	TBD	NA	2.5 MMBtu/hr
10	Communications Module Generator Engine	TBD	TBD	TBD	TBD	NA	30 kW-e
11	(12) Various Light Plants	TBD	TBD	TBD	TBD	NA	90 kW-e, Total
12	Temporary Office Complex Generator Engine	TBD	TBD	TBD	TBD	NA	350 kW-e
13	Temporary Camp Bull Rail Generator Engine No. 1	TBD	TBD	TBD	TBD	NA	15 kW-e
14	Temporary Camp Bull Rail Generator Engine No. 2	TBD	TBD	TBD	TBD	NA	15 kW-e
15	Temporary Camp Bull Rail Generator Engine No. 3	TBD	TBD	TBD	TBD	NA	15 kW-e
16	Temporary Camp Bull Rail Generator Engine No. 4	TBD	TBD	TBD	TBD	NA	15 kW-e
17	Temporary Camp Bull Rail Generator Engine No. 5	TBD	TBD	TBD	TBD	NA	15 kW-e
18	Temporary Camp Bull Rail Generator Engine No. 6	TBD	TBD	TBD	TBD	NA	15 kW-e
19	Diesel Storage Tank No. 1	TBD	TBD	TBD	TBD	NA	9,900 gallons
20	Diesel Storage Tank No. 2	TBD	TBD	TBD	TBD	NA	9,900 gallons
21	Diesel Storage Tank No. 3	TBD	TBD	TBD	TBD	NA	9,900 gallons
22	Diesel Storage Tank No. 4	TBD	TBD	TBD	TBD	NA	9,900 gallons
23	Diesel Storage Tank No. 5	TBD	TBD	TBD	TBD	NA	9,900 gallons
24	Diesel Storage Tank No. 6	TBD	TBD	TBD	TBD	NA	9,900 gallons
25	Diesel Storage Tank No. 7	TBD	TBD	TBD	TBD	NA	9,900 gallons
26	Diesel Storage Tank No. 8	TBD	TBD	TBD	TBD	NA	9,900 gallons
27	Diesel Storage Tank No. 9	TBD	TBD	TBD	TBD	NA	9,900 gallons
28	Diesel Storage Tank No. 10	TBD	TBD	TBD	TBD	NA	9,900 gallons
29	Gasoline Storage Tank No. 1	TBD	TBD	TBD	TBD	NA	9,900 gallons
30	Gasoline Storage Tank No. 2	TBD	TBD	TBD	TBD	NA	9,900 gallons

**If no annual limit is applicable (e.g., hours, fuel), then specify not applicable (N/A).*
Please use additional copies of this sheet if necessary.

Have you identified each emission unit (if you do not have a Title V permit), or each new or affected emission unit (if you have an existing Title V permit) in Section 2 above? ☒ Yes ☐ No

If not, please explain:

Section 3 Emissions Unit Use

EU ID No.	Is unit portable?		Is the unit:						Is this unit a:		If limited operation, is the unit:				
[List same EUs as in Section 2.]	Yes	No	a nonroad engine? Yes	No	an intermittently used oil field support equipment per Policy 04.02.105? Yes	No	an oil field construction unit per Policy 04.02.104? Yes	No	primary (base load) unit?	or limited operation unit?	emergency or black start unit?	subject to a permit limit?	or other (specify)?		
1	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐		
2	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐		
3	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐		
4	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐		
5	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐		
6	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐		
7	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐		
8	☐	☒	☐	☒	☐	☒	☐	☒	☒	☐	☐	☐	☐		
9	☐	☒	☐	☒	☐	☒	☐	☒	☒	☐	☐	☐	☐		
10	☐	☒	☐	☒	☐	☒	☐	☒	☒	☐	☐	☐	☐		
11	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐		
12	☐	☒	☐	☒	☐	☒	☐	☒	☒	☐	☐	☐	☐		
13	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐		
14	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐		
15	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐		
16	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐		
17	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐		
18	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐		
19	☐	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐		
20	☐	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐		
21	☐	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐		
22	☐	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐		
23	☐	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐		
24	☐	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐		
25	☐	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐		
26	☐	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐		
27	☐	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐		
28	☐	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐		
29	☐	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐		
30	☐	☒	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐	☐		

Please use additional copies of this sheet if necessary.

Have you specified the use of each emission unit in Section 3 above? ☒ Yes ☐ No

If not, please explain:

Section 4 Fuel Information

Complete Section 4a or 4b for each emissions unit, as appropriate.

Section 4a Fuel Burning Equipment not Including Flares

EU ID No.	Fuel type(s)	Maximum fuel sulfur content	Fuel density (lb/gal) (if liquid fuel)	Higher heating value*	Maximum fuel consumption rate (gallons/hour or MMscf/hour)
1	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	42.0 gallons/hr
2	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	42.0 gallons/hr
3	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	42.0 gallons/hr
4	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	123.2 gallons/hr
5	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	123.2 gallons/hr
6	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	133.7 gallons/hr
7	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	133.7 gallons/hr
8	LSD	0.05 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	18.7 gallons/hr
9	LSD	0.05 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	18.7 gallons/hr
10	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	2.3 gallons/hr
11	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	6.9 gallons/hr, total
12	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	26.8 gallons/hr
13	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	1.1 gallons/hour
14	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	1.1 gallons/hour
15	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	1.1 gallons/hour
16	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	1.1 gallons/hour
17	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	1.1 gallons/hour
18	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7.1	133,500 ☒ Btu/gal ☐ Btu/dscf Other	1.1 gallons/hour

**Use British thermal unit (Btu) per gallon (gal) for liquid fuels. Use Btu per dry standard cubic foot (dscf) for gaseous fuels.*
Please use additional copies of this sheet if necessary.

Have you provided the fuel details for each fuel-burning emission unit (excluding flares) in Section 4a above? ☒ Yes ☐ No
If not, please explain:

Section 4b Flares

Complete this section if the project/stationary source contains a flare.

Do you own or operate a flare? ☐ Yes ☒ No *(If not skip this section)*

EU ID No:	Heat release rate for pilot / purge operation (MMBtu/hr)	Maximum heat release rate (MMBtu/hr)	Flare gas heat content (Btu/scf)	Flare gas H_2S content (ppmv)
NA				

Please use additional copies of this sheet if necessary

Include additional notes as warranted.

Have you provided the fuel use details for all flares in Section 4b above? ☐ Yes ☐ No

If not, please explain:

Section 5 Materials Processed and Methods of Operation

Complete this section if the project/stationary source contains a materials-handling process.

Do you own or operate a flare? ☐ Yes ☒ No *(If not, skip this section)*

EU ID No.	Materials processed	Maximum material processing rate	Describe method of operation
NA			

Please use additional copies of this sheet if necessary

Include additional notes as warranted.

Have you specified the material processing details in Section 5 above? ☐ Yes ☐ No

If not, please explain:

Section 6 Emission Control Information (if applicable)

Complete this section if the project/stationary source contains emission control equipment.

Do you own or operate emission control equipment? ☐ Yes ☒ No *(If not, note below and skip this section.)*

EU ID No.	Control equipment	Pollutant(s) controlled:	Description of the control equipment	Description of significant operating parameters and set points for the control equipment	The control equipment is necessary:		
					To comply with an emission standard	To avoid a project classification	Other – give purpose of control equipment
NA					☐	☐	
					☐	☐	
					☐	☐	
					☐	☐	
					☐	☐	
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					☐	☐	

Please use additional copies of this sheet if necessary

Include additional notes as warranted.

Have you specified the details of any emission controls in Section 6 above? ☐ Yes ☐ No

If not, please explain:

Section 7 Emission Factors

Give exact citations of emission factor sources.

EU ID No.	Emission Factors								
	NOx	**CO**	**PM-2.5**	**PM-10**	**PM**	**SO_2**	**VOC**	**HAPs**	**Lead**
1 through 3	4.375 g/kW-hr (3.5 g/kW-hr * 1.25 NTE)	4.375 g/kW-hr (3.5 g/kW-hr * 1.25 NTE)	0.125 g/kW-hr (0.1 g/kW-hr * 1.25 NTE)	0.125 g/kW-hr (0.1 g/kW-hr * 1.25 NTE)	0.125 g/kW-hr (0.1 g/kW-hr * 1.25 NTE)	0.0002 lb/gal	0.5 g/kW-hr (0.4 g/kW-hr * 1.25 NTE)	Variable	NA
4 and 5	1.005 g/kW-hr (0.67 g/kW-hr * 1.5 NTE)	4.375 g/kW-hr (3.5 g/kW-hr * 1.25 NTE)	0.045 g/kW-hr (0.03 g/kW-hr * 1.5 NTE)	0.045 g/kW-hr (0.03 g/kW-hr * 1.5 NTE)	0.045 g/kW-hr (0.03 g/kW-hr * 1.5 NTE)	0.0002 lb/gal	0.285 g/kW-hr (0.19 g/kW-hr * 1.5 NTE)	Variable	NA
6 and 7	8.0 g/kW-hr (6.4 g/kW-hr * 1.25 NTE)	4.375 g/kW-hr (3.5 g/kW-hr * 1.25 NTE)	0.25 g/kW-hr (0.2 g/kW-hr * 1.25 NTE)	0.25 g/kW-hr (0.2 g/kW-hr * 1.25 NTE)	0.25 g/kW-hr (0.2 g/kW-hr * 1.25 NTE)	0.0002 lb/gal	8.0 g/kW-hr (6.4 g/kW-hr * 1.25 NTE)	Variable	NA
8 and 9	20 lb/kgal	5 lb/kgal	3.3 lb/kgal	3.3 lb/kgal	3.3 lb/kgal	0.0071 lb/gal	0.34 lb/kgal	Variable	NA
10	9.375 g/kW-hr (7.5 g/kW-hr * 1.25 NTE)	6.875 g/kW-hr (5.5 g/kW-hr * 1.25 NTE)	0.75 g/kW-hr (0.6 g/kW-hr * 1.25 NTE)	0.75 g/kW-hr (0.6 g/kW-hr * 1.25 NTE)	0.75 g/kW-hr (0.6 g/kW-hr * 1.25 NTE)	0.0002 lb/gal	9.375 g/kW-hr (7.5 g/kW-hr * 1.25 NTE)	Variable	NA
11	7.5 g/kW-hr	6.6 g/kW-hr	0.8 g/kW-hr	0.8 g/kW-hr	0.8 g/kW-hr	0.0002 lb/gal	7.5 g/kW-hr	Variable	NA
12	5.0 g/kW-hr (4.0 g/kW-hr * 1.25 NTE)	4.375 g/kW-hr (3.5 g/kW-hr * 1.25 NTE)	0.25 g/kW-hr (0.2 g/kW-hr * 1.25 NTE)	0.25 g/kW-hr (0.2 g/kW-hr * 1.25 NTE)	0.25 g/kW-hr (0.2 g/kW-hr * 1.25 NTE)	0.0002 lb/gal	5.0 g/kW-hr (4.0 g/kW-hr * 1.25 NTE)	Variable	NA
13 through 18	7.5 g/kW-hr	6.6 g/kW-hr	0.8 g/kW-hr	0.8 g/kW-hr	0.8 g/kW-hr	0.0002 lb/gal	7.5 g/kW-hr	Variable	NA
19 through 28	NA	NA	NA	NA	NA	NA	2.7 lb/yr	Variable	NA
29 and 30	NA	NA	NA	NA	NA	NA	1,135 lb/yr	Variable	NA

EU ID No.	Sources and References for Emission Factors								
	NOx	**CO**	**PM-2.5**	**PM-10**	**PM**	**SO_2**	**VOC**	**HAPs**	**Lead**
1 through 3	40 CFR 1039.102, Tier 4i	40 CFR 1039.102, Tier 4i	40 CFR 1039.102, Tier 4i	40 CFR 1039.102, Tier 4i	40 CFR 1039.102, Tier 4i	Mass Balance	40 CFR 1039.102, Tier 4i	Table 3.4-3, AP-42	NA
4 and 5	40 CFR 1039.101, Tier 4	40 CFR 1039.101, Tier 4	40 CFR 1039.101, Tier 4	40 CFR 1039.101, Tier 4	40 CFR 1039.101, Tier 4	Mass Balance	40 CFR 1039.101, Tier 4	Table 3.4-3, AP-42	NA
6 and 7	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	Mass Balance	40 CFR 89.112, Tier 2	Table 3.4-3, AP-42	NA
8 and 9	Table 1.3-1, AP-42	Table 1.3-1, AP-42	Table 1.3-1 & 1.3-2, AP-42	Table 1.3-1 & 1.3-2, AP-42	Table 1.3-1 & 1.3-2, AP-42	Mass Balance	Table 1.3-1, AP-42	Table 1.3-9 & 1.3-10, AP-42	NA
10	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	Mass Balance	40 CFR 89.112, Tier 2	Table 3.3-2, AP-42	NA
11	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	Mass Balance	40 CFR 89.112, Tier 2	NA	NA
12	40 CFR 89.112, Tier 3	40 CFR 89.112, Tier 3	40 CFR 89.112, Tier 3	40 CFR 89.112, Tier 3	40 CFR 89.112, Tier 3	Mass Balance	40 CFR 89.112, Tier 3	Table 3.3-2, AP-42	NA
13 through18	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	40 CFR 89.112, Tier 2	Mass Balance	40 CFR 89.112, Tier 2	NA	NA
19 through 28	NA	NA	NA	NA	NA	NA	Section 7.1, AP-42	Section 7.1, AP-42, EPA SPECIATE	NA
29 and 30	NA	NA	NA	NA	NA	NA	Section 7.1, AP-42	Section 7.1, AP-42, EPA SPECIATE	NA

Please use additional copies of this sheet if necessary.

Include additional notes as warranted.

Emission factors and references for each EU are also noted in Attachment A.

Have you specified all emission factors and reference sources in Section 7 above? ☒ Yes ☐ No

If not, please explain:

Section 8 Applicable State Emission Limits (listed in 18 AAC 50.050 through 18 AAC 50.090)

Complete this section for emissions units that are new or are affected by the physical change or change in operation.

EU ID No.	Emission Limit or Standard	Regulation Citation	Compliance Method
EU IDs 1 through 10, and 12	Visible Emissions, excluding condensed water vapor, from an industrial process or fuel burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six minutes.	18 AAC 50.055(a)(1)	40 CFR 60 Appendix A, Method 9; see Attachment D of this application.
EU IDs 1 through 10, and 12	Particulate matter emitted from an industrial process or fuel burning equipment may not exceed, 0.05 grains per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours.	18 AAC 50.055(b)(1)	See Attachment D of this application.
EU IDs 1 through 10, and 12	Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel burning equipment may not exceed 500 ppm averaged over three hours.	18 AAC 50.055(c)(1)	See Attachment D of this application.

Please use additional copies of this sheet if necessary.

Have you specified all applicable state emission limits in Section 8 above? ☒ Yes ☐ No

Have you specified a demonstration of compliance for each emission limit or standard? ☒ Yes ☐ No

If you answered "no" to either question, please explain:

Section 9 Incinerators

Complete this section if the project/stationary source contains an incinerator.
Do you own or operate an incinerator? ☐ Yes ☒ No *(If not, skip this section.)*

EU ID No.	Fuels Burned (type and consumption rate)	Rated capacity in pounds per hour	Type of waste burned
NA			

Please use additional copies of this sheet if necessary

Include additional notes as warranted.

Have you specified the details of all incinerators in Section 9 above? ☐ Yes ☐ No
If not, please explain:

Attachment A

Emissions Unit Information and Potential to Emit Calculations

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Table 1. Oil Search (Alaska), LLC Pikka Development - Nanushuk Operations Pad (NOP)
Prevention of Significant Deterioration (PSD) and Minor Source Air Permit Applicability Summary

Regulated NSR Pollutant [1]	Stationary Source Potential to Emit Emissions	PSD Major Stationary Source Applicability 18 AAC 50.306	PSD Permit Required?	Minor Source Permit Applicability 18 AAC 50.502(c)(1)	Minor Source Permit Required?
NO_X	249.2 tpy	250 tpy	No	40 tpy	Yes
CO	233.5 tpy	250 tpy	No	----	----
PM	8.8 tpy	----	No	----	----
PM_{10}	8.8 tpy	250 tpy	No	15 tpy	No
$PM_{2.5}$	8.8 tpy	250 tpy	No	10 tpy	No
VOC	184.4 tpy	250 tpy	No	----	----
SO_2	1.5 tpy	250 tpy	No	40 tpy	No
Pb	2.0E-04 tpy	----	No	0.6 tpy	No
NO_X as a precursor to $PM_{2.5}$	249.2 tpy	250 tpy	No	----	----
SO_2 as a precursor to $PM_{2.5}$	1.5 tpy	250 tpy	No	----	----
GHG - CO_2e	40,511.9 tpy	----	No [2]	----	----

Notes:

[1] A regulated NSR pollutant, as defined under 40 Code of Federal Regulations (CFR) 52.21(b)(50), includes, but is not limited to, any pollutant subject to a national ambient air quality standard (NAAQS), as defined under 18 Alaska Administrative Code (AAC) 50.306(b)(1)(B), a constituent or precursor for a pollutant for which a NAAQS has been promulgated, and any pollutant that otherwise is subject to regulation, as defined in 40 CFR 52.21(b)(49), under the Clean Air Act.

[2] GHGs are subject to regulation if the stationary source is a new major stationary source for a regulated NSR pollutant that is not GHGs, and will also emit or will have the potential to emit 75,000 tpy carbon dioxide equivalent (CO_2e) or more, per 40 CFR 52.21(b)(49)(iv)(a).

Table 2. Oil Search (Alaska), LLC Pikka Development - Nanushuk Operations Pad (NOP)
Hazardous Air Pollutant (HAP) Air Permit Applicability Summary

Hazardous Air Pollutants	Stationary Source Potential to Emit Emissions	HAP Major Source Permit Applicability 18 AAC 50.316(a)(1)	HAP Major Source Permit Required? [1]
Maximum Individual (Benzene)	0.2 tpy	10 tpy	No
Aggregate Total	0.5 tpy	25 tpy	No

Notes:

[1] A major stationary source of hazardous air pollutants subject to a standard under 40 CFR 63 must obtain a construction permit, per 18 AAC 50.316(a)(1).

Table 3. Oil Search (Alaska), LLC Pikka Development - Nanushuk Operations Pad (NOP)
Stationary Source Emissions Unit Inventory

Emissions Unit					Fuel	Potential Fuel Use	Potential Operation
ID	Description	Make/Model [1]	Classification	Rating/Size			
1	Camp A Generator Engine No. 1	TBD [2]	Stationary	800 bhp	ULSD [3]	827,330 gal/yr [4]	19,720 hr/yr [5]
2	Camp A Generator Engine No. 2	TBD	Stationary	800 bhp	ULSD		
3	Camp A Generator Engine No. 3	TBD	Stationary	800 bhp	ULSD		
4	Camp B Generator Engine No. 1	TBD	Stationary	2,350 bhp	ULSD	1,100,035 gal/yr [4]	8,926 hr/yr [5]
5	Camp B Generator Engine No. 2	TBD	Stationary	2,350 bhp	ULSD		
6	Camp C Generator Engine No. 1	TBD	Stationary	2,550 bhp	ULSD	1,200,074 gal/yr [4]	8,974 hr/yr [5]
7	Camp C Generator Engine No. 2	TBD	Stationary	2,550 bhp	ULSD		
8	Maintenance Building Heater No. 1	TBD	Stationary	2.5 MMBtu/hr [6]	LSD [7]	164,070 gal/yr [4]	8,760 hr/yr
9	Maintenance Building Heater No. 2	TBD	Stationary	2.5 MMBtu/hr [6]	LSD	164,070 gal/yr [4]	8,760 hr/yr
10	Communications Module Generator Engine	TBD	Stationary	30 kW-e	ULSD	20,089 gal/yr [4,8]	8,760 hr/yr
11	(12) Various Light Plants	NA [8]	Nonroad Engine	90 kW-e, total	ULSD	60,266 gal/yr [4,8]	8,760 hr/yr
12	Temporary Office Complex Generator Engine	TBD	Stationary	350 kW-e	ULSD	234,366 gal/yr [4,8]	8,760 hr/yr
13	Temporary Camp Bull Rail Generator Engine No. 1	NA	Nonroad Engine	15 kW-e	ULSD	10,044 gal/yr [4,8]	8,760 hr/yr
14	Temporary Camp Bull Rail Generator Engine No. 2	NA	Nonroad Engine	15 kW-e	ULSD	10,044 gal/yr [4,8]	8,760 hr/yr
15	Temporary Camp Bull Rail Generator Engine No. 3	NA	Nonroad Engine	15 kW-e	ULSD	10,044 gal/yr [4,8]	8,760 hr/yr
16	Temporary Camp Bull Rail Generator Engine No. 4	NA	Nonroad Engine	15 kW-e	ULSD	10,044 gal/yr [4,8]	8,760 hr/yr
17	Temporary Camp Bull Rail Generator Engine No. 5	NA	Nonroad Engine	15 kW-e	ULSD	10,044 gal/yr [4,8]	8,760 hr/yr
18	Temporary Camp Bull Rail Generator Engine No. 6	NA	Nonroad Engine	15 kW-e	ULSD	10,044 gal/yr [4,8]	8,760 hr/yr
19	Diesel Storage Tank No. 1	NA	Stationary	9,900 gallons	NA [9]	NA	8,760 hr/yr
20	Diesel Storage Tank No. 2	NA	Stationary	9,900 gallons	NA	NA	8,760 hr/yr
21	Diesel Storage Tank No. 3	NA	Stationary	9,900 gallons	NA	NA	8,760 hr/yr
22	Diesel Storage Tank No. 4	NA	Stationary	9,900 gallons	NA	NA	8,760 hr/yr
23	Diesel Storage Tank No. 5	NA	Stationary	9,900 gallons	NA	NA	8,760 hr/yr
24	Diesel Storage Tank No. 6	NA	Stationary	9,900 gallons	NA	NA	8,760 hr/yr
25	Diesel Storage Tank No. 7	NA	Stationary	9,900 gallons	NA	NA	8,760 hr/yr
26	Diesel Storage Tank No. 8	NA	Stationary	9,900 gallons	NA	NA	8,760 hr/yr
27	Diesel Storage Tank No. 9	NA	Stationary	9,900 gallons	NA	NA	8,760 hr/yr
28	Diesel Storage Tank No. 10	NA	Stationary	9,900 gallons	NA	NA	8,760 hr/yr
29	Gasoline Storage Tank No. 1	NA	Stationary	9,900 gallons	NA	NA	8,760 hr/yr
30	Gasoline Storage Tank No. 2	NA	Stationary	9,900 gallons	NA	NA	8,760 hr/yr

Notes:

[1] Oil Search (Alaska), LLC has yet to procure the actual equipment that will be installed at the NOP. The information in the emissions unit (EU) inventory is a proxy of the actual EUs that will be installed at the NOP stationary source.

[2] To be determined.

[3] Ultra-Low Sulfur Diesel.

[4] Potential fuel use rates are based on a fuel heat capacity of 18,800 Btu/lb, density of 7.1 lb/gal for diesel fuel, engine brake-specific fuel consumption rate of 7,000 Btu/hp-hr, and conversion factor of 1.341 hp/kW.

[5] Potential annual hours of operation for the camp generator engines are equivalent to fuel consumption limits of 827,330 gallons per 12-month period for EU IDs 1 through 3, combined; 1,100,035 gallons per 12-month period for EU IDs 4 and 5, combined; and 1,200,074 gallons per 12-month period for EU IDs 6 and 7, combined.

[6] Maximum heat input capacity.

[7] Low Sulfur Diesel

[8] Assumes 92 percent of the engine shaft mechanical power is converted to electrical power, per guidance in ADEC's *Modeling Review Procedures Manual* (October 2018).

[9] Not applicable.

Table 4. Oil Search (Alaska), LLC Pikka Development - Nanushuk Operations Pad (NOP)
Oxides of Nitrogen (NO_X) Emissions Summary

Emissions Unit					Potential Operation	Emission Factor		NTE	Potential Annual
ID	Description	Classification	Rating/Size	Fuel		Units	Reference	Multiplier [1]	NO_X Emissions
1	Camp A Generator Engine No. 1	Stationary	800 bhp	ULSD [2]	19,720 hr/yr	3.5 g/kW-hr	40 CFR 1039.102, Tier 4i	1.25	56.7 tpy
2	Camp A Generator Engine No. 2	Stationary	800 bhp	ULSD					
3	Camp A Generator Engine No. 3	Stationary	800 bhp	ULSD					
4	Camp B Generator Engine No. 1	Stationary	2,350 bhp	ULSD	8,926 hr/yr	0.67 g/kW-hr	40 CFR 1039.101, Tier 4	1.5	17.3 tpy
5	Camp B Generator Engine No. 2	Stationary	2,350 bhp	ULSD					
6	Camp C Generator Engine No. 1	Stationary	2,550 bhp	ULSD	8,974 hr/yr	6.4 g/kW-hr	40 CFR 89.112, Tier 2	1.25	150.5 tpy
7	Camp C Generator Engine No. 2	Stationary	2,550 bhp	ULSD					
8	Maintenance Building Heater No. 1	Stationary	2.5 MMBtu/hr	LSD [3]	8,760 hr/yr	20 lb/10^3 gal	Table 1.3-1, AP-42	NA [4]	1.6 tpy [5]
9	Maintenance Building Heater No. 2	Stationary	2.5 MMBtu/hr	LSD	8,760 hr/yr	20 lb/10^3 gal	Table 1.3-1, AP-42	NA	1.6 tpy [5]
10	Communications Module Generator Engine	Stationary	30 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	1.25	3.0 tpy [6]
11	(12) Various Light Plants	Nonroad Engine	90 kW-e, total	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	7.1 tpy [6]
12	Temporary Office Complex Generator Engine	Stationary	350 kW-e	ULSD	8,760 hr/yr	4.0 g/kW-hr	40 CFR 89.112, Tier 3	1.25	18.4 tpy [6]
13	Temporary Camp Bull Rail Generator Engine No. 1	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.2 tpy [6]
14	Temporary Camp Bull Rail Generator Engine No. 2	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.2 tpy [6]
15	Temporary Camp Bull Rail Generator Engine No. 3	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.2 tpy [6]
16	Temporary Camp Bull Rail Generator Engine No. 4	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.2 tpy [6]
17	Temporary Camp Bull Rail Generator Engine No. 5	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.2 tpy [6]
18	Temporary Camp Bull Rail Generator Engine No. 6	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.2 tpy [6]
19	Diesel Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
20	Diesel Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
21	Diesel Storage Tank No. 3	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
22	Diesel Storage Tank No. 4	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
23	Diesel Storage Tank No. 5	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
24	Diesel Storage Tank No. 6	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
25	Diesel Storage Tank No. 7	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
26	Diesel Storage Tank No. 8	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
27	Diesel Storage Tank No. 9	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
28	Diesel Storage Tank No. 10	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
29	Gasoline Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
30	Gasoline Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
								Total Potential NO_X Emissions	**263.3 tpy**
								Total Stationary Source Potential to Emit NO_X Emissions [7]	**249.2 tpy**

Notes:

[1] A not to exceed (NTE) factor of 1.25 or 1.5 is applied to all EPA Tier 1 through Tier 4 emission standards, per 40 CFR 60.4212(c) or 40 CFR 1039.101.

[2] Ultra-Low Sulfur Diesel.

[3] Low Sulfur Diesel.

[4] Not applicable.

[5] Potential emissions are based on a fuel heat capacity of 18,800 Btu/lb and ULSD density of 7.1 lb/gal.

[6] Assumes 92 percent of the engine shaft mechanical power is converted to electrical power, per guidance in the ADEC's *Modeling Review Procedures Manual* (October 2018).

[7] Per 18 AAC 50.100, potential emissions of nonroad engines are not included when determining the classification of a stationary source.

Table 5. Oil Search (Alaska), LLC Pikka Development - Nanushuk Operations Pad (NOP)
Carbon Monoxide (CO) Emissions Summary

Emissions Unit					Potential Operation	Emission Factor		NTE	Potential Annual
ID	Description	Classification	Rating/Size	Fuel		Units	Reference	Multiplier [1]	CO Emissions
1	Camp A Generator Engine No. 1	Stationary	800 bhp	ULSD [2]	19,720 hr/yr	3.5 g/kW-hr	40 CFR 1039.102, Tier 4i	1.25	56.7 tpy
2	Camp A Generator Engine No. 2	Stationary	800 bhp	ULSD					
3	Camp A Generator Engine No. 3	Stationary	800 bhp	ULSD					
4	Camp B Generator Engine No. 1	Stationary	2,350 bhp	ULSD	8,926 hr/yr	3.5 g/kW-hr	40 CFR 1039.101, Tier 4	1.25	75.4 tpy
5	Camp B Generator Engine No. 2	Stationary	2,350 bhp	ULSD					
6	Camp C Generator Engine No. 1	Stationary	2,550 bhp	ULSD	8,974 hr/yr	3.5 g/kW-hr	40 CFR 89.112, Tier 2	1.25	82.3 tpy
7	Camp C Generator Engine No. 2	Stationary	2,550 bhp	ULSD					
8	Maintenance Building Heater No. 1	Stationary	2.5 MMBtu/hr	LSD [3]	8,760 hr/yr	5 lb/10^3 gal	Table 1.3-1, AP-42	NA [4]	0.4 tpy [5]
9	Maintenance Building Heater No. 2	Stationary	2.5 MMBtu/hr	LSD	8,760 hr/yr	5 lb/10^3 gal	Table 1.3-1, AP-42	NA	0.4 tpy [5]
10	Communications Module Generator Engine	Stationary	30 kW-e	ULSD	8,760 hr/yr	5.5 g/kW-hr	40 CFR 89.112, Tier 2	1.25	2.2 tpy [6]
11	(12) Various Light Plants	Nonroad Engine	90 kW-e, total	ULSD	8,760 hr/yr	6.6 g/kW-hr	40 CFR 89.112, Tier 2	NA	6.2 tpy [6]
12	Temporary Office Complex Generator Engine	Stationary	350 kW-e	ULSD	8,760 hr/yr	3.5 g/kW-hr	40 CFR 89.112, Tier 3	1.25	16.1 tpy [6]
13	Temporary Camp Bull Rail Generator Engine No. 1	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	6.6 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.0 tpy [6]
14	Temporary Camp Bull Rail Generator Engine No. 2	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	6.6 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.0 tpy [6]
15	Temporary Camp Bull Rail Generator Engine No. 3	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	6.6 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.0 tpy [6]
16	Temporary Camp Bull Rail Generator Engine No. 4	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	6.6 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.0 tpy [6]
17	Temporary Camp Bull Rail Generator Engine No. 5	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	6.6 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.0 tpy [6]
18	Temporary Camp Bull Rail Generator Engine No. 6	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	6.6 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.0 tpy [6]
19	Diesel Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
20	Diesel Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
21	Diesel Storage Tank No. 3	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
22	Diesel Storage Tank No. 4	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
23	Diesel Storage Tank No. 5	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
24	Diesel Storage Tank No. 6	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
25	Diesel Storage Tank No. 7	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
26	Diesel Storage Tank No. 8	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
27	Diesel Storage Tank No. 9	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
28	Diesel Storage Tank No. 10	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
29	Gasoline Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
30	Gasoline Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
								Total Potential CO Emissions	**246.0 tpy**
								Total Stationary Source Potential to Emit CO Emissions [7]	**233.5 tpy**

Notes:

[1] A not to exceed (NTE) factor of 1.25 or 1.5 is applied to all EPA Tier 1 through Tier 4 emission standards, per 40 CFR 60.4212(c) or 40 CFR 1039.101.

[2] Ultra-Low Sulfur Diesel.

[3] Low Sulfur Diesel.

[4] Not applicable.

[5] Potential emissions are based on a fuel heat capacity of 18,800 Btu/lb and ULSD density of 7.1 lb/gal.

[6] Assumes 92 percent of the engine shaft mechanical power is converted to electrical power, per guidance in the ADEC's *Modeling Review Procedures Manual* (October 2018).

[7] Per 18 AAC 50.100, potential emissions of nonroad engines are not included when determining the classification of a stationary source

Table 6. Oil Search (Alaska), LLC Pikka Development - Nanushuk Operations Pad (NOP)
Particulate Matter ($PM/PM_{10}/PM_{2.5}$) Emissions Summary

Emissions Unit					Potential Operation	Emission Factor		NTE	Potential Annual
ID	Description	Classification	Rating/Size	Fuel		Units	Reference	Multiplier [1]	PM Emissions
1	Camp A Generator Engine No. 1	Stationary	800 bhp	ULSD [2]	19,720 hr/yr	0.1 g/kW-hr	40 CFR 1039.102, Tier 4i	1.25	1.6 tpy
2	Camp A Generator Engine No. 2	Stationary	800 bhp	ULSD					
3	Camp A Generator Engine No. 3	Stationary	800 bhp	ULSD					
4	Camp B Generator Engine No. 1	Stationary	2,350 bhp	ULSD	8,926 hr/yr	0.03 g/kW-hr	40 CFR 1039.101, Tier 4	1.5	0.8 tpy
5	Camp B Generator Engine No. 2	Stationary	2,350 bhp	ULSD					
6	Camp C Generator Engine No. 1	Stationary	2,550 bhp	ULSD	8,974 hr/yr	0.2 g/kW-hr	40 CFR 89.112, Tier 2	1.25	4.7 tpy
7	Camp C Generator Engine No. 2	Stationary	2,550 bhp	ULSD					
8	Maintenance Building Heater No. 1	Stationary	2.5 MMBtu/hr	LSD [3]	8,760 hr/yr	3.3 lb/10^3 gal	Table 1.3-1 & 1.3-2, AP-42	NA [4]	0.3 tpy [5]
9	Maintenance Building Heater No. 2	Stationary	2.5 MMBtu/hr	LSD	8,760 hr/yr	3.3 lb/10^3 gal	Table 1.3-1 & 1.3-2, AP-42	NA	0.3 tpy [5]
10	Communications Module Generator Engine	Stationary	30 kW-e	ULSD	8,760 hr/yr	0.6 g/kW-hr	40 CFR 89.112, Tier 2	1.25	0.2 tpy [6]
11	(12) Various Light Plants	Nonroad Engine	90 kW-e, total	ULSD	8,760 hr/yr	0.8 g/kW-hr	40 CFR 89.112, Tier 2	NA	0.8 tpy [6]
12	Temporary Office Complex Generator Engine	Stationary	350 kW-e	ULSD	8,760 hr/yr	0.2 g/kW-hr	40 CFR 89.112, Tier 3	1.25	0.9 tpy [6]
13	Temporary Camp Bull Rail Generator Engine No. 1	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	0.8 g/kW-hr	40 CFR 89.112, Tier 2	NA	0.1 tpy [6]
14	Temporary Camp Bull Rail Generator Engine No. 2	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	0.8 g/kW-hr	40 CFR 89.112, Tier 2	NA	0.1 tpy [6]
15	Temporary Camp Bull Rail Generator Engine No. 3	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	0.8 g/kW-hr	40 CFR 89.112, Tier 2	NA	0.1 tpy [6]
16	Temporary Camp Bull Rail Generator Engine No. 4	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	0.8 g/kW-hr	40 CFR 89.112, Tier 2	NA	0.1 tpy [6]
17	Temporary Camp Bull Rail Generator Engine No. 5	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	0.8 g/kW-hr	40 CFR 89.112, Tier 2	NA	0.1 tpy [6]
18	Temporary Camp Bull Rail Generator Engine No. 6	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	0.8 g/kW-hr	40 CFR 89.112, Tier 2	NA	0.1 tpy [6]
19	Diesel Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
20	Diesel Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
21	Diesel Storage Tank No. 3	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
22	Diesel Storage Tank No. 4	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
23	Diesel Storage Tank No. 5	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
24	Diesel Storage Tank No. 6	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
25	Diesel Storage Tank No. 7	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
26	Diesel Storage Tank No. 8	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
27	Diesel Storage Tank No. 9	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
28	Diesel Storage Tank No. 10	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
29	Gasoline Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
30	Gasoline Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	NA	0 tpy
								Total Potential $PM/PM_{10}/PM_{2.5}$ Emissions	**10.3 tpy**
								Total Stationary Source Potential to Emit $PM/PM_{10}/PM_{2.5}$ Emissions [7]	**8.8 tpy**

Notes:

[1] A not to exceed (NTE) factor of 1.25 or 1.5 is applied to all EPA Tier 1 through Tier 4 emission standards, per 40 CFR 60.4212(c) or 40 CFR 1039.101.

[2] Ultra-Low Sulfur Diesel.

[3] Low Sulfur Diesel.

[4] Not applicable.

[5] Potential emissions are based on a fuel heat capacity of 18,800 Btu/lb and ULSD density of 7.1 lb/gal.

[6] Assumes 92 percent of the engine shaft mechanical power is converted to electrical power, per guidance in the ADEC's *Modeling Review Procedures Manual* (October 2018).

[7] Per 18 AAC 50.100, potential emissions of nonroad engines are not included when determining the classification of a stationary source

Table 7. Oil Search (Alaska), LLC Pikka Development - Nanushuk Operations Pad (NOP)
Volatile Organic Compounds (VOC) Emissions Summary

Emissions Unit					Potential Operation	Emission Factor		NTE Multiplier [1]	Potential Annual VOC Emissions
ID	Description	Classification	Rating/Size	Fuel		Units	Reference		
1	Camp A Generator Engine No. 1	Stationary	800 bhp	ULSD [2]	19,720 hr/yr	0.4 g/kW-hr [2]	40 CFR 1039.102, Tier 4i	1.25	6.5 tpy
2	Camp A Generator Engine No. 2	Stationary	800 bhp	ULSD					
3	Camp A Generator Engine No. 3	Stationary	800 bhp	ULSD					
4	Camp B Generator Engine No. 1	Stationary	2,350 bhp	ULSD	8,926 hr/yr	0.19 g/kW-hr	40 CFR 1039.101, Tier 4	1.5	4.9 tpy
5	Camp B Generator Engine No. 2	Stationary	2,350 bhp	ULSD					
6	Camp C Generator Engine No. 1	Stationary	2,550 bhp	ULSD	8,974 hr/yr	6.4 g/kW-hr	40 CFR 89.112, Tier 2	1.25	150.5 tpy
7	Camp C Generator Engine No. 2	Stationary	2,550 bhp	ULSD					
8	Maintenance Building Heater No. 1	Stationary	2.5 MMBtu/hr	LSD [3]	8,760 hr/yr	0.34 lb/10^3 gal	Table 1.3-1, AP-42	NA [4]	2.79E-02 tpy [5]
9	Maintenance Building Heater No. 2	Stationary	2.5 MMBtu/hr	LSD	8,760 hr/yr	0.34 lb/10^3 gal	Table 1.3-1, AP-42	NA	2.79E-02 tpy [5]
10	Communications Module Generator Engine	Stationary	30 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	1.25	3.0 tpy [6]
11	(12) Various Light Plants	Nonroad Engine	90 kW-e, total	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	7.1 tpy [6]
12	Temporary Office Complex Generator Engine	Stationary	350 kW-e	ULSD	8,760 hr/yr	4.0 g/kW-hr	40 CFR 89.112, Tier 3	1.25	18.4 tpy [6]
13	Temporary Camp Bull Rail Generator Engine No. 1	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.2 tpy [6]
14	Temporary Camp Bull Rail Generator Engine No. 2	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.2 tpy [6]
15	Temporary Camp Bull Rail Generator Engine No. 3	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.2 tpy [6]
16	Temporary Camp Bull Rail Generator Engine No. 4	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.2 tpy [6]
17	Temporary Camp Bull Rail Generator Engine No. 5	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.2 tpy [6]
18	Temporary Camp Bull Rail Generator Engine No. 6	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	7.5 g/kW-hr	40 CFR 89.112, Tier 2	NA	1.2 tpy [6]
19	Diesel Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	2.7 lb/yr	Section 7.1, AP-42	NA	1.4E-03 tpy
20	Diesel Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	2.7 lb/yr	Section 7.1, AP-42	NA	1.4E-03 tpy
21	Diesel Storage Tank No. 3	Stationary	9,900 gallons	NA	8,760 hr/yr	2.7 lb/yr	Section 7.1, AP-42	NA	1.4E-03 tpy
22	Diesel Storage Tank No. 4	Stationary	9,900 gallons	NA	8,760 hr/yr	2.7 lb/yr	Section 7.1, AP-42	NA	1.4E-03 tpy
23	Diesel Storage Tank No. 5	Stationary	9,900 gallons	NA	8,760 hr/yr	2.7 lb/yr	Section 7.1, AP-42	NA	1.4E-03 tpy
24	Diesel Storage Tank No. 6	Stationary	9,900 gallons	NA	8,760 hr/yr	2.7 lb/yr	Section 7.1, AP-42	NA	1.4E-03 tpy
25	Diesel Storage Tank No. 7	Stationary	9,900 gallons	NA	8,760 hr/yr	2.7 lb/yr	Section 7.1, AP-42	NA	1.4E-03 tpy
26	Diesel Storage Tank No. 8	Stationary	9,900 gallons	NA	8,760 hr/yr	2.7 lb/yr	Section 7.1, AP-42	NA	1.4E-03 tpy
27	Diesel Storage Tank No. 9	Stationary	9,900 gallons	NA	8,760 hr/yr	2.7 lb/yr	Section 7.1, AP-42	NA	1.4E-03 tpy
28	Diesel Storage Tank No. 10	Stationary	9,900 gallons	NA	8,760 hr/yr	2.7 lb/yr	Section 7.1, AP-42	NA	1.4E-03 tpy
29	Gasoline Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	1,135 lb/yr	Section 7.1, AP-42	NA	0.6 tpy
30	Gasoline Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	1,135 lb/yr	Section 7.1, AP-42	NA	0.6 tpy
Total Potential VOC Emissions									**198.6 tpy**
Total Stationary Source Potential to Emit VOC Emissions [7]									**184.4 tpy**

Notes:

[1] A not to exceed (NTE) factor of 1.25 or 1.5 is applied to all EPA Tier 1 through Tier 4 emission standards, per 40 CFR 60.4212(c) or 40 CFR 1039.101.

[2] Ultra-Low Sulfur Diesel.

[3] Low Sulfur Diesel.

[4] Not applicable.

[5] Potential emissions are based on a fuel heat capacity of 18,800 Btu/lb and ULSD density of 7.1 lb/gal.

[6] Assumes 92 percent of the engine shaft mechanical power is converted to electrical power, per guidance in the ADEC's *Modeling Review Procedures Manual* (October 2018).

[7] Per 18 AAC 50.100, potential emissions of nonroad engines are not included when determining the classification of a stationary source.

Table 8. Oil Search (Alaska), LLC Pikka Development - Nanushuk Operations Pad (NOP)
Volatile Organic Compounds (VOC) Emissions Summary for Storage Tanks

Tank Emissions	Diesel Storage Tank (9,900 gallon)	Gasoline Storage Tank (9,900 gallon)
Tank Description		
Orientation	Vertical	Vertical
Contents	Diesel	Gasoline
Capacity (gallons)	9,900	9,900
Diameter, D (ft)	10	10
Radium, R_S (ft)	5	5
Shell Height, H_S (ft)	13	13
Average Liquid Height, H_L (ft)	10.4	10.4
Maximum Liquid Height, H_{LX} (ft)	12	12
Throughput, Q (gal/yr)	118,800	118,800
Color	White	White
Paint Condition	New	New
Roof Type	Dome	Dome
Standing Loss (L_S) Calculations		
Vapor Space Expansion Factor, K_E	0.023	0.023
Vapor Space Outage, H_{VO} (ft)	3.29	3.29
Average Daily Ambient Temperature, T_{AA} (^oR)	478.10	478.10
Liquid Bulk Temperature, T_B (^oR)	478.53	478.53
Average Vapor Temperature, T_V (^oR)	479.51	479.51
Vented Vapor Density, K_S	0.9990	0.5248
Stock Vapor Density, W_V (lb/ft^3)	1.52E-04	6.67E-02
Standing Loss, L_S (lb/yr)	**0.33**	**75.89**
Working Loss (L_W) Calculations		
Tank Maximum Liquid Volume, V_{LX} (ft^3)	942	942
Number of Turnovers per Year, N	16.85	16.85
Turnover Factor, K_N	1.0	1.0
Working Loss, L_W (lb/yr)	**2.41**	**1,059.13**
Total Potential VOC Emissions (lb/yr)	**2.74**	**1,135.02**

Notes:

T_{AX} (Deadhorse, AK)	=	25.2 F	485.2 R
T_{AN} (Deadhorse, AK)	=	11.0 F	471.0 R
a	=	0.17	White, New
I	=	838	Btu/ft^2-d
K_P (diesel)	=	1	
M_V (diesel)	=	130	lb/lb-mol
P_{va} (diesel)	=	0.006	psi
K_P (gasoline)	=	1	
M_V (gasoline)	=	66	lb/lb-mol
P_{va} (gasoline)	=	5.2	psi
K_B	=	1	Vent setting range up to 0.03 psig

Table 9. Oil Search (Alaska), LLC Pikka Development - Nanushuk Operations Pad (NOP)
Sulfur Dioxide (SO_2) Emissions Summary

Emissions Unit					Potential Operation	Emission Factor		Potential Annual SO_2 Emissions
ID	Description	Classification	Rating/Size	Fuel		Units	Reference	
1	Camp A Generator Engine No. 1	Stationary	800 bhp	ULSD [1]	19,720 hr/yr	0.0002 lb/gal [2]	Mass Balance	8.81E-02 tpy [5,6]
2	Camp A Generator Engine No. 2	Stationary	800 bhp	ULSD				
3	Camp A Generator Engine No. 3	Stationary	800 bhp	ULSD				
4	Camp B Generator Engine No. 1	Stationary	2,350 bhp	ULSD	8,926 hr/yr	0.0002 lb/gal [2]	Mass Balance	0.1 tpy [5,6]
5	Camp B Generator Engine No. 2	Stationary	2,350 bhp	ULSD				
6	Camp C Generator Engine No. 1	Stationary	2,550 bhp	ULSD	8,974 hr/yr	0.0002 lb/gal [2]	Mass Balance	0.1 tpy [5,6]
7	Camp C Generator Engine No. 2	Stationary	2,550 bhp	ULSD				
8	Maintenance Building Heater No. 1	Stationary	2.5 MMBtu/hr	LSD [3]	8,760 hr/yr	0.0071 lb/gal [4]	Mass Balance	5.82E-01 tpy [5]
9	Maintenance Building Heater No. 2	Stationary	2.5 MMBtu/hr	LSD	8,760 hr/yr	0.0071 lb/gal [4]	Mass Balance	5.82E-01 tpy [5]
10	Communications Module Generator Engine	Stationary	30 kW-e	ULSD	8,760 hr/yr	0.0002 lb/gal [2]	Mass Balance	2.14E-03 tpy [5,6,7]
11	(12) Various Light Plants	Nonroad Engine	90 kW-e, total	ULSD	8,760 hr/yr	0.0002 lb/gal [2]	Mass Balance	6.42E-03 tpy [5,6,7]
12	Temporary Office Complex Generator Engine	Stationary	350 kW-e	ULSD	8,760 hr/yr	0.0002 lb/gal [2]	Mass Balance	2.50E-02 tpy [5,6,7]
13	Temporary Camp Bull Rail Generator Engine No. 1	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	0.0002 lb/gal [2]	Mass Balance	1.07E-03 tpy [5,6,7]
14	Temporary Camp Bull Rail Generator Engine No. 2	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	0.0002 lb/gal [2]	Mass Balance	1.07E-03 tpy [5,6,7]
15	Temporary Camp Bull Rail Generator Engine No. 3	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	0.0002 lb/gal [2]	Mass Balance	1.07E-03 tpy [5,6,7]
16	Temporary Camp Bull Rail Generator Engine No. 4	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	0.0002 lb/gal [2]	Mass Balance	1.07E-03 tpy [5,6,7]
17	Temporary Camp Bull Rail Generator Engine No. 5	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	0.0002 lb/gal [2]	Mass Balance	1.07E-03 tpy [5,6,7]
18	Temporary Camp Bull Rail Generator Engine No. 6	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	0.0002 lb/gal [2]	Mass Balance	1.07E-03 tpy [5,6,7]
19	Diesel Storage Tank No. 1	Stationary	9,900 gallons	NA [8]	8,760 hr/yr	NA	NA	0 tpy
20	Diesel Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
21	Diesel Storage Tank No. 3	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
22	Diesel Storage Tank No. 4	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
23	Diesel Storage Tank No. 5	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
24	Diesel Storage Tank No. 6	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
25	Diesel Storage Tank No. 7	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
26	Diesel Storage Tank No. 8	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
27	Diesel Storage Tank No. 9	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
28	Diesel Storage Tank No. 10	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
29	Gasoline Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
30	Gasoline Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
							Total Potential SO_2 Emissions	**1.54 tpy**
							Total Stationary Source Potential to Emit SO_2 Emissions [9]	**1.53 tpy**

Notes:

[1] Ultra-Low Sulfur Diesel.

[2] ULSD emission factors are based on a fuel sulfur content of 15 parts per million by weight (ppmw).

[3] Low Sulfur Diesel

[4] Low Sulfur Diesel (LSD) emission factors are based on a fuel sulfur content of 500 ppmw.

[5] Potential emissions are based on a fuel heat capacity of 18,800 Btu/lb and a density of 7.1 lb/gal for diesel fuel.

[6] The ULSD-fired internal combustion engines are assumed to have a brake-specific fuel consumption rate of 7,000 Btu/bhp-hr.

[7] Assumes 92 percent of the engine shaft mechanical power is converted to electrical power, per guidance in the ADEC's *Modeling Review Procedures Manual* (October 2018).

[8] Not applicable.

[9] Per 18 AAC 50.100, potential emissions of nonroad engines are not included when determining the classification of a stationary source.

Table 10. Oil Search Alaska, LLC Pikka Development - Nanushuk Operations Pad (NOP)
Greenhouse Gas (GHG) Emissions Summary

Emissions Unit					Potential Operation	Potential Annual GHG (CO_2e) Emissions [1,2]
ID	Description	Classification	Rating/Size	Fuel		
1	Camp A Generator Engine No. 1	Stationary	800 bhp	ULSD [3]	19,720 hr/yr	9,034 tpy
2	Camp A Generator Engine No. 2	Stationary	800 bhp	ULSD		
3	Camp A Generator Engine No. 3	Stationary	800 bhp	ULSD		
4	Camp B Generator Engine No. 1	Stationary	2,350 bhp	ULSD	8,926 hr/yr	12,012 tpy
5	Camp B Generator Engine No. 2	Stationary	2,350 bhp	ULSD		
6	Camp C Generator Engine No. 1	Stationary	2,550 bhp	ULSD	8,974 hr/yr	13,104 tpy
7	Camp C Generator Engine No. 2	Stationary	2,550 bhp	ULSD		
8	Maintenance Building Heater No. 1	Stationary	2.5 MMBtu/hr	LSD [4]	8,760 hr/yr	1,792 tpy
9	Maintenance Building Heater No. 2	Stationary	2.5 MMBtu/hr	LSD	8,760 hr/yr	1,792 tpy
10	Communications Module Generator Engine	Stationary	30 kW-e	ULSD	8,760 hr/yr	219 tpy
11	(12) Various Light Plants	Nonroad Engine	90 kW-e, total	ULSD	8,760 hr/yr	658 tpy
12	Temporary Office Complex Generator Engine	Stationary	350 kW-e	ULSD	8,760 hr/yr	2,559 tpy
13	Temporary Camp Bull Rail Generator Engine No. 1	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	110 tpy
14	Temporary Camp Bull Rail Generator Engine No. 2	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	110 tpy
15	Temporary Camp Bull Rail Generator Engine No. 3	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	110 tpy
16	Temporary Camp Bull Rail Generator Engine No. 4	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	110 tpy
17	Temporary Camp Bull Rail Generator Engine No. 5	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	110 tpy
18	Temporary Camp Bull Rail Generator Engine No. 6	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	110 tpy
19	Diesel Storage Tank No. 1	Stationary	9,900 gallons	NA [5]	8,760 hr/yr	0 tpy
20	Diesel Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	0 tpy
21	Diesel Storage Tank No. 3	Stationary	9,900 gallons	NA	8,760 hr/yr	0 tpy
22	Diesel Storage Tank No. 4	Stationary	9,900 gallons	NA	8,760 hr/yr	0 tpy
23	Diesel Storage Tank No. 5	Stationary	9,900 gallons	NA	8,760 hr/yr	0 tpy
24	Diesel Storage Tank No. 6	Stationary	9,900 gallons	NA	8,760 hr/yr	0 tpy
25	Diesel Storage Tank No. 7	Stationary	9,900 gallons	NA	8,760 hr/yr	0 tpy
26	Diesel Storage Tank No. 8	Stationary	9,900 gallons	NA	8,760 hr/yr	0 tpy
27	Diesel Storage Tank No. 9	Stationary	9,900 gallons	NA	8,760 hr/yr	0 tpy
28	Diesel Storage Tank No. 10	Stationary	9,900 gallons	NA	8,760 hr/yr	0 tpy
29	Gasoline Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	0 tpy
30	Gasoline Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	0 tpy
					Total Potential GHG Emissions	**41,828 tpy**
					Total Stationary Source Potential to Emit GHG Emissions [6]	**40,512 tpy**

Notes:

[1] Tables 11 through 13 provide detailed CO_2, CH_4 and N_2O emission calculations.

[2] GHG (carbon dioxide equivalents (CO_2e)) are based on CO_2, CH_4 and N_2O global warming potentials of 1, 25, and 298, respectively, published in 40 CFR 98 Table A-1.

[3] Ultra-Low Sulfur Diesel.

[4] Low Sulfur Diesel.

[5] Not applicable.

[6] Per 18 AAC 50.100, potential emissions of nonroad engines are not included when determining the classification of a stationary source.

Table 11. Oil Search Alaska, LLC Pikka Development - Nanushuk Operations Pad (NOP)
Carbon Dioxide (CO_2) Emissions Summary

Emissions Unit					Potential Operation	Emission Factor		Potential Annual CO_2 Emissions
ID	Description	Classification	Rating/Size	Fuel		Units	Reference	
1	Camp A Generator Engine No. 1	Stationary	800 bhp	ULSD [1]	19,720 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	9,003 tpy [2]
2	Camp A Generator Engine No. 2	Stationary	800 bhp	ULSD				
3	Camp A Generator Engine No. 3	Stationary	800 bhp	ULSD				
4	Camp B Generator Engine No. 1	Stationary	2,350 bhp	ULSD	8,926 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	11,971 tpy [2]
5	Camp B Generator Engine No. 2	Stationary	2,350 bhp	ULSD				
6	Camp C Generator Engine No. 1	Stationary	2,550 bhp	ULSD	8,974 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	13,059 tpy [2]
7	Camp C Generator Engine No. 2	Stationary	2,550 bhp	ULSD				
8	Maintenance Building Heater No. 1	Stationary	2.5 MMBtu/hr	LSD [3]	8,760 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	1,785 tpy
9	Maintenance Building Heater No. 2	Stationary	2.5 MMBtu/hr	LSD	8,760 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	1,785 tpy
10	Communications Module Generator Engine	Stationary	30 kW-e	ULSD	8,760 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	219 tpy [2,4]
11	(12) Various Light Plants	Nonroad Engine	90 kW-e, total	ULSD	8,760 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	656 tpy [2,4]
12	Temporary Office Complex Generator Engine	Stationary	350 kW-e	ULSD	8,760 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	2,550 tpy [2,4]
13	Temporary Camp Bull Rail Generator Engine No. 1	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	109 tpy [2,4]
14	Temporary Camp Bull Rail Generator Engine No. 2	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	109 tpy [2,4]
15	Temporary Camp Bull Rail Generator Engine No. 3	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	109 tpy [2,4]
16	Temporary Camp Bull Rail Generator Engine No. 4	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	109 tpy [2,4]
17	Temporary Camp Bull Rail Generator Engine No. 5	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	109 tpy [2,4]
18	Temporary Camp Bull Rail Generator Engine No. 6	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	73.96 kg/MMBtu	Table C-1, 40 CFR 98	109 tpy [2,4]
19	Diesel Storage Tank No. 1	Stationary	9,900 gallons	NA [5]	8,760 hr/yr	NA	NA	0 tpy
20	Diesel Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
21	Diesel Storage Tank No. 3	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
22	Diesel Storage Tank No. 4	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
23	Diesel Storage Tank No. 5	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
24	Diesel Storage Tank No. 6	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
25	Diesel Storage Tank No. 7	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
26	Diesel Storage Tank No. 8	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
27	Diesel Storage Tank No. 9	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
28	Diesel Storage Tank No. 10	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
29	Gasoline Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
30	Gasoline Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
							Total Potential CO_2 Emissions	**41,685 tpy**
							Total Stationary Source Potential to Emit CO_2 Emissions [6]	**40,373 tpy**

Notes:

[1] Ultra-Low Sulfur Diesel.

[2] The ULSD-fired internal combustion engines are assumed to have a brake-specific fuel consumption rate of 7,000 Btu/bhp-hr.

[3] Low Sulfur Diesel.

[4] Assumes 92 percent of the engine shaft mechanical power is converted to electrical power, per guidance in the ADEC's *Modeling Review Procedures Manual* (October 2018).

[5] Not applicable.

[6] Per 18 AAC 50.100, potential emissions of nonroad engines are not included when determining the classification of a stationary source.

Table 12. Oil Search Alaska, LLC Pikka Development - Nanushuk Operations Pad (NOP)
Methane (CH_4) Emissions Summary

Emissions Unit					Potential Operation	Emission Factor		Potential Annual CH_4 Emissions
ID	Description	Classification	Rating/Size	Fuel		Units	Reference	
1	Camp A Generator Engine No. 1	Stationary	800 bhp	ULSD [1]	19,720 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	0.4 tpy [2]
2	Camp A Generator Engine No. 2	Stationary	800 bhp	ULSD				
3	Camp A Generator Engine No. 3	Stationary	800 bhp	ULSD				
4	Camp B Generator Engine No. 1	Stationary	2,350 bhp	ULSD	8,926 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	0.5 tpy [2]
5	Camp B Generator Engine No. 2	Stationary	2,350 bhp	ULSD				
6	Camp C Generator Engine No. 1	Stationary	2,550 bhp	ULSD	8,974 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	0.5 tpy [2]
7	Camp C Generator Engine No. 2	Stationary	2,550 bhp	ULSD				
8	Maintenance Building Heater No. 1	Stationary	2.5 MMBtu/hr	LSD [3]	8,760 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	0.1 tpy
9	Maintenance Building Heater No. 2	Stationary	2.5 MMBtu/hr	LSD	8,760 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	0.1 tpy
10	Communications Module Generator Engine	Stationary	30 kW-e	ULSD	8,760 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	8.9E-03 tpy [2,4]
11	(12) Various Light Plants	Nonroad Engine	90 kW-e, total	ULSD	8,760 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	2.7E-02 tpy [2,4]
12	Temporary Office Complex Generator Engine	Stationary	350 kW-e	ULSD	8,760 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	0.1 tpy [2,4]
13	Temporary Camp Bull Rail Generator Engine No. 1	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	4.4E-03 tpy [2,4]
14	Temporary Camp Bull Rail Generator Engine No. 2	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	4.4E-03 tpy [2,4]
15	Temporary Camp Bull Rail Generator Engine No. 3	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	4.4E-03 tpy [2,4]
16	Temporary Camp Bull Rail Generator Engine No. 4	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	4.4E-03 tpy [2,4]
17	Temporary Camp Bull Rail Generator Engine No. 5	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	4.4E-03 tpy [2,4]
18	Temporary Camp Bull Rail Generator Engine No. 6	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	3.00E-03 kg/MMBtu	Table C-2, 40 CFR 98	4.4E-03 tpy [2,4]
19	Diesel Storage Tank No. 1	Stationary	9,900 gallons	NA [5]	8,760 hr/yr	NA	NA	0 tpy
20	Diesel Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
21	Diesel Storage Tank No. 3	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
22	Diesel Storage Tank No. 4	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
23	Diesel Storage Tank No. 5	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
24	Diesel Storage Tank No. 6	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
25	Diesel Storage Tank No. 7	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
26	Diesel Storage Tank No. 8	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
27	Diesel Storage Tank No. 9	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
28	Diesel Storage Tank No. 10	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
29	Gasoline Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
30	Gasoline Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
							Total Potential CH_4 Emissions	**1.7 tpy**
							Total Stationary Source Potential to Emit CH_4 Emissions [6]	**1.6 tpy**

Notes:

[1] Ultra-Low Sulfur Diesel.

[2] The ULSD-fired internal combustion engines are assumed to have a brake-specific fuel consumption rate of 7,000 Btu/bhp-hr.

[3] Low Sulfur Diesel.

[4] Assumes 92 percent of the engine shaft mechanical power is converted to electrical power, per guidance in the ADEC's *Modeling Review Procedures Manual* (October 2018).

[5] Not applicable.

[6] Per 18 AAC 50.100, potential emissions of nonroad engines are not included when determining the classification of a stationary source.

Table 13. Oil Search Alaska, LLC Pikka Development - Nanushuk Operations Pad (NOP)
Nitrous Oxide (N_2O) Emissions Summary

Emissions Unit					Potential Operation	Emission Factor		Potential Annual N_2O Emissions
ID	Description	Classification	Rating/Size	Fuel		Units	Reference	
1	Camp A Generator Engine No. 1	Stationary	800 bhp	ULSD [1]	19,720 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	7.3E-02 tpy [2]
2	Camp A Generator Engine No. 2	Stationary	800 bhp	ULSD				
3	Camp A Generator Engine No. 3	Stationary	800 bhp	ULSD				
4	Camp B Generator Engine No. 1	Stationary	2,350 bhp	ULSD	8,926 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	0.1 tpy [2]
5	Camp B Generator Engine No. 2	Stationary	2,350 bhp	ULSD				
6	Camp C Generator Engine No. 1	Stationary	2,550 bhp	ULSD	8,974 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	0.1 tpy [2]
7	Camp C Generator Engine No. 2	Stationary	2,550 bhp	ULSD				
8	Maintenance Building Heater No. 1	Stationary	2.5 MMBtu/hr	LSD [3]	8,760 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	1.4E-02 tpy
9	Maintenance Building Heater No. 2	Stationary	2.5 MMBtu/hr	LSD	8,760 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	1.4E-02 tpy
10	Communications Module Generator Engine	Stationary	30 kW-e	ULSD	8,760 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	1.8E-03 tpy [2,4]
11	(12) Various Light Plants	Nonroad Engine	90 kW-e, total	ULSD	8,760 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	5.3E-03 tpy [2,4]
12	Temporary Office Complex Generator Engine	Stationary	350 kW-e	ULSD	8,760 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	2.1E-02 tpy [2,4]
13	Temporary Camp Bull Rail Generator Engine No. 1	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	8.9E-04 tpy [2,4]
14	Temporary Camp Bull Rail Generator Engine No. 2	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	8.9E-04 tpy [2,4]
15	Temporary Camp Bull Rail Generator Engine No. 3	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	8.9E-04 tpy [2,4]
16	Temporary Camp Bull Rail Generator Engine No. 4	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	8.9E-04 tpy [2,4]
17	Temporary Camp Bull Rail Generator Engine No. 5	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	8.9E-04 tpy [2,4]
18	Temporary Camp Bull Rail Generator Engine No. 6	Nonroad Engine	15 kW-e	ULSD	8,760 hr/yr	6.0E-04 kg/MMBtu	Table C-2, 40 CFR 98	8.9E-04 tpy [2,4]
19	Diesel Storage Tank No. 1	Stationary	9,900 gallons	NA [5]	8,760 hr/yr	NA	NA	0 tpy
20	Diesel Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
21	Diesel Storage Tank No. 3	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
22	Diesel Storage Tank No. 4	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
23	Diesel Storage Tank No. 5	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
24	Diesel Storage Tank No. 6	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
25	Diesel Storage Tank No. 7	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
26	Diesel Storage Tank No. 8	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
27	Diesel Storage Tank No. 9	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
28	Diesel Storage Tank No. 10	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
29	Gasoline Storage Tank No. 1	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
30	Gasoline Storage Tank No. 2	Stationary	9,900 gallons	NA	8,760 hr/yr	NA	NA	0 tpy
							Total Potential N_2O Emissions	**0.3 tpy**
							Total Stationary Source Potential to Emit N_2O Emissions [6]	**0.3 tpy**

Notes:

[1] Ultra-Low Sulfur Diesel.

[2] The ULSD-fired internal combustion engines are assumed to have a brake-specific fuel consumption rate of 7,000 Btu/bhp-hr.

[3] Low Sulfur Diesel.

[4] Assumes 92 percent of the engine shaft mechanical power is converted to electrical power, per guidance in the ADEC's *Modeling Review Procedures Manual* (October 2018).

[5] Not applicable.

[6] Per 18 AAC 50.100, potential emissions of nonroad engines are not included when determining the classification of a stationary source.

Table 14. Oil Search Alaska, LLC Pikka Development - Nanushuk Operations Pad (NOP)
Hazardous Air Pollutants (HAPs) Emissions Summary

Hazardous Air Pollutant	HAP Emissions by Unit Category [1]					Potential Annual HAP Emissions
	ULSD-fired Engines > 600 hp	ULSD-fired Engines < 600 hp	ULSD-fired Heaters	ULSD Tanks	Gasoline Tanks	
1,1,1-Trichloroethane	----	----	2.7E-04 tpy	----	----	2.7E-04 tpy
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	----	----	3.6E-09 tpy	----	----	3.6E-09 tpy
1,3-Butadiene	----	6.6E-04 tpy	----	----	----	6.6E-04 tpy
Acetaldehyde	5.3E-03 tpy	1.3E-02 tpy	----	----	----	1.8E-02 tpy
Acrolein	1.6E-03 tpy	1.6E-03 tpy	----	----	----	3.2E-03 tpy
Benzene	1.6E-01 tpy	1.6E-02 tpy	2.5E-04 tpy	3.5E-04 tpy	1.6E-02 tpy	1.9E-01 tpy
Ethylbenzene	----	----	7.4E-05 tpy	4.4E-05 tpy	6.8E-04 tpy	8.0E-04 tpy
Formaldehyde	1.6E-02 tpy	2.0E-02 tpy	3.8E-02 tpy	----	----	7.5E-02 tpy
Hexane	----	----	----	7.7E-04 tpy	4.3E-02 tpy	4.3E-02 tpy
Naphthalene	----	1.4E-03 tpy	1.3E-03 tpy	----	----	2.8E-03 tpy
Polycyclic Organic Matter	4.4E-02 tpy	1.4E-03 tpy	7.1E-05 tpy	----	----	4.6E-02 tpy
Toluene	5.9E-02 tpy	6.9E-03 tpy	7.2E-03 tpy	2.8E-04 tpy	1.4E-02 tpy	8.7E-02 tpy
Xylenes (isomers and mixture)	4.0E-02 tpy	4.8E-03 tpy	1.3E-04 tpy	1.8E-05 tpy	4.5E-04 tpy	4.6E-02 tpy
Arsenic Compounds	----	----	8.8E-05 tpy	----	----	8.8E-05 tpy
Beryllium Compounds	----	----	6.6E-05 tpy	----	----	6.6E-05 tpy
Cadmium Compounds	----	----	6.6E-05 tpy	----	----	6.6E-05 tpy
Chromium Compounds	----	----	6.6E-05 tpy	----	----	6.6E-05 tpy
Lead Compounds	----	----	2.0E-04 tpy	----	----	2.0E-04 tpy
Mercury Compounds	----	----	6.6E-05 tpy	----	----	6.6E-05 tpy
Manganese Compounds	----	----	1.3E-04 tpy	----	----	1.3E-04 tpy
Nickel Compounds	----	----	6.6E-05 tpy	----	----	6.6E-05 tpy
Selenium Compounds	----	----	3.3E-04 tpy	----	----	3.3E-04 tpy
Total Stationary Source Potential to Emit HAP Emissions [2]	**0.3 tpy**	**0.1 tpy**	**4.9E-02 tpy**	**1.5E-03 tpy**	**0.1 tpy**	**0.5 tpy**

Notes:
[1] Tables 15 through 19 provide detailed emissions calculations for emissions unit categories.
[2] Per 18 AAC 50.100, potential emissions of nonroad engines are not included when determining the classification of a stationary source.

Table 15. Oil Search Alaska, LLC Pikka Development - Nanushuk Operations Pad (NOP)
ULSD-Fired RICE (>600 hp) Hazardous Air Pollutants (HAPs) Emissions Summary

CAS No.	Chemical Name	Emission Factor		Potential Annual HAP Emissions [1]
		Units	Reference	
75070	Acetaldehyde	2.52E-05 lb/MMBtu	Table 3.4-3, AP-42	5.3E-03 tpy
107028	Acrolein	7.88E-06 lb/MMBtu	Table 3.4-3, AP-42	1.6E-03 tpy
71432	Benzene	7.76E-04 lb/MMBtu	Table 3.4-3, AP-42	1.6E-01 tpy
5000	Formaldehyde	7.89E-05 lb/MMBtu	Table 3.4-3, AP-42	1.6E-02 tpy
N/A	Polycyclic Organic Matter	2.12E-04 lb/MMBtu	Table 3.4-4, AP-42	4.4E-02 tpy
108883	Toluene	2.81E-04 lb/MMBtu	Table 3.4-3, AP-42	5.9E-02 tpy
1330207	Xylenes (isomers and mixture)	1.93E-04 lb/MMBtu	Table 3.4-3, AP-42	4.0E-02 tpy
			Total Stationary Source Potential to Emit HAP Emissions	**3.3E-01 tpy**

Notes:

[1] Total heat rate based on 19,720 operating hours per year for EU IDs 1-3 (combined); 8,926 hours per year for EU IDs 4 and 5 (combined); and 8,974 hours per year for EU IDs 6 and 7 (combined) and a brake-specific fuel consumption rate of 7,000 Btu/bhp-hr.

EU IDs 1-3 (800 bhp, each)	5.6 MMBtu/hr
EU IDs 4 and 5 (2,350 bhp, each)	16.5 MMBtu/hr
EU IDs 6 and 7 (2,550 bhp, each)	17.9 MMBtu/hr
Total Potential Heat Rate	417,451 MMBtu/yr, total

Table 16. Oil Search Alaska, LLC Pikka Development - Nanushuk Operations Pad (NOP)
ULSD-Fired RICE (<600 hp) Hazardous Air Pollutants (HAPs) Emissions Summary

CAS No.	Chemical Name	Emission Factor		Potential Annual HAP Emissions [1,2]
		Units	Reference	
106990	1,3-Butadiene	3.91E-05 lb/MMBtu	Table 3.3-2, AP-42	6.6E-04 tpy
75070	Acetaldehyde	7.67E-04 lb/MMBtu	Table 3.3-2, AP-42	1.3E-02 tpy
107028	Acrolein	9.25E-05 lb/MMBtu	Table 3.3-2, AP-42	1.6E-03 tpy
71432	Benzene	9.33E-04 lb/MMBtu	Table 3.3-2, AP-42	1.6E-02 tpy
5000	Formaldehyde	1.18E-03 lb/MMBtu	Table 3.3-2, AP-42	2.0E-02 tpy
91203	Naphthalene	8.48E-05 lb/MMBtu	Table 3.3-2, AP-42	1.4E-03 tpy
N/A	Polycyclic Organic Matter	8.32E-05 lb/MMBtu	Table 3.3-2, AP-42	1.4E-03 tpy
108883	Toluene	4.09E-04 lb/MMBtu	Table 3.3-2, AP-42	6.9E-03 tpy
1330207	Xylenes (isomers and mixture)	2.85E-04 lb/MMBtu	Table 3.3-2, AP-42	4.8E-03 tpy
			Total Stationary Source Potential to Emit HAP Emissions	**6.5E-02 tpy**

Notes:

[1] Per 18 AAC 50.100, potential emissions of nonroad engines are not included when determining the classification of a stationary source.

[2] Total heat rate based on 8,760 operating hours per year for each unit, 92 percent of the engine shaft mechanical power is converted to electrical power, and a brake-specific fuel consumption rate of 7,000 Btu/bhp-hr.

EU ID 10 (30 kW-e)	0.3 MMBtu/hr
EU ID 12 (350 kW-e)	3.6 MMBtu/hr
Total Potential Heat Rate	33,965 MMBtu/yr, total

Table 17. Oil Search Alaska, LLC Pikka Development - Nanushuk Operations Pad (NOP)
LSD-Fired Heaters Hazardous Air Pollutants (HAPs) Emissions Summary

CAS No.	Chemical Name	Emission Factor		Potential Annual HAP Emissions [1,2]
		Units	Reference	
74552	1,1,1-Trichloroethane	2.36E-04 lb/10^3 gal	Table 1.3-9, AP-42	2.7E-04 tpy
3268879	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	3.10E-09 lb/10^3 gal	Table 1.3-9, AP-42	3.6E-09 tpy
71432	Benzene	2.14E-04 lb/10^3 gal	Table 1.3-9, AP-42	2.5E-04 tpy
100414	Ethylbenzene	6.36E-05 lb/10^3 gal	Table 1.3-9, AP-42	7.4E-05 tpy
5000	Formaldehyde	3.30E-02 lb/10^3 gal	Table 1.3-9, AP-42	3.8E-02 tpy
91203	Naphthalene	1.13E-03 lb/10^3 gal	Table 1.3-9, AP-42	1.3E-03 tpy
N/A	Polycyclic Organic Matter	6.06E-05 lb/10^3 gal		7.1E-05 tpy
	Acenaphthene	2.11E-05 lb/10^3 gal	Table 1.3-9, AP-42	
	Acenaphthylene	2.53E-07 lb/10^3 gal	Table 1.3-9, AP-42	
	Anthracene	1.22E-06 lb/10^3 gal	Table 1.3-9, AP-42	
	Benz(a)anthracene	4.01E-06 lb/10^3 gal		
	Benzo(b,k)fluroanthene	1.48E-06 lb/10^3 gal	Table 1.3-9, AP-42	
	Benzo(g,h,i)perylene	2.26E-06 lb/10^3 gal	Table 1.3-9, AP-42	
	Chrysene	2.38E-06 lb/10^3 gal	Table 1.3-9, AP-42	
	Dibenzo(a,h)anthracene	1.67E-06 lb/10^3 gal	Table 1.3-9, AP-42	
	Fluroanthene	4.84E-06 lb/10^3 gal	Table 1.3-9, AP-42	
	Fluorene	4.47E-06 lb/10^3 gal	Table 1.3-9, AP-42	
	Indeno(1,2,3-cd)pyrene	2.14E-06 lb/10^3 gal	Table 1.3-9, AP-42	
	Phenanathrene	1.05E-05 lb/10^3 gal	Table 1.3-9, AP-42	
	Pyrene	4.25E-06 lb/10^3 gal	Table 1.3-9, AP-42	
108883	Toluene	6.20E-03 lb/10^3 gal	Table 1.3-9, AP-42	7.2E-03 tpy
1330207	Xylenes (isomers and mixture)	1.09E-04 lb/10^3 gal	Table 1.3-9, AP-42	1.3E-04 tpy
N/A	Arsenic Compounds	4.00E+00 lb/10^{12} Btu	Table 1.3-10, AP-42	8.8E-05 tpy
N/A	Beryllium Compounds	3.00E+00 lb/10^{12} Btu	Table 1.3-10, AP-42	6.6E-05 tpy
N/A	Cadmium Compounds	3.00E+00 lb/10^{12} Btu	Table 1.3-10, AP-42	6.6E-05 tpy
N/A	Chromium Compounds	3.00E+00 lb/10^{12} Btu	Table 1.3-10, AP-42	6.6E-05 tpy
N/A	Lead Compounds	9.00E+00 lb/10^{12} Btu	Table 1.3-10, AP-42	2.0E-04 tpy
N/A	Mercury Compounds	3.00E+00 lb/10^{12} Btu	Table 1.3-10, AP-42	6.6E-05 tpy
N/A	Manganese Compounds	6.00E+00 lb/10^{12} Btu	Table 1.3-10, AP-42	1.3E-04 tpy
	Nickel Compounds	3.00E+00 lb/10^{12} Btu	Table 1.3-10, AP-42	6.6E-05 tpy
N/A	Selenium Compounds	1.50E+01 lb/10^{12} Btu	Table 1.3-10, AP-42	3.3E-04 tpy
			Total Stationary Source Potential to Emit HAP Emissions	**4.9E-02 tpy**

Notes:

[1] Potential emissions are based on a fuel heat capacity of 18,800 Btu/lb.

[2] Total heat rate based on 8,760 operating hours per year for each unit.

EU IDs 8 and 9 (2.5 MMBtu/hr, each)	2.5 MMBtu/hr
Total Potential Heat Rate	43,800 MMBtu/yr

Table 18. Oil Search Alaska, LLC Pikka Development - Nanushuk Operations Pad (NOP)
ULSD Storage Tanks Hazardous Air Pollutants (HAPs) Emissions Summary

CAS No.	Chemical Name	Emission Factor		Potential Annual HAP Emissions
		Units	Reference	
71432	Benzene	2.57 wt. pct.	EPA SPECIATE [1,2]	3.5E-04 tpy
100414	Ethylbenzene	0.32 wt. pct.	EPA SPECIATE [1,2]	4.4E-05 tpy
110543	Hexane	5.61 wt. pct.	EPA SPECIATE [1,2]	7.7E-04 tpy
108883	Toluene	2.06 wt. pct.	EPA SPECIATE [1,2]	2.8E-04 tpy
1330207	Xylenes (isomers and mixture)	0.13 wt. pct.	EPA SPECIATE [1,2]	1.8E-05 tpy
			Total Stationary Source Potential to Emit HAP Emissions	**1.5E-03 tpy**

Notes:

[1] EPA SPECIATE online profile: Distillate Oil / Tank/ Volatilization/ HAPs.

[2] Emission rate of chemical component for tanks: $L_{TI} = Z_{VI} \times L_T$ (AP-42, Section 7.1.4, Equation 40-1)

Where:

Z_{VI} = component weight fraction in vapor (EPA SPECIATE)

L_T = Total VOC losses (Refer to Table 8)

Table 19. Oil Search Alaska, LLC Pikka Development - Nanushuk Operations Pad (NOP)
Gasoline Storage Tanks Hazardous Air Pollutants (HAPs) Emissions Summary

CAS No.	Chemical Name	Emission Factor		Potential Annual HAP Emissions
		Units	Reference	
71432	Benzene	1.41 wt. pct.	EPA SPECIATE [1,2]	1.6E-02 tpy
100414	Ethylbenzene	0.06 wt. pct.	EPA SPECIATE [1,2]	6.8E-04 tpy
110543	Hexane	3.75 wt. pct.	EPA SPECIATE [1,2]	4.3E-02 tpy
108883	Toluene	1.25 wt. pct.	EPA SPECIATE [1,2]	1.4E-02 tpy
1330207	Xylenes (isomers and mixture)	0.04 wt. pct.	EPA SPECIATE [1,2]	4.5E-04 tpy
			Total Stationary Source Potential to Emit HAP Emissions	**7.4E-02 tpy**

Notes:

[1] EPA SPECIATE online profile: Gasoline / Tank/ Volatilization / HAPs.

[2] Emission rate of chemical component for tanks: $L_{TI} = Z_{VI} \times L_T$ (AP-42, Section 7.1.4, Equation 40-1)

Where:

Z_{VI} = component weight fraction in vapor (EPA SPECIATE)

L_T = Total VOC losses (Refer to Table 8)

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Attachment B

Compliance Demonstration

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Attachment B
18 AAC 50.055 Emissions Standards Compliance Demonstration

18 AAC 50.055(a)(1) – Visible Emissions Standard

All stationary fuel-burning equipment is subject to the visible emissions requirement of 18 Alaska Administrative Code (AAC) 50.055(a)(1). This rule requires that visibility through the exhaust effluent not be reduced by visible emissions, excluding condensed water vapor, by more than 20 percent averaged over any six consecutive minutes.

Although visibility information is not available for the fuel-burning equipment that will be installed at the NOP, operating experience with similar equipment installed at locations on the Alaska North Slope has shown compliance with this standard when the equipment is properly operated and maintained.

18 AAC 50.055(b)(1) – Particulate Matter Emissions Standard

All stationary fuel-burning equipment is subject to the particulate matter emissions requirement of 18 AAC 50.055(b)(1). This rule requires that particulate matter emissions from industrial processes and fuel-burning equipment not exceed 0.05 grains per cubic foot of exhaust gas corrected to standard conditions (gr/dscf) and averaged over three hours.

<u>Emissions Units: Diesel-fired RICE</u>

- From NSPS Subpart IIII, PM Emission Factor = 0.75 g/kW-hr, based on 0.6 g/kW-hr times 1.25 NTE multiplier (worst-case emission factor in stationary source EU inventory)
- Emission Factor = 0.176 lb/MMBtu (brake-specific fuel consumption rate = 7,000 Btu/hp-hr)
- From 40 CFR 60, Method 19, Equation 19-1:

$$E = CF \frac{20.9}{(20.9 - \%O_2)}$$

Where: E = Pollutant emission rate (lb/MMBtu)
C = Pollutant concentration in stack gas (lb/scf)
F = F-factor (scf/MMBtu)
O_2 = Percent oxygen by weight in fuel

- Solving for C and converting to gr/scf:

Where: E = 0.176 lb/MMBtu
F = 9,190 scf/MMBtu (factor for liquid fuel combustion)
O_2 = 15 percent for diesel-fired RICE

$$C = \frac{0.176\ \text{lb}}{\text{MMBtu}} \times \frac{\text{MMBtu}}{9{,}190\ \text{scf}} \times \frac{(20.9 - 15)}{20.9} \times \frac{7{,}000\ \text{gr}}{\text{lb}} = 0.038 \frac{\text{gr}}{\text{scf}}$$

The PM emission rate for diesel-fired RICE is less than 0.05 gr/scf, so the resulting emissions will comply with the grain loading standard of 18 AAC 50.055(b)(1).

Emissions Units: Diesel-fired Heaters

- From AP-42, Table 1.3-1 & 1.3-2, PM Emission Factor = 3.3 lb/10^3 gallon
- Emission Factor = 0.0247 lb/MMBtu (gross BTU = 133,500 Btu/gal)
- From 40 CFR 60, Method 19, Equation 19-1:

$$E = CF \frac{20.9}{(20.9 - \%O_2)}$$

Where: E = Pollutant emission rate (lb/MMBtu)
C = Pollutant concentration in stack gas (lb/scf)
F = F-factor (scf/MMBtu)
O_2 = Percent oxygen by weight in fuel

- Solving for C and converting to gr/scf:

Where: E = 0.0247 lb/MMBtu
F = 9,190 scf/MMBtu (factor for liquid fuel combustion)
O_2 = 5 percent for heaters

$$C = \frac{0.0247\ \text{lb}}{\text{MMBtu}} \times \frac{\text{MMBtu}}{9{,}190\ \text{scf}} \times \frac{(20.9 - 5)}{20.9} \times \frac{7{,}000\ \text{gr}}{\text{lb}} = 0.014 \frac{\text{gr}}{\text{scf}}$$

The PM emission rate for diesel-fired heaters is less than 0.05 gr/scf, so the resulting emissions will comply with the grain loading standard of 18 AAC 50.055(b)(1).

18 AAC 50.055(c) – Sulfur Compound Emissions Standard

All stationary fuel-burning equipment is subject to the sulfur compound emissions requirement of 18 AAC 50.055(c). This rule requires that sulfur compound emissions from fuel-burning equipment not exceed 500 parts per million (ppm) averaged over three hours.

Emissions Units: Diesel-fired Equipment

- Convert ppm SO_2 in stack gas to weight percent S in fuel (F-factor for liquid fuel combustion = 9,190 scf/MMBtu; diesel heating value = 19,400 Btu/lb):

$$500\ \text{ppm}\ SO_2 \times \frac{1.66 \times 10^{-7}\ \text{lb}\ SO_2/\text{scf}}{1\ \text{ppm}\ SO_2} = \frac{8.3 \times 10^{-5}\ \text{lb}\ SO_2}{\text{scf fuel}}$$

$$\frac{8.3 \times 10^{-5}\ \text{lb SO}_2}{\text{scf fuel}} \times \frac{9{,}190\ \text{scf fuel}}{10^6\text{Btu}} \times \frac{19{,}400\ \text{Btu}}{\text{lb fuel}} = \frac{0.0148\ \text{lb SO}_2}{\text{lb fuel}}$$

$$\frac{0.0148\ \text{lb SO}_2}{\text{lb fuel}} \times \frac{\text{mol SO}_2}{64\ \text{lb SO}_2} \times \frac{\text{mol S}}{\text{mol SO}_2} \times \frac{32\ \text{lb S}}{\text{mol S}} = \frac{0.0074\ \text{lb S}}{\text{lb fuel}}$$

$$\frac{0.0074\ \text{lb S}}{\text{lb fuel}} = 0.74\ \text{wt. pct. S}$$

The fuel sulfur content of the liquid fuel fired at the NOP will be less than 0.74 percent by weight, so the resulting SO_2 stack concentration will be less than 500 ppm and will comply with the sulfur compound emission standard of 18 AAC 50.055(c).

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Attachment C

Owner Requested Limits

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Attachment C
Owner Requested Limits

Per 18 AAC 50.540(j), an application for an air quality minor permit to establish an Owner Requested Limit (ORL) under 18 AAC 50.508(5) must include the information required in 18 AAC 50.225(b)(2) through (6) and (8). Each required element is addressed below.

18 AAC 50.225(b)(2)

Per 18 AAC 50.225(b)(2), a list of all emissions units (EUs) at the stationary source is provided in Table A-1 of this application.

18 AAC 50.225(b)(3)

Per 18 AAC 50.225(b)(3), the calculated potential to emit air pollutants for the stationary source is provided in Attachment A of this application. The project is a proposed new stationary source, so no existing EUs are in place at the stationary source. The actual emissions are zero.

18 AAC 50.225(b)(4) and (b)(5)

Per 18 AAC 50.225(b)(4), a description of each proposed limit is provided below. For each air pollutant, a calculation of the effect the limit will have on the stationary source's potential to emit and the allowable emissions are provided in Attachment A.

Per 18 AAC 50.225(b)(5), a description of a verifiable method to attain and maintain each limit, including monitoring and recordkeeping requirements is provided below and is proposed as a new permit condition.

1. Limit the ULSD fired in EU IDs 1 through 3 to 827,330 gallons per 12-month period, combined.
    a. Monitor and record the fuel consumption for EU IDs 1 through 3.
    b. At the end of each calendar month, calculate and record the fuel consumption for EU IDs 1 through 3, each, for the previous month and 12-consecutive month period.
    c. Include in each operating report required by the applicable permit issued for the source under AS 46.14.130(b) and 18 AAC 50, the 12-consecutive month fuel consumption for EU IDs 1 through 3, combined, for each month covered by the operating report.

2. Limit the ULSD fired in EU IDs 4 and 5 to 1,100,035 gallons per 12-month period, combined.
    a. Monitor and record the fuel consumption for EU IDs 4 and 5.
    b. At the end of each calendar month, calculate and record the fuel consumption for EU IDs 4 and 5, each, for the previous month and 12-consecutive month period.
    c. Include in each operating report required by the applicable permit issued for the source under AS 46.14.130(b) and 18 AAC 50, the 12-consecutive month fuel consumption for EU IDs 4 and 5, combined, for each month covered by the operating report.
3. Limit the ULSD fired in EU IDs 6 and 7 to 1,200,074 gallons per 12-month period, combined.
    a. Monitor and record the fuel consumption for EU IDs 6 and 7.
    b. At the end of each calendar month, calculate and record the fuel consumption for EU IDs 6 and 7, each, for the previous month and 12-consecutive month period.
    c. Include in each operating report required by the applicable permit issued for the source under AS 46.14.130(b) and 18 AAC 50, the 12-consecutive month fuel consumption for EU IDs 6 and 7, combined, for each month covered by the operating report.

18 AAC 50.225(b)(6)

Per 18 AAC 50.225(b)(6), a citation to each requirement that the person seeks to avoid, including an explanation of why the requirement would apply in the absence of the limits and how the limits allow the person to avoid the requirement is provided below.

Oil Search (Alaska), LLC (OSA) is requesting ORLs to allow for the installation and operation of the EUs while avoiding Prevention of Significant Deterioration (PSD) permit applicability under 18 AAC 50.306 for oxides of nitrogen (NO_X), carbon monoxide (CO) and volatile organic compounds (VOCs) and to avoid air quality minor permit applicability under 18 AAC 50.502(c)(1)(F) for particulate matter with a diameter less than 2.5 micrometers ($PM_{2.5}$). The requirement to obtain a PSD permit applies to any construction of a stationary source with a potential to emit of an air pollutant greater than an amount listed under 40 CFR 52.21(b)(1)(i)(b). The proposed limits will reduce the potential to emit to levels less than 250 tons per year (tpy) for NO_X, CO, and VOC emissions. The requirement to obtain an air quality minor permit applies to the construction of a new stationary source with the potential to emit more than 10 tpy of direct $PM_{2.5}$ emissions. The proposed limits will reduce the stationary source's potential to emit $PM_{2.5}$ to less than 10 tpy.

18 AAC 50.225(b)(8)

Per 18 AAC 50.225(b)(8), OSA will comply with the proposed limits.

Attachment D

Ambient Demonstration

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Attachment D
Ambient Demonstration

1.0 OVERVIEW

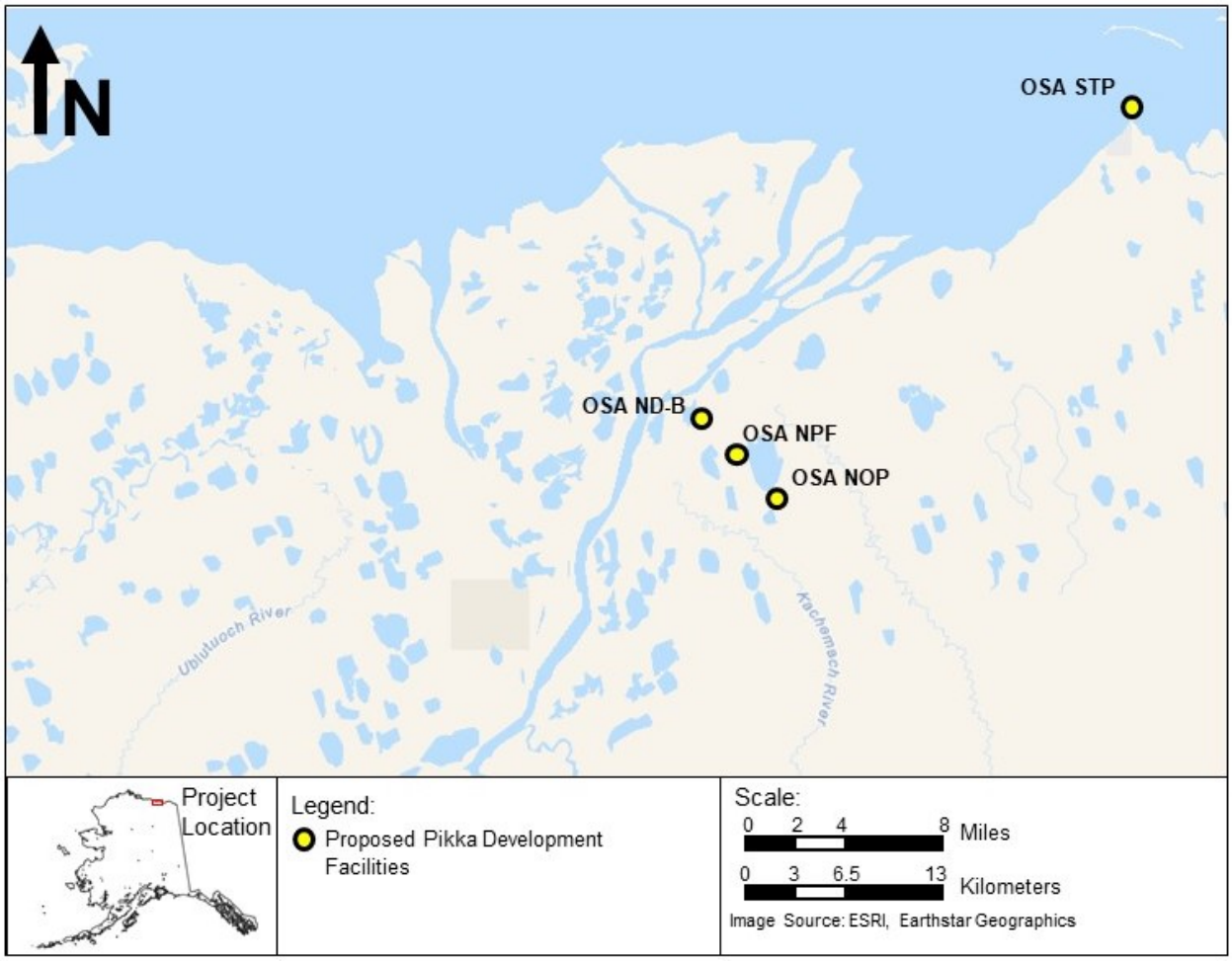
Oil Search (Alaska), LLC (OSA) is planning to construct and operate a new stationary source identified as the Nanushuk Operations Pad (NOP) in the Pikka Development. The NOP will include facilities to support-field wide operations, including permanent operations camps, construction camps, an operations control center, ultra-low sulfur diesel (ULSD)-fired engines, diesel-fired heaters, and storage tanks for gasoline and diesel dispensing facilities. A map showing the location of the proposed stationary source is provided in Figure 1-1.

The proposed project is anticipated to trigger air quality minor permitting requirements under 18 Alaska Administrative Code (AAC) 50.502(c)(1) based on the NOP stationary source's potential to emit nitrogen oxides (NO_X). As a result, air dispersion modeling is triggered for demonstrating that the proposed NOP stationary source will not cause or contribute to a violation of the annual average nitrogen dioxide (NO_2) Alaska Ambient Air Quality Standard (AAAQS) under 18 AAC 50.540(c)(2)(A). The procedures and results of the dispersion modeling analysis for the proposed NOP are described below. The air quality modeling results demonstrate that the project will not result in ambient air quality impacts that will exceed the annual average NO_2 AAAQS.

2.0 MODELING METHODOLOGY

Dispersion modeling was conducted to estimate the potential ambient air quality impacts associated with the installation and operation of the equipment associated with the proposed NOP. The air quality analysis used the latest version of the AERMOD (21112) air dispersion model, per 40 CFR 51, Appendix W. The latest version of AERMET (21112) was used to prepare meteorological data and atmospheric stability and meteorology inputs for the use in AERMOD. The most recent version of the Building Profile Input Program with Plume Rise Model Enhancements (BPIPPRM 04274) was used to model the effects of building downwash on the dispersion of emissions. The AERMOD terrain data pre-processor, AERMAP, was not used to process source elevations, receptor elevations, and hill height scales because the model domain is flat.

Figure 1-1. Project Location Map



2.1 MODEL EMISSIONS UNIT INPUT PARAMETERS

Some NOP construction activities are anticipated to overlap with the NOP operations. As such, the dispersion modeling analysis was based on a conservative simulation of concurrent operations of the NOP construction and permanent EUs at maximum operating loads and emission rates.

Small construction equipment and intermittently used oil field support equipment from the NOP and the offsite ND-B stationary source that combust ULSD were not explicitly modeled in the ambient air quality analysis. This approach is consistent with ADEC Policy and Procedure 04.02.104, *Construction Phase Air Emissions at Oil Fields* (November 2006) and ADEC Policy and Procedure 04.02.105, *Intermittently Used Oilfield Support Equipment* (November 2006).

Table 2-1 provides the locations, physical parameters, and emission rates for the explicitly modeled NOP EUs. All EU exhaust points and structures used for AERMOD input were referenced to the Universal Transverse Mercator (UTM) coordinate system and reference a base elevation of 1.83 meters (m). The NOP engines were each modeled with a horizontal uncapped stack and the NOP heaters were each modeled with a vertical capped stack.

The respective modeled EU locations, physical parameters, and emission rates are based upon “worst-case” emission scenarios.

Table 2-1. NOP Model Parameters and Emission Rates

Emissions Unit		Exhaust Stack Location UTM		Exhaust Stack Parameters				Emission Rates
Model ID	**Description**	**X (m)**	**Y (m)**	**Height (m)**	**Temp (K)**	**Velocity (m/s)**	**Diameter (m)**	**Long-Term (LT) NO_X (g/s)**
CAMPA_E1	Camp A Generator Engine No. 1	594,825.41	7,799,962.55	3.66	957	82.4	0.152	7.25E-01
CAMPA_E2	Camp A Generator Engine No. 2	594,821.49	7,799,963.17	3.66	957	82.4	0.152	7.25E-01
CAMPA_E3	Camp A Generator Engine No. 3	594,817.58	7,799,963.79	3.66	957	82.4	0.152	7.25E-01
CAMPB_E1	Camp B Generator Engine No. 1	594,813.67	7,799,964.41	3.66	778	41.8	0.508	4.89E-01
CAMPB_E2	Camp B Generator Engine No. 2	594,809.75	7,799,965.03	3.66	778	41.8	0.508	4.89E-01
CAMPC_E1	Camp C Generator Engine No. 1	594,805.84	7,799,965.65	3.66	744	51.6	0.457	4.23E+00
CAMPC_E2	Camp C Generator Engine No. 2	594,801.93	7,799,966.27	3.66	744	51.6	0.457	4.23E+00
MNT_HTR1	Maintenance Building Heater No. 1	594,775.65	7,799,950.38	14.02	461	13.0	0.152	4.72E-02
MNT_HTR2	Maintenance Building Heater No. 2	594,781.67	7,799,949.42	14.02	461	13.0	0.152	4.72E-02
COM_ENG1	Communications Module Generator Engine	594,686.09	7,800,057.14	5.18	811	11.6	0.127	8.49E-02
TMP_ENG1	Temporary Office Complex Generator Engine	594,889.46	7,799,899.33	2.44	776	78.1	0.152	5.28E-01

2.2 OFFSITE MODEL EMISSIONS UNIT INVENTORY

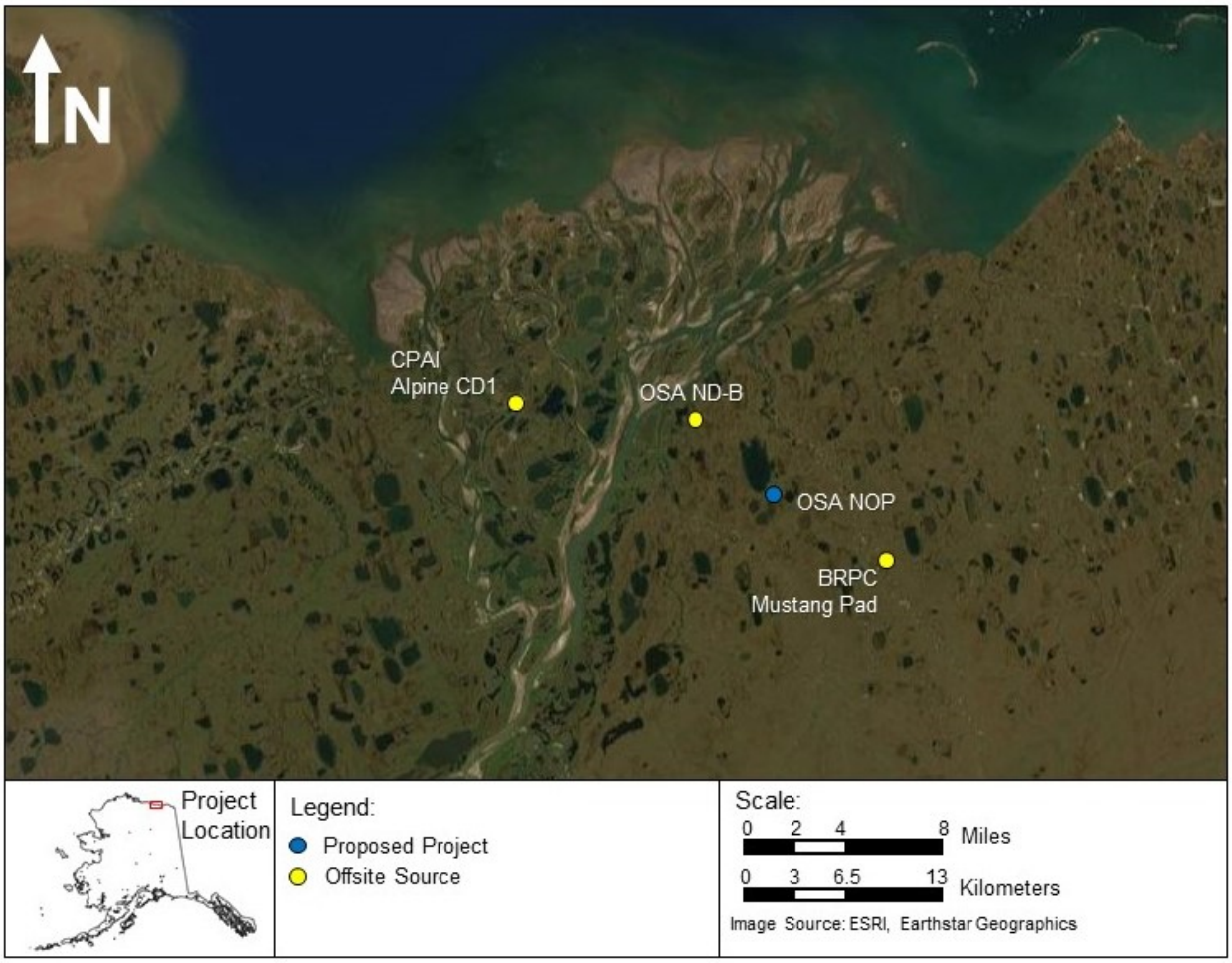
For a cumulative ambient air quality impact assessment, the potential emissions from the proposed project EU inventory and offsite stationary sources were modeled to compute a cumulative impact. The offsite source inventory is based on the proximity of an offsite source to the proposed NOP. Section 8.2 of 40 CFR 51, Appendix W indicates that offsite sources that will cause a significant concentration gradient in the vicinity of the proposed NOP stationary source should be explicitly modeled. There are no emissions sources that have the potential to cause a significant concentration gradient in the vicinity of the NOP. However, to ensure that ambient NO_2 impacts from offsite sources are adequately accounted for in the dispersion modeling analysis, any stationary source located within 20 kilometers of the proposed NOP location was explicitly modeled.

Figure 2-1 shows the locations of the proposed NOP and the modeled offsite sources. The modeled offsite inventory includes the OSA Nanushuk Drillsite B (ND-B), ConocoPhillips Alaska, Inc. (CPAI) Alpine CD1 (CPAI CD1), and the Brooks Range Petroleum Corporation Mustang Development Pad (BRPC Mustang Pad). The OSA ND-B EUs were explicitly modeled as individual point sources while other offsite stationary sources were each modeled as a single point source.

The modeled EU locations, stack parameters, and modeled annual average NO_2 emission rates for the offsite sources in the cumulative impact analysis are based on the following data sources:

- The OSA ND-B stationary source was modeled based on information in the Technical Analysis Report (TAR) for Air Quality Minor Permit No. AQ1564MSS01.
- The CPAI CD1 stationary source was modeled based on information in the TAR for Air Quality Minor Permit No. AQ0489MSS12.
- The BRPC Mustang Pad stationary source was modeled based on information in the TAR for Air Quality Permit No. AQ1328MSS03.

Figure 2-1. Aerial Image of the NOP and Modeled Offsite Sources

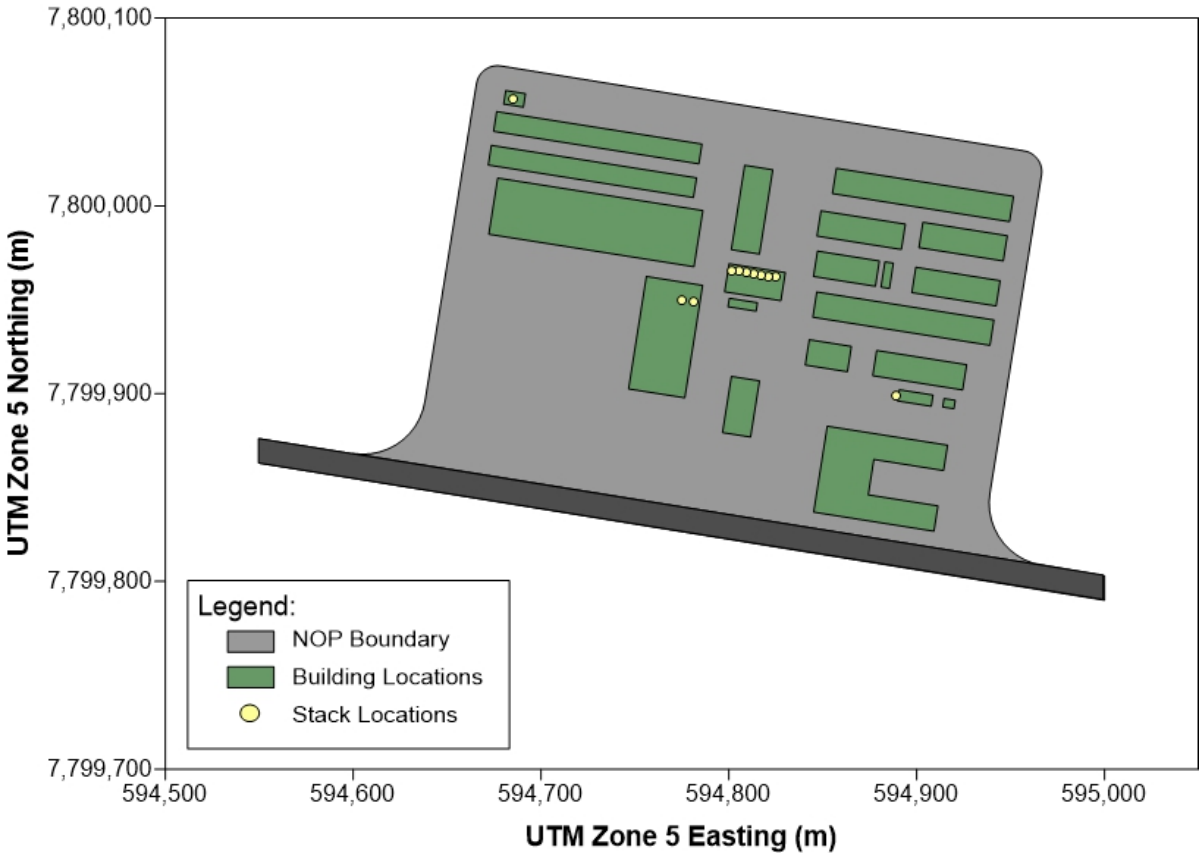


2.3 BUILDING DOWNWASH ANALYSIS

The modeling analysis follows the guidance provided in the EPA *Guidelines for Determination of Good Engineering Practice Stack Height* (EPA-450/4-80-023R, June 1985). The latest version of BPIPPRM (04274) was used to process building downwash. Building coordinates and heights for each structure that could influence a modeled emission unit were entered into BPIPPRM and the output dimensions were used to ensure that no stack exceeds good engineering practice (GEP) stack height and to provide the direction-specific downwash dimensions to the AERMOD model.

Figure 2-2 provides a depiction of the proposed OSA NOP facility structures and EUs. The buildings and structures used in the downwash analysis are outlined in green and the EU exhaust stack locations are depicted with yellow circles. All building and emission unit locations are referenced to UTM Zone 5 coordinates. BPIPPRM input and output files prepared for the modeling analysis are provided in Attachment E.

Figure 2-2. Proposed NOP Footprint and Modeled EU Stack Locations



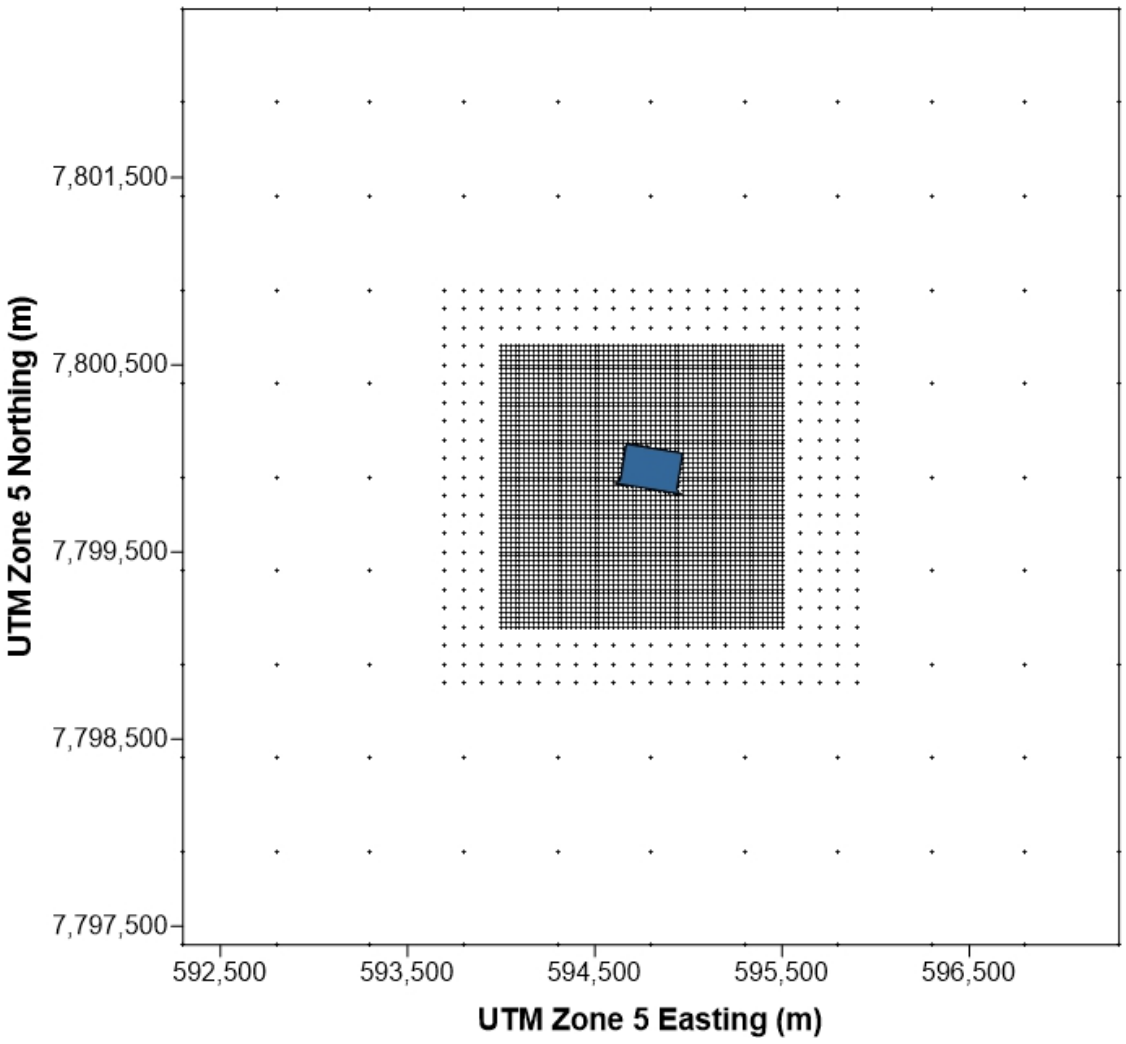
2.4 MODEL RECEPTORS AND TERRAIN

EPA defines ambient air as that portion of the atmosphere, external to buildings, to which the general public has access (40 CFR Part 50). For the purposes of modeling stationary source emissions, the area to which an owner or operator of a stationary source controls public access via a physical barrier is not considered ambient air. Accordingly, model receptors were placed along the NOP gravel pad edges to represent the ambient air boundary. Per ADEC Worker housing Issues Policy No. 04.02.108, no receptors were placed at worker housing or camp areas because all workers will be active and "on-call" at all times and because these areas are not otherwise open to public access.

The AERMOD terrain data pre-processor, AERMAP, was not used to calculate discrete receptor elevations and hill height scales because the area surrounding the proposed project is the North Slope coastal plain and can be appropriately modeled as flat terrain. As a result, receptor elevations and hill height scales were set equal to 0 m.

Figure 2-3 depicts all receptor fields used for the modeling analyses. The receptor fields were developed to capture maximum impacts and for evaluating impacts in the areas distant from the NOP. The ambient air boundary receptors are composed of receptors spaced apart by less than 25 m. The near field is composed of receptors spaced apart by 25 m within a 2.25 km^2 area centered over the NOP. The mid field receptors are spaced apart by 100 m within a 4.84 km^2 area. The far field receptor grid is composed of adjacent receptors spaced apart by 500 m within a 25 km^2 area. Maximum pollutant impacts were predicted within the near field receptor and the near field grid. As a result, the near field grid did not need to be adjusted because the maximum pollutant concentrations had been correctly identified.

Figure 2-3. Full Model Receptor Grid



2.5 NO_2 MODELING APPROACH

Because the AAAQS for NO_X are expressed in terms of NO_2, additional calculations and modeling approaches are used to determine NO_2 impacts from modeled NO_X emissions. A multi-tiered screening approach was used for the modeling analysis that follows the guidance in 40 CFR 51, Appendix W, Section 4.2.3.4 *Models for Nitrogen Dioxide*. The first tier (Tier 1) screening method assumes all emitted NO_X is converted to NO_2. The Tier 2 screening approach multiplies the Tier 1 results by the Ambient Ratio Method 2 (ARM2), which provides estimates of representative equilibrium ratios of NO_2-to-NO_X values based on ambient levels of NO_2 and NO_X derived from national data from EPA. Because the Tier 1 and Tier 2 approaches proved to be overly conservative, a third level screening approach (Tier 3) was used.

For the Tier 3 approach, the Plume Volume Molar Ratio Method (PVMRM) approach was used in accordance with the EPA guidance memos, *Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard* (June 28, 2010) and *Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO_2 National Ambient Air Quality Standard* (September 30, 2014). The PVMRM was used because this method is representative for relatively isolated and elevated point sources, such as the sources at the NOP. The PVMRM was used to determine the amount of NO titration by accounting for the amount of ozone (O_3) entrained in the modeled EU exhaust plumes.

The use of the PVMRM requires in-stack NO_2-to-NO_X ratios for the modeled EUs and background O_3 data. The NOP modeled EU inventory is comprised of ULSD-fired RICE and diesel-fired heaters. Source specific NO_2-to-NO_X ratios for all modeled emission units are provided in *NO_2-to-NO_X ratios per Source Tests Approved by the Alaska Department of Environmental Conservation*, updated August 23, 2013. Based on the source-specific in-stack NO_2-to NO_X data, NO_2-to-NO_X ratios of 0.30, 0.10, and 0.10 were assumed for the Tier 4 ULSD-fired RICE, Tier 0 through Tier 3 ULSD-fired RICE, and the heaters, respectively. Because source-specific in-stack NO_2-to-NO_X data for off-site sources are unavailable, except for the ND-B offsite source, a NO_2-to-NO_X ratio of 0.50 was used for modeling the offsite source annual NO_2 impacts following EPA guidance. The same NO_2-to-NO_X ratios used for the ND-B air quality minor permit (Permit No. AQ1564MSS01) modeling analysis were used for modeling the NO_2 offsite impacts from the modeled ND-B EUs.

A conservative ozone dataset, based on a multi-year data set collected at the Prudhoe Bay Unit (PBU) A-Pad ambient air monitoring station was used for the modeling analysis. The ozone data set has been determined to be acceptable for use by ADEC and used for prior air permit modeling demonstrations (e.g., OSA ND-B Permit No. AQ1564MSS01).

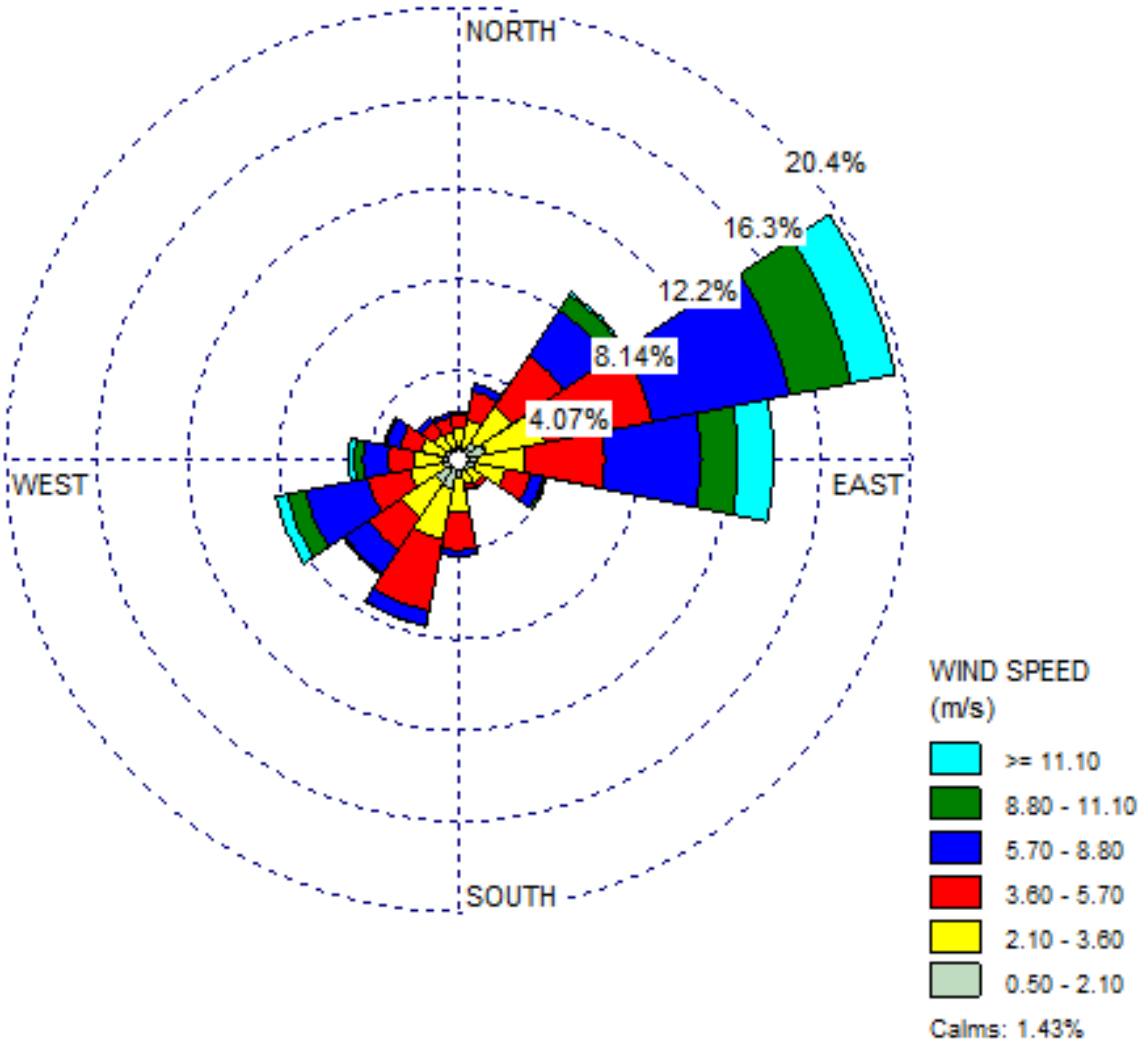
2.6 AERMET METEOROLOGICAL DATA

Following the EPA guidance in 40 CFR 51, Appendix W, representative site-specific

meteorological data were used to estimate air pollutant impacts for the Project. Publicly available hourly surface meteorological data collected during calendar years 2016, 2017, and 2019 at the CPAI Nuiqsut Meteorological Monitoring Station (Nuiqsut Station) and concurrent twice-daily upper air meteorological data collected by the National Weather Service at Utqiagvik, Alaska were processed using AERMET (21112). ADEC has reviewed the data and determined the surface meteorological data collected during 2016, 2017, and 2019 at the Nuiqsut Station meets the requirements in 40 CFR 51 Appendix W. ADEC has also indicated that the Nuiqsut meteorological data are representative of meteorological conditions at the NOP based on the Nuiqsut Station proximity to the NOP and because the data were recently collected.

The on-site meteorological data are comprised of hourly averages of Prevention of Significant Deterioration (PSD) meteorological monitoring parameters including horizontal wind speed, horizontal wind direction, standard deviation of the horizontal wind direction (sigma-theta), ambient 2-meter temperature, ambient 10-meter temperature, vertical temperature difference (10-meter temperature minus 2-meter temperature, “Delta T”), solar radiation, and standard deviation of vertical wind speed (sigma-W). Figure 2-4 provides a wind rose based on the wind data collected at the Nuiqsut Station during the 2016, 2017 and 2019 monitoring years.

Figure 2-4. Nuiqsut Monitoring Station Wind Rose
Calendar Years 2016, 2017, and 2019



The AERMET algorithms process upper air and surface meteorological data with site-specific geophysical inputs to calculate the atmospheric boundary layer parameters that are then supplied to AERMOD for use in the air dispersion model algorithms. The geophysical parameters are albedo, Bowen ratio, and surface roughness length. The procedures used to determine these input parameters are outlined in the EPA AERMOD Implementation Guide (April 2021) and the Alaska Department of Environmental Conservation (ADEC) AERMET

Geometric Means, How to Calculate the Geometric Mean Bowen Ratio and the Inverse-Distance Weighted Geometric Mean Surface Roughness Length in Alaska (June 2009). The recommendations for determining the geophysical input parameters are summarized below.

- Albedo is based on a simple un-weighted arithmetic mean for a representative domain defined by a 10 km by 10 km grid with a resolution on 1 km^2 and centered on the surface measurement site.

- Bowen Ratio is based on simple un-weighted geometric mean for the same representative domain that is used to define the site-specific albedo.

- Surface roughness length is based on an inverse-distance weighted geometric mean for a default up wind distance of 1 km relative to the surface metrological measurement site. Surface roughness length may be varied by sector to account for variations in land cover near the measurement site. The sector widths should be no smaller than 30 degrees.

The AERMET geophysical input parameters are also seasonally dependent. AERMET uses a significantly different definition of the monthly make-up of the seasons than the conditions experienced on the Alaska North Slope. These geophysical parameters were input in AERMET per month to reflect the seasonal patterns of the Alaska North Slope. The following definitions of the seasons are based on climate records for Deadhorse, Alaska and have been approved by ADEC for prior permit activities.

- Summer (June through September): vegetation is emerging or partially green, the period when the mean daily high temperatures rise above 32 °F (0 °C).

- Winter (October through May): mean daily high temperatures rarely exceed 32 °F and the surface is covered with snow and ice.

Table 2-2 provides a summary of geophysical parameters separated by season and land use classification for meteorological stations located on the North Slope Coastal Plain that have been approved by ADEC for prior permit activities near the Project area. The values presented in Table 2-2 for the North Slope Coastal Plain (Land) were input to AERMET.

Table 2-2. Alaska North Slope Coastal Plain Geophysical Parameters

Land Use Classification	Season[1]	Albedo	Bowen Ratio	Surface Roughness Length (m)
North Slope Coastal Plain (Land)	Summer	0.18	0.80	0.020
	Winter	0.80	1.50	0.004

Notes:

[1] Seasons are defined as: Summer (June through September), Winter (October through May).

2.7 BACKGROUND AMBIENT AIR DATA

Background ambient air quality data are required in a cumulative impact analysis to represent the contribution of ambient air pollutant concentrations from non-modeled sources (40 CFR 51, Appendix W, Section 8.3.1). The ambient air pollutant concentrations from the 2012 through 2013 Kuparuk River Unit (KRU) Drill Site 1F (DS1F) data summarized in Table 2-3 were used to represent the contribution of ambient air pollutant levels of NO_2 from non-modeled sources. The annual average NO_2 concentration measured at the KRU DSF1 Monitoring Station during the 2012 through 2013 monitoring year was 3.76 µg/m^3 and is used to represent the annual average NO_2 background level in the project area.

To ensure the KRU DS1F NO_2 data are adequately representative of the project area, the data were compared with ambient air data collected more recently during 2016 at the PBU A-Pad ambient air quality monitoring station. The results of the comparison study show that ambient NO_2 levels from 2012 through 2013 at the KRU DS1F monitoring site are similar to ambient NO_2 levels during calendar year 2016 at the PBU A-Pad monitoring site. Therefore, the 2012 through 2013 KRU DS1F ambient NO_2 data set was used for this analysis because the KRU DS1F monitoring station is closer in proximity to the NOP project location than the PBU A-Pad monitoring station. Additionally, ADEC has recently approved the use of this background ambient air quality data set for the ambient demonstration prepared for the OSA Seawater Treatment Plant Air Quality Minor Permit No. AQ1651MSS01.

Table 2-3. Summary of Ambient Background Concentrations

Pollutant	Averaging Period	Background Concentration (µg/m^3)	AAAQS (µg/m^3)	AAAQS (µg/m^3)
NO_2	Annual	3.76	100	100

3.0 CRITERIA POLLUTANT DISPERSION MODEL ANALYSIS RESULTS

Table 3-1 provides the maximum ambient air quality impacts based on the NOP ambient demonstration. Table 3-1 shows that the maximum modeled annual average NO_2 impact is 44.6 $\mu g/m^3$. Adding the annual average NO_2 background level to the maximum modeled annual average ambient concentration results in an annual average NO_2 concentration equal to 48.4 $\mu g/m^3$, which is 48.4 percent of the annual average NO_2 AAAQS.

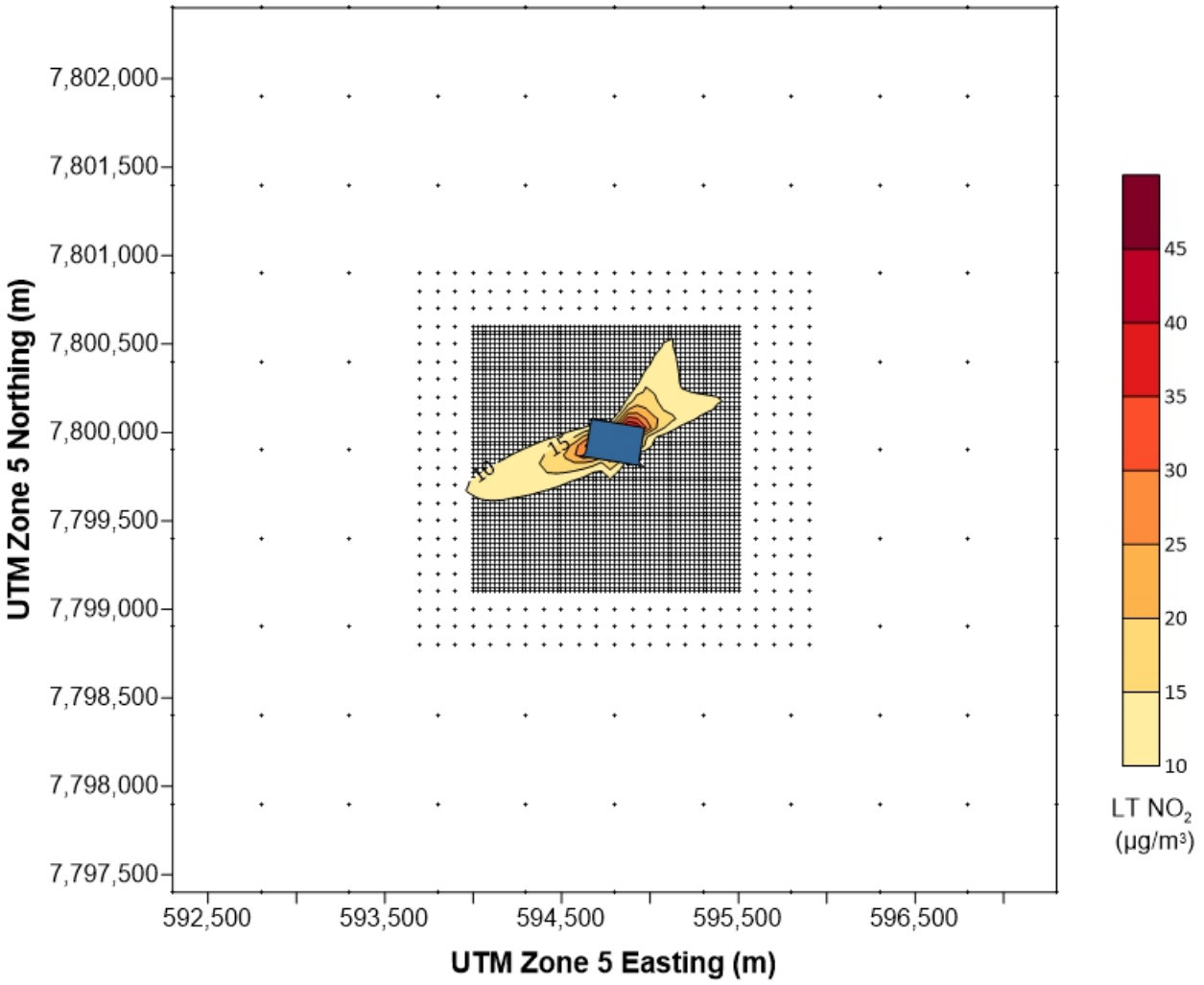
Figure 3-1 shows an isopleth of the maximum cumulative annual average NO_2 impacts, which correspond with the 2017 model year.

Table 3-1. NOP Cumulative Impact Analysis Results Including Offsite Sources

Air Pollutant	Averaging Period	Maximum Modeled Impact [1] ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Maximum Cumulative Impact ($\mu g/m^3$)	AAAQS ($\mu g/m^3$)	Percent of AAAQS
NO_2	Annual	44.6	3.76	48.4	100	48.4

Notes:
[1] Based on the modeled highest annual average NO_2 impact for all model years.

Figure 3-1. Isopleth of Maximum Cumulative Annual Average NO_2 Concentrations



4.0 REFERENCES

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EPA, *Clarification on the Use of AERMOD Dispersion Modeling for Demonstrating Compliance with the NO_2 National Ambient Air Quality Standard*, Memorandum, EPA Model Clearinghouse, Office of Air Quality Planning and Standards, Research Triangle Park, N.C., September 2014.

EPA, *Applicability of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard,* EPA Model Clearinghouse, Office of Air Quality Planning and Standards, Research Triangle Park, N.C, June 28, 2010)

Attachment E

Electronic Files