Hilcorp
North Slope, LLC

Post Office Box 244027
Anchorage, AK 99524-4027

3800 Centerpoint Drive
Suite 1400
Anchorage, AK 99503

Phone: 907/777-8300
Fax: 907/777-8301

December 18, 2023

Alaska Department of Environmental Conservation
Air Permits Program
ATTN: Application Intake
555 Cordova Street
Anchorage, AK 99501

Subject: Hilcorp North Slope, LLC – Title I Minor Permit Application for Omega Pad

Dear Application Intake,

Hilcorp North Slope, LLC (Hilcorp) submits the enclosed minor permit application for Omega Pad. The application is classified under 18 Alaska Administrative Code (AAC) 50.502(c)(1) for a new stationary source that has the potential to emit greater than 40 tons per year (tpy) of oxides of nitrogen (NO_X), 40 tpy of sulfur dioxide (SO_2), 10 tpy of particulate matter less than or equal to a nominal 2.5 microns in diameter ($PM_{2.5}$), and 15 tpy of particulate matter less than or equal to a nominal 10 microns in diameter (PM_{10}).

Hilcorp expects the Alaska Department of Environmental Conservation (ADEC) to charge an hourly permit administration fee for the processing of this application per 18 AAC 50.400(h).

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.

Please contact Natalia Lau at (907) 777-8304 or Natalia.lau@hilcorp.com with any questions or concerns.

Sincerely,

Vanessa Hughes
Asset Team Lead
Hilcorp North Slope, LLC

Enclosure: Title I Minor Permit Application for Omega Pad

cc: Natalia Lau, Hilcorp

Omega Pad

Application for an Air Quality Minor Permit

Prepared for:

Hilcorp North Slope, LLC

December 2023

BOREAL

Omega Pad

Application for an Air Quality Minor Permit

Prepared for:

Hilcorp North Slope, LLC

3800 Centerpoint Drive, Suite 1400
Anchorage, AK 99503

Prepared by:

Boreal Environmental Services

4300 B Street, Suite 510
Anchorage, AK 99503

SUMMARY OF REQUIRED APPLICATION ELEMENTS

The following table provides a summary of required elements to obtain a minor permit under 18 AAC 50.502(c)(1) for a new source with the potential to emit greater than 40 tons per year (tpy) of NO_X and SO_2, 15 tpy of PM-10, and 10 tpy of PM-2.5.

Required Application Elements

Regulatory Citation	Requirement	Application Section
18 AAC 50.540(b)	Stationary Source Identification Form	Before Attachment A
18 AAC 50.540(c)(1)(A)	Emissions Unit Information Form	Before Attachment A
18 AAC 50.540(c)(1)(B)	Emissions Summary Form	Before Attachment A
18 AAC 50.540(c)(2)(A)	Ambient demonstration for each pollutant for which a permit is required under 18 AAC 50.502(c)(1)	Attachment D

Alaska Department of Environmental Conservation
Air Quality Minor Permit Application

STATIONARY SOURCE IDENTIFICATION FORM

Section 1 Stationary Source Information

Name: Omega Pad			SIC: 1311
Project Name (if different):	Contact: Natalia Lau		
Physical Address: Prudhoe Bay, Alaska	City: Anchorage	State: AK	Zip: 99503
	Telephone: 907-777-8304		
	E-Mail Address: Natalia.lau@hilcorp.com		
UTM Coordinates (m) or Latitude/Longitude:	Northing:	Easting:	Zone:
	Latitude: 70.352586	Longitude: -149.360722	

Section 2 Legal Owner

Name: *See attached*		
Mailing Address:		
City:	State: AK	Zip:
Telephone #:		
E-Mail Address:		

Section 3 Operator *(if different from owner)*

Name: Hilcorp North Slope, LLC		
Mailing Address: 3800 Centerpoint Drive, Suite 1400		
City: Anchorage	State: AK	Zip: 99503
Telephone #: 907-777-8300		
E-Mail Address:		

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

Name: CT Corporation Systems		
Mailing Address: 9360 Glacier Hwy, Suite 202		
City: Juneau	State: AK	Zip: 99801
Telephone #:		
E-Mail Address:		

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

Name: Hilcorp North Slope, LLC Accounts Payable		
Mailing Address: P.O. Box 61529		
City: Houston	State: TX	Zip: 77208
Telephone #: 713-209-2400		
E-Mail Address:		

Section 6 Application Contact

Name: Natalia Lau			
Mailing Address: 3800 Centerpoint Drive, Suite 1400	City: Anchorage	State: AK	Zip: 99503
	Telephone: 907-777-8304		
	E-Mail Address: Natalia.lau@hilcorp.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.

Hilcorp North Slope, LLC (Hilcorp) requests an air quality Title I minor permit for Omega Pad located within the Western Operating Area of the Prudhoe Bay oil field, approximately 7.8 miles west-southwest of Hilcorp's Gathering Center #2 (GC-2). The project emissions unit inventory includes four hot oil heaters, one or two standby generator engines, and five storage tanks. Omega Pad will not be contiguous or adjacent wth any other well pads in the area. The stationary source triggers air quality minor permitting requirements under 18 Alaska Administrative Code (AAC) 50.502(c)(1) for a new source that has the potential to emit greater than 40 tons per year (tpy) of oxides of nitrogen (NO_X), 40 tpy of sulfur dioxide (SO_2), 10 tpy of particulate matter less than or equal to a nominal 2.5 microns in diameter ($PM_{2.5}$), and 15 tpy of particulate matter less than or equal to a nominal 10 microns in diameter (PM_{10}). As a result, dispersion modeling is required to demonstrate that the stationary source will not cause or contribute to an exceedance of the annual average nitrogen dioxide (NO_2), 1-hour, 3-hour, 24-hour, and annual average SO_2, 24-hour and annual average $PM_{2.5}$, and 24-hour average PM_{10} Alaska Ambient Air Quality Standards (AAAQS), per 18 AAC 50.540(c)(2)(A).

Application Information

Attachment A provides an air quality permit applicability summary and potential to emit calculations.

Attachment B provides vendor data in support of the information in this application.

Attachment C 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 D provides the ambient demonstration (dispersion modeling) as required under 18 AAC 50.540(c)(2)(A).

Attachment E provides supporting electronic files.

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)];

Not applicable.

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

Not applicable.

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)];

Not applicable.

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)];

Not applicable.

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.

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 submitted to the Department on: (see date below).

Omega Pad
(Stationary Source Name)

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:	Date: 12/18/23
Printed Name: Vanessa Hughes	Title: Asset Lead

Section 15 Attachments

☒ Attachments Included.

Attachment A – Emissions Unit Information and Potential to Emit Calculations
Attachment B – Vendor Data
Attachment C – Compliance Demonstration
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:

Alaska Department of Environmental Conservation
Air Permit Program
555 Cordova Street
Anchorage, Alaska 99501
(907) 269-4718

Section 2 Legal Owner

Hilcorp North Slope, LLC
3800 Centerpoint Drive, Suite 1400
Anchorage, AK 99503

ConocoPhilips Alaska, Inc.
700 G Street (zip 99501)
P.O. Box 100360
Anchorage, AK 99510-0360

ExxonMobil Alaska Production, Inc.
3301 C Street, Suite 400 (zip 99503)
P.O. Box 196601
Anchorage, AK 99519-6601

Chevron USA, Inc.
1029 West 3rd Avenue, Suite 150
Anchorage, AK 99501-1972

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: Omega Pad

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

EU ID No.	PTE (tpy)									
	CO	**NOx[4]**	**PM-2.5[1]**	**PM-10[1]**	**PM**	**SO_2**	**VOC[2]**	**Fugitive VOC[3]**	**Fugitive PM[3]**	**Lead**
1	41.85	50.37	3.79	3.79	3.79	20.98	2.74	0.0	0.0	2.49E-04
2	41.85	50.37	3.79	3.79	3.79	20.98	2.74	0.0	0.0	2.49E-04
3	41.85	50.37	3.79	3.79	3.79	20.98	2.74	0.0	0.0	2.49E-04
4	41.85	50.37	3.79	3.79	3.79	20.98	2.74	0.0	0.0	2.49E-04
5	49.08	10.78	0.48	0.48	0.48	7.0E-02	3.06	0.0	0.0	0.0
6-10 (tanks)	0.00	0.00	0.00	0.00	0.00	0.00	9.3E-02	0.0	0.0	0.0
Total tpy	**216.5**	**212.3**	**15.6**	**15.6**	**15.6**	**84.0**	**14.1**	**0.0**	**0.0**	**9.96E-04**

☒ 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: Omega 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	Const. Date	Make / Model		Serial No.	Requested Limit* (specify units)	Max. Rated Capacity or Design Throughput
1	Hot Oil Heater	TBD	Tulsa Heater	TBD	TBD	N/A	115 MMBtu/hr
2	Hot Oil Heater	TBD	Tulsa Heater	TBD	TBD	N/A	115 MMBtu/hr
3	Hot Oil Heater	TBD	Tulsa Heater	TBD	TBD	N/A	115 MMBtu/hr
4	Hot Oil Heater	TBD	Tulsa Heater	TBD	TBD	N/A	115 MMBtu/hr
5	Standby Engine(s)	TBD	TBD	TBD	TBD	N/A	1 x 1,490 bhp or 2 x 779 bhp
6-10	Tanks	TBD	TBD	TBD	TBD	N/A	See Table A-3

**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	☐	☒	☐	☒	☐	☒	☐	☒	☒	☐	☐	☐	☐
6-10 tanks	☐	☒	☐	☒	☐	☒	☐	☒	☒	☐	☐	☐	☐

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	Fuel Gas	250 ☐ wt. % S ☒ ppmv H_2S	N/A	1,011 ☐ Btu/gal ☒ Btu/dscf Other	0.1137 MMscf/hr
2	Fuel Gas	250 ☐ wt. % S ☒ ppmv H_2S	N/A	1,011 ☐ Btu/gal ☒ Btu/dscf Other	0.1137 MMscf/hr
3	Fuel Gas	250 ☐ wt. % S ☒ ppmv H_2S	N/A	1,011 ☐ Btu/gal ☒ Btu/dscf Other	0.1137 MMscf/hr
4	Fuel Gas	250 ☐ wt. % S ☒ ppmv H_2S	N/A	1,011 ☐ Btu/gal ☒ Btu/dscf Other	0.1137 MMscf/hr
5	ULSD	0.0015 ☒ wt. % S ☐ ppmv H_2S	7	137,000 ☒ Btu/gal ☐ Btu/dscf Other	76.1 or 36.5 gal/hr

**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)
N/A				

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.

EU ID No.	Materials processed	Maximum material processing rate	Describe method of operation
N/A			

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
N/A					☐	☐	

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:

Not Applicable – all control equipment are inherent to the design of the unit:

- Heaters, EU IDs 1-4, are equipped with ultra-low NOx burners (NOx < 0.04 lb/MMBtu); and
- Standby Engine(s), EU ID 5, have controls inherent to engine design for Tier 4 certification.

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	0.1 lb/MMBtu	84 lb/MMscf	7.6 lb/MMscf	7.6 lb/MMscf	7.6 lb/MMscf	250 ppmv H_2S	5.5 lb/MMscf	Variable	2.49E-04
2	0.1 lb/MMBtu	84 lb/MMscf	7.6 lb/MMscf	7.6 lb/MMscf	7.6 lb/MMscf	250 ppmv H_2S	5.5 lb/MMscf	Variable	2.49E-04
3	0.1 lb/MMBtu	84 lb/MMscf	7.6 lb/MMscf	7.6 lb/MMscf	7.6 lb/MMscf	250 ppmv H_2S	5.5 lb/MMscf	Variable	2.49E-04
4	0.1 lb/MMBtu	84 lb/MMscf	7.6 lb/MMscf	7.6 lb/MMscf	7.6 lb/MMscf	250 ppmv H_2S	5.5 lb/MMscf	Variable	2.49E-04
5	Variable	3.5 g/kW-hr	Variable	Variable	Variable	0.0015 w%S	Variable	Variable	N/A
6-10	N/A	N/A	N/A	N/A	N/A	N/A	0.1 lb/MWe-hr	Variable	N/A

EU ID No.	Sources and References for Emission Factors								
	NOx	**CO**	**PM-2.5**	**PM-10**	**PM**	**SO_2**	**VOC**	**HAPs**	**Lead**
1	NSPS Db	AP-42 Table 1.4-1	AP-42 Table 1.4-2	AP-42 Table 1.4-2	AP-42 Table 1.4-2	Mass Balance	AP-42 Table 1.4-2	AP-42 Tables 1.4-2, 3, 4	AP-42 Table 1.4-2
2	NSPS Db	AP-42 Table 1.4-1	AP-42 Table 1.4-2	AP-42 Table 1.4-2	AP-42 Table 1.4-2	Mass Balance	AP-42 Table 1.4-2	AP-42 Tables 1.4-2, 3, 4	AP-42 Table 1.4-2
3	NSPS Db	AP-42 Table 1.4-1	AP-42 Table 1.4-2	AP-42 Table 1.4-2	AP-42 Table 1.4-2	Mass Balance	AP-42 Table 1.4-2	AP-42 Tables 1.4-2, 3, 4	AP-42 Table 1.4-2
4	NSPS Db	AP-42 Table 1.4-1	AP-42 Table 1.4-2	AP-42 Table 1.4-2	AP-42 Table 1.4-2	Mass Balance	AP-42 Table 1.4-2	AP-42 Tables 1.4-2, 3, 4	AP-42 Table 1.4-2
5	Tier 4 or Vendor Data	Tier 4	Tier 4 or Vendor Data	Tier 4 or Vendor Data	Tier 4 or Vendor Data	Mass Balance	Tier 4 or Vendor Data	AP-42 Tables 3.4-3, 4	N/A
6-10	N/A	N/A	N/A	N/A	N/A	N/A	AP-42 Section 7.1	AP-42 Section 7.1	N/A

Please use additional copies of this sheet if necessary.

Include additional notes as warranted.

See attached spreadsheet for variable information.

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 – 5	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 C of this application.
EU IDs 1 – 5	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 C of this application.
EU IDs 1 – 5	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 C 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
N/A			

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

Table A-1. Prevention of Significant Deterioration (PSD) and Minor Source Air Permit Applicability Summary

Hilcorp North Slope, LLC - Omega Pad

Pollutant	Stationary Source Potential to Emit Emissions	PSD Major Stationary Source Applicability Threshold [1]	PSD Permit Required?	Minor Air Quality Permit Applicability Threshold [2]	Minor Source Permit Required?
NO_X	212.25 tpy	250 tpy	No	40 tpy	**Yes**
CO	216.48 tpy	250 tpy	No	N/A [3]	N/A
PM	15.63 tpy	250 tpy	No	N/A	N/A
PM_{10}	15.63 tpy	250 tpy	No	15 tpy	**Yes**
$PM_{2.5}$	15.63 tpy	250 tpy	No	10 tpy	**Yes**
VOC	14.11 tpy	250 tpy	No	N/A	N/A
SO_2	84.00 tpy	250 tpy	No	40 tpy	**Yes**
Pb	9.96E-04 tpy	250 tpy	No	0.6 tpy	No
GHG (CO_2e)	243,732.84 tpy	N/A [4]	N/A	N/A	N/A

Notes:

[1] Prevention of Significant Deterioration (PSD) major source thresholds for a new stationary source that is not a source listed in 40 CFR 52.21(b)(1)(i)(a) (40 CFR 52.21(b)(1)(i)(b)).

[2] Minor air permit thresholds for a new stationary source under 18 AAC 50.502(c)(1).

[3] Not applicable.

[4] Not applicable. Greenhouse gases (GHGs) are subject to regulation if the source is a new major stationary source for a regulated pollutant that is not a GHG and will also have the potential to emit 75,000 tpy CO_2e or more (40 CFR 52.21(b)(49)(iv)(a)).

Table A-2. Hazardous Air Pollutant (HAP) Air Permit Applicability Summary
Hilcorp North Slope, LLC - Omega Pad

Pollutant	Stationary Source Potential to Emit HAPs	HAP Major Source Permit Applicability [1]	HAP Major Source Permit Required?
Total HAPs	3.9 tpy	25 tpy	No
Single Largest HAP (n-hexane)	3.6 tpy	10 tpy	No

Notes:

[1] HAPs major thresholds under 42 USC §7412(a)(1)). A major stationary source of HAPs subject to a standard under 40 CFR 63 must obtain a construction permit, per 18 AAC 50.316(a)(1).

Table A-3. Stationary Source Emissions Unit Inventory
Hilcorp North Slope, LLC - Omega Pad

EU ID	Description	Make/Model	Fuel Type	Rating/Size	Maximum Operation
1	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr [1]	8,760 hr/yr
2	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr [1]	8,760 hr/yr
3	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr [1]	8,760 hr/yr
4	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr [1]	8,760 hr/yr
5	Standby Engine(s) [2]	One Cummins QST30-G17 (Tier 4)	Diesel	1,490 bhp	8,760 hr/yr
		Two Caterpillar C18 (Tier 4)		779 bhp, each	
6	Emulsion Breaker Tank	TBD	N/A	2,300 gallons	8,760 hr/yr
7	Anti Foam Tank	TBD	N/A	2,300 gallons	8,760 hr/yr
8	Pad Buster Tank	TBD	N/A	2,300 gallons	8,760 hr/yr
9	Corrosion Inhibitor Tank	TBD	N/A	14,000 gallons	8,760 hr/yr
10	ULSD Tank	TBD	N/A	5,000 gallons	8,760 hr/yr

Notes:

[1] Heater rating is 102 MMBtu/hr (output), each, with 88.7 percent fuel efficiency.

[2] The standby engine will either be one Cummins QST30-G17 engine or two Caterpillar C18 engines.

Table A-4. Oxides of Nitrogen (NO_X) Emissions Summary

Hilcorp North Slope, LLC - Omega Pad

EU ID	Description	Make/Model	Fuel Type	Rating/Size	Maximum Operation	Emission Factor	Reference	Potential Annual NO_X Emissions [1]
1	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	0.10 lb/MMBtu	NSPS Subpart Db [2]	50.37 tpy
2	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	0.10 lb/MMBtu	NSPS Subpart Db [2]	50.37 tpy
3	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	0.10 lb/MMBtu	NSPS Subpart Db [2]	50.37 tpy
4	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	0.10 lb/MMBtu	NSPS Subpart Db [2]	50.37 tpy
5	Standby Engine(s)	One Cummins QST30-G17 (Tier 4)	Diesel	1,490 bhp	8,760 hr/yr	0.67 g/kW-hr	40 CFR 1039, Tier 4	10.78 tpy [3,4]
		Two Caterpillar C18 (Tier 4)		779 bhp, each		0.51 lb/hr	Vendor Data	4.47 tpy [4]
6	Emulsion Breaker Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
7	Anti Foam Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
8	Pad Buster Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
9	Corrosion Inhibitor Tank	TBD	N/A	14,000 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
10	ULSD Tank	TBD	N/A	5,000 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
							Total Potential NO_X Emissions	**212.3 tpy**

Notes:

[1] Parameters and Conversions:

Fuel Gas Higher Heat Value: 1,011 Btu/scf

[2] EU IDs 1-4 include ultra low NO_X burners (NO_X < 0.040 lb/MMBtu) with electric ignited pilots and flame rods.

[3] A Not-to-Exceed (NTE) factor of 1.5 is used for Tier 4 NO_X calculations per 40 CFR 1039.101(e).

[4] The standby engine will either be one Cummins QST30-G17 engine or two Caterpillar C18 engines; the potential emissions includes the worst-case scenario.

Table A-5. Carbon Monoxide (CO) Emissions Summary

Hilcorp North Slope, LLC - Omega Pad

EU ID	Description	Make/Model	Fuel Type	Rating/Size	Maximum Operation	Emission Factor	Reference	Potential Annual CO Emissions [1]
1	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	84 lb/MMscf	AP-42 Table 1.4-1	41.85 tpy
2	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	84 lb/MMscf	AP-42 Table 1.4-1	41.85 tpy
3	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	84 lb/MMscf	AP-42 Table 1.4-1	41.85 tpy
4	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	84 lb/MMscf	AP-42 Table 1.4-1	41.85 tpy
5	Standby Engine(s)	One Cummins QST30-G17 (Tier 4)	Diesel	1,490 bhp	8,760 hr/yr	3.5 g/kW-hr	40 CFR 1039, Tier 4	46.94 tpy [2,3]
		Two Caterpillar C18 (Tier 4)		779 bhp, each		3.5 g/kW-hr	40 CFR 1039, Tier 4	49.08 tpy [2,3]
6	Emulsion Breaker Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
7	Anti Foam Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
8	Pad Buster Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
9	Corrosion Inhibitor Tank	TBD	N/A	14,000 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
10	ULSD Tank	TBD	N/A	5,000 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
							Total Potential CO Emissions	**216.5 tpy**

Notes:

[1] Parameters and Conversions:

Fuel Gas Higher Heat Value: 1,011 Btu/scf

[2] A Not-to-Exceed (NTE) factor of 1.25 is used for Tier 4 CO calculations per 40 CFR 1039.101(e).

[3] The standby engine will either be one Cummins QST30-G17 engine or two Caterpillar C18 engines; the potential emissions includes the worst-case scenario.

Table A-6. Particulate Matter ($PM/PM_{10}/PM_{2.5}$) Emissions Summary

Hilcorp North Slope, LLC - Omega Pad

EU ID	Description	Make/Model	Fuel Type	Rating/Size	Maximum Operation	Emission Factor	Reference	Potential Annual PM Emissions[1]
1	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	7.6 lb/MMscf	AP-42 Table 1.4-2	3.79 tpy
2	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	7.6 lb/MMscf	AP-42 Table 1.4-2	3.79 tpy
3	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	7.6 lb/MMscf	AP-42 Table 1.4-2	3.79 tpy
4	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	7.6 lb/MMscf	AP-42 Table 1.4-2	3.79 tpy
5	Standby Engine(s)	One Cummins QST30-G17 (Tier 4)	Diesel	1,490 bhp	8,760 hr/yr	0.03 g/kW-hr	40 CFR 1039, Tier 4	0.48 tpy[2,3]
		Two Caterpillar C18 (Tier 4)		779 bhp, each		0.04 lb/hr	Vendor Data	0.35 tpy[3]
6	Emulsion Breaker Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
7	Anti Foam Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
8	Pad Buster Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
9	Corrosion Inhibitor Tank	TBD	N/A	14,000 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
10	ULSD Tank	TBD	N/A	5,000 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
							Total Potential PM Emissions	**15.6 tpy**

Notes:

[1] Parameters and Conversions:

Fuel Gas Higher Heat Value: 1,011 Btu/scf

[2] A Not-to-Exceed (NTE) factor of 1.5 is used for Tier 4 PM calculations per 40 CFR 1039.101(e).

[3] The standby engine will either be one Cummins QST30-G17 engine or two Caterpillar C18 engines; the potential emissions includes the worst-case scenario.

Table A-7. Volatile Organic Compounds (VOC) Emissions Summary

Hilcorp North Slope, LLC - Omega Pad

EU ID	Description	Make/Model	Fuel Type	Rating/Size	Maximum Operation	Emission Factor	Reference	Potential Annual VOC Emissions [1]
1	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	5.5 lb/MMscf	AP-42 Table 1.4-2	2.74 tpy
2	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	5.5 lb/MMscf	AP-42 Table 1.4-2	2.74 tpy
3	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	5.5 lb/MMscf	AP-42 Table 1.4-2	2.74 tpy
4	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	5.5 lb/MMscf	AP-42 Table 1.4-2	2.74 tpy
5	Standby Engine(s)	One Cummins QST30-G17 (Tier 4)	Diesel	1,490 bhp	8,760 hr/yr	0.19 g/kW-hr	40 CFR 1039, Tier 4	3.06 tpy [2,3]
		Two Caterpillar C18 (Tier 4)		779 bhp, each		0.04 lb/hr	Vendor Data	0.35 tpy [3]
6	Emulsion Breaker Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	0.02 tpy	Table A-8	0.02 tpy
7	Anti Foam Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	0.02 tpy	Table A-8	0.02 tpy
8	Pad Buster Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	0.02 tpy	Table A-8	0.02 tpy
9	Corrosion Inhibitor Tank	TBD	N/A	14,000 gallons	8,760 hr/yr	0.03 tpy	Table A-8	0.03 tpy
10	ULSD Tank	TBD	N/A	5,000 gallons	8,760 hr/yr	1.6E-04 tpy	Table A-8	1.6E-04 tpy
							Total Potential VOC Emissions	**14.1 tpy**

Notes:

[1] Parameters and Conversions:

Fuel Gas Higher Heat Value: 1,011 Btu/scf

[2] A Not-to-Exceed (NTE) factor of 1.5 is used for Tier 4 VOC calculations per 40 CFR 1039.101(e).

[3] The standby engine will either be one Cummins QST30-G17 engine or two Caterpillar C18 engines; the potential emissions includes the worst-case scenario.

Table A-8. Volatile Organic Compounds (VOCs) - Tanks
Hilcorp North Slope, LLC - Omega Pad

Tank Emission Calculations [1]						
Parameter	**Emulsion Breaker Tank**	**Anti Foam Tank**	**Pad Buster Tank**	**Corrosion Inhibitor Tank**	**ULSD Tank**	**Equation**
Standing Loss (Ls) Calculations						
Vapor Space Expansion Factor, K_E	0.023	0.023	0.023	0.023	0.023	Eq. 1-12
Roof Outage, H_{RO} (ft)	0.07	0.07	0.07	0.14	0.09	Eq. 1-17
Vapor Space Outage, H_{VO} (ft)	4.98	4.98	4.98	8.39	1.09	Eq. 1-16
Average Daily Temp, T_{AA} (°R)	477.77	477.77	477.77	477.77	477.77	Eq. 1-30
Liquid Bulk Temp, T_B (°R)	478.20	478.20	478.20	478.20	478.20	Eq. 1-31
Average Daily Liquid Temp, T_{LA} (°R)	478.74	478.74	478.74	478.74	478.74	Eq. 1-28
Vapor Pressure, P_{VA} (psia)	0.4895	0.489	0.49	0.37	0.001	Eq. 1-25
Vented Vapor Sat Factor, K_S	0.89	0.89	0.89	0.86	1.00	Eq. 1-21
Average Vapor Temp, T_V (°R)	479.18	479.18	479.18	479.18	479.18	Eq. 1-33
Vapor Density, W_V (lb/ft^3)	7.62E-03	7.62E-03	7.62E-03	2.28E-03	0.000	Eq. 1-22
Vapor Space Volume, V_V (ft^3)	191.63	191.63	191.63	1,113.69	61.77	Eq. 1-3
Standing Loss, L_S (lb/yr)	10.86	10.86	10.86	18.34	0.02	Eq. 1-2
Working Loss (Lw) Calculations						
Annual Sum Liquid, ΣH_{OI}(ft/yr)	95.86	95.86	95.86	169.18	141.33	Eq. 1-37
Maximum Liquid Height, H_{LX} (ft)	8.00	8.00	8.00	14.00	11.00	Eq. 1-36
Minimum Liquid Height, H_{LN} (ft)	1	1	1	1	1	Eq. 1-36
Number of Turnovers, N	14	14	14	13	14	Eq. 1-36
Factors, K_N, K_B	1.0	1.0	1.0	1.0	1.0	Eq. 1-35
Factor, K_P	1.0	1.0	1.0	1.0	1.0	Eq. 1-35
Net Working Loss, V_Q (ft^3/yr)	3,689	3,689	3,689	22,456	8,020	Eq. 1-39
Working Loss, L_W (lb/yr)	28.10	28.10	28.10	51.18	0.30	Eq. 1-35
Potential Emissions (tpy)						
Total VOCs	1.95E-02	1.95E-02	1.95E-02	3.48E-02	1.62E-04	Eq. 1-1
Benzene	0.00	5.01E-04	0.00	0.00	4.15E-06	--
Cumene	1.95E-04	9.74E-06	1.95E-04	0.00	8.08E-08	--
Ethylbenzene	9.74E-04	1.95E-04	1.95E-03	0.00	5.17E-07	--
Hexane	0.00	1.09E-03	0.00	0.00	9.07E-06	--
Methanol	0.00	9.74E-04	0.00	3.48E-02	0.00	--
Naphthalene	1.95E-04	9.74E-04	0.00	0.00	0.00	--
Toluene	1.95E-04	4.01E-04	1.95E-04	0.00	3.33E-06	--
1,2,4-Trimethylbenzene	5.84E-03	0.00	0.00	0.00	0.00	--
Xylenes	9.74E-04	2.53E-05	9.74E-04	0.00	2.10E-07	--

Notes:

[1] Reference: AP-42 Section 7.1.

[2] AP-42 Tables 7.1-2 and 7.1-3. Units for constants B and C in Table 7.1-2 are °R and Table 7.1-3 are °C.

[3] Assumes vapor mass fraction is equivalent to liquid mass fraction. Information is from Safety Data Sheets.

[4] Corrosion inhibitor is primarily methanol.

[5] EPA SPECIATE online profiles.

Tank Information					
Parameter	**Emulsion Breaker Tank**	**Anti Foam Tank**	**Pad Buster Tank**	**Corrosion Inhibitor Tank**	**ULSD Tank**
Tank Contents	EMBR11677A	AFMR19017A	Tretolite	Inhibitor	ULSD
Tank Capacity (gal)	2,300	2,300	2,300	14,000	5,000
Orientation	Vertical	Vertical	Vertical	Vertical	Vertical
Diameter (ft)	7	7	7	13	8.5
Length/Height (ft)	9	9	9	15	12
Color	White	White	White	White	White
Diesel Throughput (gal/yr)	27,600	27,600	27,600	168,000	60,000
Paint Condition	New	New	New	New	New
Roof Type	Dome	Dome	Dome	Dome	Dome
Paint Solar Absorptance, α	0.17	0.17	0.17	0.17	0.17

Meteorological Inputs (Deadhorse, AK)		
Average Daily Max Temp, T_{AX}	25.2 °F	484.9 °R
Average Daily Min Temp, T_{AN}	11.0 °F	470.7 °R
Insolation Factor, i	838 Btu/ft^2-d	

Fuel Constants [2]					
Parameter	**EMBR11677A**	**AFMR19017A**	**Tretolite**	**Inhibitor**	**ULSD**
Vapor Mol. Wt, M_V (lb/lb-mol)	80	80	80	32.04	130
Vapor Pressure Constant, A	11.368	11.368	11.368	8.079	12.101
Vapor Press. Constant, B	5,784.3	5,784.3	5,784.3	1,581.3	8,907.0
Vapor Press. Constant, C	N/A	N/A	N/A	239.7	N/A

Component Vapor Mass Fraction					
Component	**EMBR11677A [3]**	**AFMR19017A [3,5]**	**Tretolite [3]**	**Inhibitor [4]**	**ULSD [5]**
Benzene	0.000	0.026	0.000	0.000	0.026
Cumene	0.010	0.001	0.010	0.000	0.001
Ethylbenzene	0.050	0.010	0.100	0.000	0.003
Hexane	0.000	0.056	0.000	0.000	0.056
Methanol	0.000	0.050	0.000	1.000	0.000
Naphthalene	0.010	0.050	0.000	0.000	0.000
Toluene	0.010	0.021	0.010	0.000	0.021
1,2,4-Trimethylbenzene	0.300	0.000	0.000	0.000	0.000
Xylenes	0.050	0.001	0.050	0.000	0.001

Table A-9. Sulfur Dioxide (SO_2) Emissions Summary
Hilcorp North Slope, LLC - Omega Pad

EU ID	Description	Make/Model	Fuel Type	Rating/Size	Maximum Operation	Emission Factor	Reference	Potential Annual SO_2 Emissions [1]
1	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	250 ppmv H_2S [2]	Mass Balance	20.98 tpy [3]
2	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	250 ppmv H_2S [2]	Mass Balance	20.98 tpy [3]
3	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	250 ppmv H_2S [2]	Mass Balance	20.98 tpy [3]
4	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	250 ppmv H_2S [2]	Mass Balance	20.98 tpy [3]
5	Standby Engine(s)	One Cummins QST30-G17 (Tier 4)	Diesel	1,490 bhp	8,760 hr/yr	0.0015 wt. % S [4]	Mass Balance	7.0E-02 tpy [5]
		Two Caterpillar C18 (Tier 4)		779 bhp, each		0.0015 wt. % S [4]	Mass Balance	6.7E-02 tpy [5]
6	Emulsion Breaker Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
7	Anti Foam Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
8	Pad Buster Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
9	Corrosion Inhibitor Tank	TBD	N/A	14,000 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
10	ULSD Tank	TBD	N/A	5,000 gallons	8,760 hr/yr	N/A	N/A	0.00 tpy
							Total Potential SO_2 Emissions	**84.0 tpy**

Notes:

[1] Parameters and Conversions:

Fuel Gas Higher Heat Value:	1,011	Btu/scf
Diesel Fuel Density:	7	lb/gal
Diesel Engine Heat Rate:	7,000	Btu/hp-hr
Diesel Engine Fuel Consumption:	137,000	Btu/gal
Caterpillar C18 Fuel Consumption:	36.5	gal/hr

[2] A conservative fuel gas hydrogen sulfide (H_2S) concentration of 250 ppmv is assumed as worst-case.

[3] Heaters are not subject to the 40 CFR 60 Subpart Db sulfur dioxide limit since each heater has emissions of 0.08 lb/MMBtu, which is below the 0.32 lb/MMBtu threshold.

[4] Ultra low sulfur diesel is required pursuant to 40 CFR 60 Subpart IIII.

[5] The standby engine will either be one Cummins QST30-G17 engine or two Caterpillar C18 engines; the potential emissions includes the worst-case scenario.

Table A-10. Greenhouse Gas (GHG) Emissions Summary

Hilcorp North Slope, LLC - Omega Pad

EU ID	Description	Make/Model	Fuel Type	Rating/Size	Maximum Operation	Emission Factor	Reference	Potential Annual CO_2e Emissions [1]
1	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	53.11 kg/MMBtu	40 CFR 98, C-1 & C-2	58,979 tpy
2	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	53.11 kg/MMBtu	40 CFR 98, C-1 & C-2	58,979 tpy
3	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	53.11 kg/MMBtu	40 CFR 98, C-1 & C-2	58,979 tpy
4	Hot Oil Heater	Tulsa Heater (Therminol)	Fuel Gas	115 MMBtu/hr	8,760 hr/yr	53.11 kg/MMBtu	40 CFR 98, C-1 & C-2	58,979 tpy
5	Standby Engine(s)	One Cummins QST30-G17 (Tier 4)	Diesel	1,490 bhp	8,760 hr/yr	74.21 kg/MMBtu	40 CFR 98, C-1 & C-2	7,474 tpy [2]
		Two Caterpillar C18 (Tier 4)		779 bhp, each		74.21 kg/MMBtu	40 CFR 98, C-1 & C-2	7,815 tpy [2]
6	Emulsion Breaker Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0 tpy
7	Anti Foam Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0 tpy
8	Pad Buster Tank	TBD	N/A	2,300 gallons	8,760 hr/yr	N/A	N/A	0 tpy
9	Corrosion Inhibitor Tank	TBD	N/A	14,000 gallons	8,760 hr/yr	N/A	N/A	0 tpy
10	ULSD Tank	TBD	N/A	5,000 gallons	8,760 hr/yr	N/A	N/A	0 tpy
							Total Potential GHG Emissions	**243,733 tpy**

Notes:

[1] Parameters and Conversions:

Diesel Engine Heat Rate: 7,000 Btu/hp-hr

[2] The standby engine will either be one Cummins QST30-G17 engine or two Caterpillar C18 engines; the potential emissions includes the worst-case scenario.

Table A-11. Hazardous Air Pollutants (HAPs) Emissions Summary

Hilcorp North Slope, LLC - Omega Pad

Hazardous Air Pollutant	Gas-Fired Heaters	Diesel-Fired Engine	Tanks	Potential Annual HAP Emissions [1]
1,4-Dichlorobenzene(p)	2.39E-03 tpy	----	----	2.39E-03 tpy
1,2,4-Trimethylbenzene	----	----	5.84E-03 tpy	5.84E-03 tpy
Acetaldehyde	----	1.20E-03 tpy	----	1.20E-03 tpy
Acrolein	----	3.76E-04 tpy	----	3.76E-04 tpy
Arsenic Compounds	3.99E-04 tpy	----	----	3.99E-04 tpy
Benzene	4.18E-03 tpy	3.71E-02 tpy	5.05E-04 tpy	4.18E-02 tpy
Beryllium Compounds	2.39E-05 tpy	----	----	2.39E-05 tpy
Cadmium Compounds	2.19E-03 tpy	----	----	2.19E-03 tpy
Chromium Compounds	2.79E-03 tpy	----	----	2.79E-03 tpy
Cobalt Compounds	1.67E-04 tpy	----	----	1.67E-04 tpy
Cumene	----	----	3.99E-04 tpy	3.99E-04 tpy
Ethylbenzene	----	----	3.12E-03 tpy	3.12E-03 tpy
Formaldehyde	1.49E-01 tpy	3.77E-03 tpy	----	1.53E-01 tpy
Lead Compounds	9.96E-04 tpy	----	----	9.96E-04 tpy
Manganese Compounds	7.57E-04 tpy	----	----	7.57E-04 tpy
Mercury Compounds	5.18E-04 tpy	----	----	5.18E-04 tpy
Methanol	----	----	3.57E-02 tpy	3.57E-02 tpy
Naphthalene	1.22E-03 tpy	----	1.17E-03 tpy	2.38E-03 tpy
n-Hexane	3.59E+00 tpy	----	1.10E-03 tpy	3.59E+00 tpy
Nickel Compounds	4.18E-03 tpy	----	----	4.18E-03 tpy
Polycyclic Organic Matter	1.76E-04 tpy	1.01E-02 tpy	----	1.03E-02 tpy
Selenium Compounds	4.78E-05 tpy	----	----	4.78E-05 tpy
Toluene	6.78E-03 tpy	1.34E-02 tpy	7.94E-04 tpy	2.10E-02 tpy
Xylenes	----	9.22E-03 tpy	1.97E-03 tpy	1.12E-02 tpy
Total Potential HAP Emissions	**3.76 tpy**	**7.52E-02 tpy**	**0.05 tpy**	**3.89 tpy**

Notes:

[1] See Tables A-8, A-12 and A-13 for detailed HAP emissions calculations.

Table A-12. Hazardous Air Pollutants (HAPs) - Gas-Fired Heaters

Hilcorp North Slope, LLC - Omega Pad

Section 112 Hazardous Air Pollutants		Source Category Emission Calculations	
CAS No.	**Chemical Name**	**Emission Factor [1]**	**Potential Annual HAP Emissions [2,3]**
106467	1,4-Dichlorobenzene(p)	1.20E-03 lb/MMscf	2.39E-03 tpy
N/A	Arsenic Compounds	2.00E-04 lb/MMscf	3.99E-04 tpy
71432	Benzene	2.10E-03 lb/MMscf	4.18E-03 tpy
N/A	Beryllium Compounds	1.20E-05 lb/MMscf	2.39E-05 tpy
N/A	Cadmium Compounds	1.10E-03 lb/MMscf	2.19E-03 tpy
N/A	Chromium Compounds	1.40E-03 lb/MMscf	2.79E-03 tpy
N/A	Cobalt Compounds	8.40E-05 lb/MMscf	1.67E-04 tpy
5000	Formaldehyde	7.50E-02 lb/MMscf	1.49E-01 tpy
110543	Hexane	1.80E+00 lb/MMscf	3.59E+00 tpy
N/A	Lead Compounds	5.0E-04 lb/MMscf	9.96E-04 tpy
N/A	Manganese Compounds	3.80E-04 lb/MMscf	7.57E-04 tpy
N/A	Mercury Compounds	2.60E-04 lb/MMscf	5.18E-04 tpy
91203	Naphthalene	6.10E-04 lb/MMscf	1.22E-03 tpy
N/A	Nickel Compounds	2.10E-03 lb/MMscf	4.18E-03 tpy
N/A	Polycyclic Organic Matter	8.82E-05 lb/MMscf	1.76E-04 tpy
N/A	Selenium Compounds	2.4E-05 lb/MMscf	4.78E-05 tpy
108883	Toluene	3.40E-03 lb/MMscf	6.78E-03 tpy
		Total Potential HAP Emissions	**3.76 tpy**

Notes:

[1] Reference: AP-42, Tables 1.4-2, 1.4-3, and 1.4-4.

[2] Total fuel rate calculated as noted below:

EU ID	Description	Heat Rate
1	Hot Oil Heater	996.4 MMscf/yr
2	Hot Oil Heater	996.4 MMscf/yr
3	Hot Oil Heater	996.4 MMscf/yr
4	Hot Oil Heater	996.4 MMscf/yr
	Total:	3,985.6 MMscf/yr

[3] Parameters and Conversions:

Fuel Gas Higher Heat Value:	1,011 Btu/scf

Table A-13. Hazardous Air Pollutants (HAPs) - Diesel-Fired Engines > 600 hp

Hilcorp North Slope, LLC - Omega Pad

Section 112 Hazardous Air Pollutants		Source Category Emission Calculations	
CAS No.	**Chemical Name**	**Emission Factor [1]**	**Potential Annual HAP Emissions [2,3]**
75070	Acetaldehyde	2.52E-05 lb/MMBtu	1.20E-03 tpy
107028	Acrolein	7.88E-06 lb/MMBtu	3.76E-04 tpy
71432	Benzene	7.76E-04 lb/MMBtu	3.71E-02 tpy
5000	Formaldehyde	7.89E-05 lb/MMBtu	3.77E-03 tpy
N/A	Polycyclic Organic Matter	2.12E-04 lb/MMBtu	1.01E-02 tpy
108883	Toluene	2.81E-04 lb/MMBtu	1.34E-02 tpy
1330207	Xylenes (isomers and mixture)	1.93E-04 lb/MMBtu	9.22E-03 tpy
		Total Potential HAP Emissions	**7.52E-02 tpy**

Notes:

[1] Reference: AP-42, Tables 3.4-3 and 3.4-4.

[2] Total heat rate calculated as noted below:

EU ID	Description	Heat Rate	
5	One Cummins QST30-G17 (Tier 4)	91,366.8 MMBtu/yr @	8,760 hr/yr
	Two Caterpillar C18 (Tier 4)	95,536.6 MMBtu/yr @	8,760 hr/yr
	Total (Worst-Case):	95,536.6 MMBtu/yr	

[3] Parameters and Conversions:

Diesel Engine Heat Rate:	7,000 Btu/hp-hr

Attachment B

Vendor Data

Perf No: EM1017 **Change Level:** 04

General | Heat Rejection | Emissions | Regulatory | Altitude Derate | Cross Reference | Perf Param Ref

View PDF

SALES MODEL:	C18	**COMBUSTION:**	DIRECT INJECTION
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,800
MACHINE SALES MODEL:		**HERTZ:**	60
ENGINE POWER (BHP):	779	**FAN POWER (HP):**	32.2
GEN POWER WITH FAN (EKW):	500.0	**ADDITIONAL PARASITICS (HP):**	2.7
COMPRESSION RATIO:	16.1	**ASPIRATION:**	TA
RATING LEVEL:	STANDBY	**AFTERCOOLER TYPE:**	ATAAC
PUMP QUANTITY:	1	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC, ATAAC
FUEL TYPE:	DIESEL	**INLET MANIFOLD AIR TEMP (F):**	127
MANIFOLD TYPE:	DRY	**JACKET WATER TEMP (F):**	192.2
GOVERNOR TYPE:	ELEC	**TURBO CONFIGURATION:**	SINGLE
ELECTRONICS TYPE:	ADEM4	**TURBO QUANTITY:**	1
CAMSHAFT TYPE:	STANDARD	**TURBOCHARGER MODEL:**	S430S 0.88 A/R VOF
IGNITION TYPE:	CI	**CERTIFICATION YEAR:**	2015
INJECTOR TYPE:	EUI	**PISTON SPD @ RATED ENG SPD (FT/MIN):**	2,161.4
REF EXH STACK DIAMETER (IN):	6		
MAX OPERATING ALTITUDE (FT):	3,002		

INDUSTRY	SUB INDUSTRY	APPLICATION
ELECTRIC POWER	STANDARD	PACKAGED GENSET

General Performance Data Top

Note(s)

INLET MANIFOLD AIR TEMPERATURE ("INLET MFLD TEMP") FOR THIS CONFIGURATION IS MEASURED AT THE OUTLET OF THE AFTERCOOLER.

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)	ELEC SPEC FUEL CONSUMPTN (ESFC)	ISO ELEC SPEC FUEL CONSUMPTN (ESFC)
EKW	%	BHP	PSI	LB/BHP-HR	LB/BHP-HR	GAL/HR	GAL/HR	LB/EKW-HR	LB/EKW-HR
500.0	100	744	296	0.348	0.345	36.5	36.2	0.518	0.513
450.0	90	673	267	0.349	0.345	33.0	32.7	0.521	0.516

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)	ELEC SPEC FUEL CONSUMPTN (ESFC)	ISO ELEC SPEC FUEL CONSUMPTN (ESFC)
400.0	80	601	239	0.348	0.345	29.5	29.2	0.523	0.518
375.0	75	566	225	0.349	0.345	27.8	27.6	0.526	0.521
350.0	70	530	211	0.350	0.347	26.2	25.9	0.530	0.525
300.0	60	460	183	0.354	0.350	22.9	22.7	0.542	0.537
250.0	50	390	155	0.360	0.357	19.8	19.6	0.562	0.556
200.0	40	321	128	0.370	0.366	16.7	16.6	0.594	0.588
150.0	30	252	100	0.386	0.383	13.8	13.6	0.650	0.644
125.0	25	218	87	0.400	0.396	12.3	12.1	0.696	0.689
100.0	20	182	73	0.419	0.415	10.8	10.7	0.765	0.758
50.0	10	110	44	0.506	0.501	7.8	7.8	1.111	1.100

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
EKW	%	BHP	IN-HG	DEG F	DEG F	IN-HG	DEG F	IN-HG	DEG F
500.0	100	744	69.3	122.2	1,261.4	86.5	836.8	76	401.6
450.0	90	673	63.8	122.1	1,208.5	79.6	799.7	70	382.0
400.0	80	601	57.8	122.1	1,152.4	72.0	761.9	64	360.3
375.0	75	566	54.7	122.1	1,125.7	68.2	744.2	60	349.3
350.0	70	530	51.5	122.1	1,100.2	64.4	727.6	57	338.1
300.0	60	460	45.2	122.0	1,048.6	56.7	694.6	50	315.1
250.0	50	390	38.6	122.0	993.0	49.1	659.8	43	290.8
200.0	40	321	31.6	121.7	930.1	41.7	620.8	36	261.7
150.0	30	252	24.9	121.2	856.8	34.2	576.1	29	232.7
125.0	25	218	21.8	120.9	815.8	30.5	551.4	25	218.8
100.0	20	182	18.9	120.0	769.5	27.2	523.9	22	205.9
50.0	10	110	14.1	114.9	654.1	23.6	456.8	18	183.4

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
EKW	%	BHP	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
500.0	100	744	1,340.0	2,465.3	5,817.5	6,076.5	934.9	843.1
450.0	90	673	1,282.0	2,350.9	5,554.9	5,788.7	917.8	831.6
400.0	80	601	1,211.3	2,221.8	5,237.0	5,446.2	894.3	813.8
375.0	75	566	1,173.9	2,156.0	5,069.8	5,267.1	880.5	802.8
350.0	70	530	1,135.6	2,089.2	4,899.2	5,084.7	865.2	790.2
300.0	60	460	1,056.3	1,949.9	4,547.3	4,709.8	830.6	761.4
250.0	50	390	972.6	1,801.9	4,177.8	4,318.1	791.4	728.3
200.0	40	321	871.7	1,621.2	3,735.6	3,854.2	737.7	682.0
150.0	30	252	780.5	1,440.5	3,336.9	3,434.4	683.8	635.7
125.0	25	218	742.6	1,354.0	3,171.5	3,258.4	658.4	614.1
100.0	20	182	714.2	1,274.2	3,047.2	3,123.6	637.0	596.4
50.0	10	110	688.2	1,136.5	2,933.1	2,988.7	609.7	577.6

Heat Rejection Data Top

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHAUST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
500.0	100	744	16,038	5,739	24,758	12,589	4,231	6,509	31,568	79,429	84,612
450.0	90	673	14,560	5,356	22,331	11,023	3,827	5,781	28,519	71,857	76,546
400.0	80	601	13,203	4,843	19,835	9,453	3,419	4,995	25,499	64,187	68,376
375.0	75	566	12,567	4,609	18,654	8,732	3,222	4,613	23,998	60,493	64,440
350.0	70	530	11,954	4,397	17,522	8,056	3,030	4,239	22,495	56,894	60,607
300.0	60	460	10,771	3,992	15,335	6,779	2,656	3,515	19,509	49,869	53,123
250.0	50	390	9,626	3,651	13,207	5,563	2,292	2,825	16,539	43,040	45,848
200.0	40	321	8,495	3,583	10,986	4,318	1,939	2,095	13,629	36,413	38,788
150.0	30	252	7,376	3,338	8,946	3,194	1,593	1,490	10,707	29,906	31,858
125.0	25	218	6,818	3,097	8,025	2,691	1,421	1,243	9,230	26,674	28,414
100.0	20	182	6,239	2,779	7,179	2,218	1,249	1,048	7,733	23,449	24,979
50.0	10	110	4,839	2,191	5,647	1,288	907	804	4,660	17,030	18,141

Emissions Data Top

Units Filter All Units

DIESEL

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITH FAN		EKW	500.0	375.0	250.0	125.0	50.0
ENGINE POWER		BHP	744	566	390	218	110
PERCENT LOAD		%	100	75	50	25	10
NON-ETHANE HC	(CORR 15% O2)	PPM	2.4233763	1.2835633	0.0	0.0	0.0
TOTAL NOX (AS NO2)		G/HR	161	156	48	15	37
TOTAL CO		G/HR	0	0	0	0	0
TOTAL HC		G/HR	9	4	0	0	0
TOTAL CO2		KG/HR	375	285	203	125	80
PART MATTER		G/HR	4.3	2.0	1.3	0.8	0.6
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	100.5	127.4	55.8	31.4	130.7
TOTAL CO	(CORR 5% O2)	MG/NM3	0.0	0.0	0.0	0.0	0.0
TOTAL HC	(CORR 5% O2)	MG/NM3	4.9	2.5	0.0	0.0	0.0
PART MATTER	(CORR 5% O2)	MG/NM3	2.2	1.4	1.3	1.4	1.5
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	37.3	47.3	20.7	11.7	48.5
TOTAL CO	(CORR 15% O2)	MG/NM3	0.0	0.0	0.0	0.0	0.0
TOTAL HC	(CORR 15% O2)	MG/NM3	1.8	0.9	0.0	0.0	0.0
PART MATTER	(CORR 15% O2)	MG/NM3	0.8	0.5	0.5	0.5	0.6
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	49	62	27	15	64
TOTAL CO	(CORR 5% O2)	PPM	0	0	0	0	0
TOTAL HC	(CORR 5% O2)	PPM	9	5	0	0	0
FORMALDEHYDE	(CORR 5% O2)	PPM	0.00	0.00	0.00	0.08	0.03
ACROLEIN	(CORR 5% O2)	PPM	0.27	0.42	1.53	0.94	1.68

GENSET POWER WITH FAN		EKW	500.0	375.0	250.0	125.0	50.0
ENGINE POWER		BHP	744	566	390	218	110
PERCENT LOAD		%	100	75	50	25	10
ACETALDEHYDE	(CORR 5% O2)	PPM	0.42	0.86	1.13	0.28	1.91
METHANOL	(CORR 5% O2)	PPM	0.00	0.20	0.09	0.01	0.00
NON-METHANE HC	(CORR 5% O2)	PPM	6.53	3.46	0.00	0.00	0.00
NON-ETHANE HC	(CORR 5% O2)	PPM	6.53	3.46	0.00	0.00	0.00
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	18	23	10	6	24
TOTAL CO	(CORR 15% O2)	PPM	0	0	0	0	0
TOTAL HC	(CORR 15% O2)	PPM	3	2	0	0	0
TOTAL NOX (AS NO2)		G/HP-HR	0.22	0.28	0.13	0.07	0.34
TOTAL CO		G/HP-HR	0.00	0.00	0.00	0.00	0.00
TOTAL HC		G/HP-HR	0.01	0.01	0.00	0.00	0.00
PART MATTER		G/HP-HR	0.01	0.00	0.00	0.00	0.01
TOTAL NOX (AS NO2)		G/KW-HR	0.30	0.38	0.17	0.09	0.46
TOTAL CO		G/KW-HR	0.00	0.00	0.00	0.00	0.00
TOTAL HC		G/KW-HR	0.02	0.01	0.00	0.00	0.00
PART MATTER		G/KW-HR	0.01	0.00	0.00	0.01	0.01
TOTAL NOX (AS NO2)		LB/HR	0.36	0.34	0.11	0.03	0.08
TOTAL CO		LB/HR	0.00	0.00	0.00	0.00	0.00
TOTAL HC		LB/HR	0.02	0.01	0.00	0.00	0.00
TOTAL CO2		LB/HR	826	628	447	275	176
PART MATTER		LB/HR	0.01	0.00	0.00	0.00	0.00
OXYGEN IN EXH		%	7.6	9.5	11.1	13.2	15.7

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITH FAN		EKW	500.0	375.0	250.0	125.0	50.0
ENGINE POWER		BHP	744	566	390	218	110
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	232	225	70	22	53
TOTAL CO		G/HR	0	0	0	0	0
TOTAL HC		G/HR	20	8	0	0	0
PART MATTER		G/HR	16.6	7.8	5.0	3.2	2.1
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	144.8	183.4	80.3	45.3	188.2
TOTAL CO	(CORR 5% O2)	MG/NM3	0.0	0.0	0.0	0.0	0.1
TOTAL HC	(CORR 5% O2)	MG/NM3	10.5	5.4	0.0	0.0	0.0
PART MATTER	(CORR 5% O2)	MG/NM3	8.3	5.3	4.9	5.3	5.8
TOTAL NOX (AS NO2)	(CORR 15% O2)	MG/NM3	53.7	68.1	29.8	16.8	69.8
TOTAL CO	(CORR 15% O2)	MG/NM3	0.0	0.0	0.0	0.0	0.0
TOTAL HC	(CORR 15% O2)	MG/NM3	3.9	2.0	0.0	0.0	0.0
PART MATTER	(CORR 15% O2)	MG/NM3	3.1	2.0	1.8	2.0	2.2
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	71	89	39	22	92
TOTAL CO	(CORR 5% O2)	PPM	0	0	0	0	0
TOTAL HC	(CORR 5% O2)	PPM	20	10	0	0	0
TOTAL NOX (AS NO2)	(CORR 15% O2)	PPM	26	33	15	8	34
TOTAL CO	(CORR 15% O2)	PPM	0	0	0	0	0
TOTAL HC	(CORR 15% O2)	PPM	7	4	0	0	0
TOTAL NOX (AS NO2)		G/HP-HR	0.31	0.40	0.18	0.10	0.49
TOTAL CO		G/HP-HR	0.00	0.00	0.00	0.00	0.00
TOTAL HC		G/HP-HR	0.03	0.01	0.00	0.00	0.00
PART MATTER		G/HP-HR	0.02	0.01	0.01	0.01	0.02
TOTAL NOX (AS NO2)		G/KW-HR	0.43	0.54	0.24	0.14	0.66
TOTAL CO		G/KW-HR	0.00	0.00	0.00	0.00	0.00
TOTAL HC		G/KW-HR	0.04	0.02	0.00	0.00	0.00
PART MATTER		G/KW-HR	0.03	0.02	0.02	0.02	0.03
TOTAL NOX (AS NO2)		LB/HR	0.51	0.50	0.15	0.05	0.12
TOTAL CO		LB/HR	0.00	0.00	0.00	0.00	0.00
TOTAL HC		LB/HR	0.04	0.02	0.00	0.00	0.00
PART MATTER		LB/HR	0.04	0.02	0.01	0.01	0.00

Regulatory Information Top

EPA TIER 4 FINAL **2015 - ----**

GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 1039 SUBPART F AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE NON-ROAD REGULATIONS.

Locality	Agency	Regulation	Tier/Stage	Max Limits - G/BKW - HR
U.S. (INCL CALIF)	EPA	NON-ROAD GENSET	TIER 4 FINAL	CO: 3.5 NOx: 0.67 HC: 0.19 PM: 0.03

EU STAGE V **2019 - ----**

GASEOUS EMISSION DATA MEASUREMENTS ARE CONSISTENT WITH THOSE DESCRIBED IN EU 2016/1628, ECE REGULATION NO. 96 AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. GASEOUS EMISSION VALUES ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE NON-ROAD REGULATIONS.

Locality	Agency	Regulation	Tier/Stage	Max Limits - G/BKW - HR
EUROPE	EU	GENSET	STAGE V	CO: 3.5 NOx: 0.67 HC: 0.19 PM: 0.035

Altitude Derate Data Top

STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)											
0	779	779	779	779	777	774	771	768	576	516	779
1,000	779	779	779	777	774	771	768	699	557	511	778
2,000	779	778	776	774	771	751	719	593	529	501	776
3,000	777	775	773	770	751	651	571	543	516	489	773
4,000	773	771	769	754	674	582	552	526	501	476	770
5,000	769	761	736	669	602	557	533	509	485	462	765
6,000	725	679	653	604	560	536	514	492	470	449	704
7,000	648	592	577	560	537	515	495	474	454	435	648
8,000	585	567	553	538	516	495	475	456	437	418	595
9,000	557	544	531	516	496	476	456	436	418	400	573
10,000	533	522	508	494	474	454	431	404	380	362	555
11,000	514	503	495	487	462	431	398	373	358	357	534
12,000	495	485	483	471	445	417	384	372	371	369	514
13,000	473	463	461	444	412	381	379	378	376	374	495
14,000	449	434	420	392	381	379	378	376	374	372	470
15,000	397	379	367	381	379	377	376	374	372	370	442

Cross Reference Top

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
4150867	PP7129	4190902	PS072	LS	CM800001	
4150867	PP7129	4190904	GS759	LS	CM800001	
4150867	PP7129	5194410	PS072	LS	CM800001	
5526359	PP7990	5424853	EE545	-	TC400001	

Performance Parameter Reference Top

Parameters Reference: DM9600 - 14

PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600

APPLICATION: Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS: Power +/- 3% Torque +/- 3% Exhaust stack temperature +/- 8% Inlet airflow +/- 5% Intake manifold pressure-gage +/- 10% Exhaust flow +/- 6% Specific fuel consumption +/- 3% Fuel rate +/- 5% Specific DEF consumption +/- 3% DEF rate +/- 5% Heat rejection +/- 5% Heat rejection exhaust only +/- 10% Heat rejection CEM only +/- 10%
Heat Rejection values based on using treated water.
Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
On 3500 and C175 engines, at speeds below Peak Torque these values are provided for reference only, and may not meet the tolerance listed.
These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS: Heat rejection +/- 10% Heat rejection to Atmosphere +/- 50% Heat rejection to Lube Oil +/- 20% Heat rejection to Aftercooler +/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS: Torque +/- 0.5% Speed +/- 0.2% Fuel flow +/- 1.0% Temperature +/- 2.0 C degrees Intake manifold pressure +/- 0.1 kPa
OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR FOR 3500 ENGINES AND SMALLER SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.
FOR 3600 ENGINES Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL DIESEL Reference fuel is #2 distillate diesel with a 35API gravity; A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 15 deg C (59 deg F), where the density is 850 G/Liter (7.0936 Lbs/Gal).
GAS Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.
Standard temperature values versus altitude could be seen on TM2001.
When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.
Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.
Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.
Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

EMISSION CYCLE LIMITS: Cycle emissions Max Limits apply to cycle-weighted averages only. Emissions at individual load points may exceed the cycle-weighted limit.

WET & DRY EXHAUST/EMISSIONS DESCRIPTION: Wet - Total exhaust flow or concentration of total exhaust flow Dry - Total exhaust flow minus water vapor or concentration of exhaust flow with water vapor excluded

EMISSIONS DEFINITIONS: Emissions : DM1176

EMISSION CYCLE DEFINITIONS
1. For constant-speed marine engines for ship main propulsion, including,diesel-electric drive, test cycle E2 shall be applied, for controllable-pitch propeller sets test cycle E2 shall be applied.
2. For propeller-law-operated main and propeller-law-operated auxiliary engines the test cycle E3 shall be applied.
3. For constant-speed auxiliary engines test cycle D2 shall be applied.
4. For variable-speed, variable-load auxiliary engines, not included above, test cycle C1 shall be applied.

HEAT REJECTION DEFINITIONS: Diesel Circuit Type and HHV Balance : DM9500

HIGH DISPLACEMENT (HD) DEFINITIONS: 3500: EM1500

RATING DEFINITIONS: Agriculture : TM6008
Fire Pump : TM6009
Generator Set : TM6035
Generator (Gas) : TM6041
Industrial Diesel : TM6010
Industrial (Gas) : TM6040
Irrigation : TM5749
Locomotive : TM6037
Marine Auxiliary : TM6036
Marine Prop (Except 3600) : TM5747
Marine Prop (3600 only) : TM5748
MSHA : TM6042
Oil Field (Petroleum) : TM6011
Off-Highway Truck : TM6039
On-Highway Truck : TM6038

SOUND DEFINITIONS: Sound Power : DM8702
Sound Pressure : TM7080

Date Released : 10/27/21

Generator set data sheet

Model: DQFAH
Frequency: 60 Hz
Fuel type: Ultra Low Sulphur Diesel (15ppm sulphur)
KW rating: 1000 standby
900 prime
Emissions level: EPA Stationary Non-emergency Tier 4

Exhaust emission data sheet Tier4F:	**EDS-1156**
Exhaust emission compliance sheet Tier4F:	**EPA-1195**
Sound performance data sheet:	**MSP-1119**
Cooling performance data sheet:	**MCP-217**
Prototype test summary data sheet:	**PTS-304**
Standard set-mounted radiator cooling outline:	**A034N275**
Optional remote radiator cooling outline:	**A034N273**
Aftertreatment outline drawing Tier4F:	**A041V017**

Fuel consumption

	Standby				Prime			
	kW (kVA)				**kW (kVA)**			
Ratings	1000 (1250)				900 (1125)			
Load	**1/4**	**1/2**	**3/4**	**Full**	**1/4**	**1/2**	**3/4**	**Full**
US gph	21.2	36.6	53.3	70.7	19.7	33.5	48.1	63.9
L/hr	80.4	138.6	201.9	267.6	74.5	127.0	182.1	241.9

DEF consumption

	Standby				Prime			
	kW (kVA)				**kW (kVA)**			
Ratings	1000 (1250)				900 (1125)			
Load	**1/4**	**1/2**	**3/4**	**Full**	**1/4**	**1/2**	**3/4**	**Full**
US gph	0.94	1.41	2.17	3.03	0.86	1.32	1.94	2.68
L/hr	3.55	5.34	8.21	11.47	3.26	5.00	7.34	10.14

Engine

	Standby rating	**Prime rating**
Engine manufacturer	Cummins Inc.	
Engine model	QST30-G17	
Configuration	Cast iron, V 12 cylinder	
Aspiration	Turbocharged and low temperature aftercooled	
Gross engine power output, kWm (bhp)	1112 (1490)	1007 (1350)
BMEP at set rated load, kPa (psi)	2427 (352)	2199 (319)
Bore, mm (in)	140 (5.51)	
Stroke, mm (in)	165 (6.5)	
Rated speed, rpm	1800	
Piston speed, m/s (ft/min)	9.91 (1950)	
Compression ratio	14.7:1	
Lube oil capacity, L (qt)	132 (140)	
Overspeed limit, rpm	2070	
Regenerative power, kW	82	

Fuel flow

	Standby rating	Prime rating
Maximum supply fuel flow, L/hr (US gph)	570 (150)	
Maximum return fuel flow, L/hr (US gph)	550 (145)	
Maximum fuel inlet restriction with clean filter, kPa (in Hg)	13.5 (4.0)	
Maximum fuel inlet temperature, °C (°F)	71 (160)	
Maximum fuel return restriction, kPa (in Hg)	68 (20)	

Air

Combustion air, m^3/min (scfm)	87 (3067)	79 (2801)
Maximum air cleaner restriction with clean filter, kPa (in H_2O)	3.7 (15)	
Alternator cooling air, m^3/min (cfm)	204 (7300)	

Exhaust

Exhaust flow at rated load, m^3/min (cfm)	212 (7469)	193 (6829)
Exhaust temperature, °C (°F)	465 (869)	456 (852)
Maximum back pressure, kPa (in H_2O)	6.8 (27)	

Standard set-mounted radiator cooling

Ambient design at 0.5 in H_2O, °C (°F)	46 (115)	47 (117)
Fan load, kW_m (HP)	43 (57)	
Coolant capacity (with radiator), L (US gal)	201 (53.2)	
Cooling system air flow, m^3/min (scfm)	952 (34000)	
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)	
Maximum fuel return line restriction kPa (in Hg)	67.5 (20)	

Optional remote radiator cooling[1]

Max flow rate at max friction head, jacket water circuit, L/min (US gal/min)	992 (262)	
Max flow rate at max friction head, aftercooler circuit, L/min (US gal/min)	303 (80)	
Heat rejected, jacket water circuit, MJ/min (Btu/min)	22.1 (20972)	20.5 (19401)
Heat rejected, aftercooler circuit, MJ/min (Btu/min)	17.9 (16972)	15.3 (14493)
Total heat radiated to room[2], MJ/min (Btu/min)	6.1 (5753)	5.6 (5301)
Maximum friction head, jacket water circuit, kPa (psi)	69 (10)	
Maximum friction head, aftercooler circuit, kPa (psi)	48 (7)	
Maximum static head, jacket water circuit, m (ft)	14 (46)	
Maximum static head, aftercooler circuit, m (ft)	14 (46)	
Maximum jacket water outlet temp, °C (°F)	104 (220)	100 (212)
Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F)	41 (105)	
Maximum aftercooler inlet temp, °C (°F)	62 (143)	56 (133)
Maximum fuel return line restriction, kPa (in Hg)	67.5 (20)	

[1] For non-standard remote installations contact your local Cummins Power Generation representative.

[2] Includes engine and alternator heat rejection; does not include heat from aftertreatment.

Aftertreatment system	T4F
Pressure drop across aftertreatment, kPa (in H_2O)	6.2 (25)
Available back pressure for exhaust system piping, kPa (in H2O)	0.5 (2)
Exhaust heater rating (kW)	250
Exhaust heater input requirements (Amps at 480V)	300
DEF tank capacity (usable) L (gal)	765 (202)
Heat radiated from aftertreatment, Btu/min (MJ/min)	1820 (1.92)

DEF flow

Maximum supply flow, L/hr (US gph)	98 (26)
Maximum return flow, L/hr (US gph)	87 (23)
Maximum static head (from pump to injector), m (ft)	6.4 (21)

Weights[1]

Unit dry weight kgs (lbs)	7633 (16824)
Unit wet weight kgs (lbs)	7931 (17480)
Aftertreatment weight kgs (lbs)	1981 (4367)

Derating factors[2]

Standby	Engine power available up to 701 m (2300 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations, derate at 3.5% per 305 m (1000 ft) and 7% per 10 °C (18 °F).
Prime	Engine power available up to 727 m (2385 ft) at ambient temperatures up to 40 °C (104 °F). Above these elevations, derate at 3.5% per 305 m (1000 ft) and 7% per 10 °C (18 °F).

Notes:
[1] Weights represent a set with standard features. See outline drawing for weights of other configurations.
[2] Derating factors do not include aftertreatment system.

Ratings definitions

Emergency standby power (ESP):	Limited-time running power (LTP):	Prime power (PRP):	Base load (continuous) power (COP):
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.

Alternator data

Voltage	Connection[1]	Temp rise degrees C	Duty[2]	Single phase factor[3]	Max surge kVA[4]	Surge kW	Alternator data sheet	Feature Code
120/208-139/240	12-lead	125/105	S/P		4234	1019	ADS-312	B252
240/416-277/480	12-lead	125/105	S/P		4234	1019	ADS-312	B252
277/480	Wye, 3-phase	125/105	S/P		3866	1018	ADS-311	B276
220/380-277/480	Wye, 3-phase	125/105	S/P		4602	1018	ADS-330	B282
220/380-277/480	Wye, 3-phase	105/80	S/P		4602	1018	ADS-330	B283
210/380-277/480	Wye, 3-phase	80	S		5521	1024	ADS-331	B284
240/416-277/480	Wye	125/105	S/P		4234	1019	ADS-312	B288
347/600	3-phase	125/105	S/P		3866	1021	ADS-311	B300
347/600	3-phase	105/80	S/P		4234	1024	ADS-312	B301
347/600	3-phase	80	S		4602	1004	ADS-330	B604

Notes:

[1] Limited single phase capability is available from some three phase rated configurations. To obtain single phase rating, multipy the three phase kW rating by the Single Phase Factor[3]. All single phase ratings are at unity power factor.

[2] Standby (S), Prime (P) and Continuous ratings (C).

[3] Factor for the *Single Phase Output from Three Phase Alternator* formula listed below.

[4] Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

Formulas for calculating full load currents:

Three phase output

$$\frac{\text{kW} \times 1000}{\text{Voltage} \times 1.73 \times 0.8}$$

Single phase output

$$\frac{\text{kW} \times \text{SinglePhaseFactor} \times 1000}{\text{Voltage}}$$

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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Attachment C

Compliance Demonstration

ATTACHMENT C: EMISSIONS STANDARDS COMPLIANCE DEMONSTRATION

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

All stationary fuel-burning equipment are 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 Omega Pad, 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/scf) and averaged over three hours.

Emissions Units: Gas-Fired Heaters

- From AP-42, Table 1.4-2, PM Emission Factor = 7.6 lb/MMscf
- Emission Factor = 0.0080 lb/MMBtu (fuel gas higher heating value = 1,011 Btu/scf)
- 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 = 0.0075 lb/MMBtu
F = 8,710 scf/MMBtu (factor for natural gas combustion)
O_2 = 5 percent

$$C = \frac{0.0075\ \text{lb}}{\text{MMBtu}} \times \frac{\text{MMBtu}}{8{,}710\ \text{scf}} \times \frac{(20.9 - 5)}{20.9} \times \frac{7{,}000\ \text{gr}}{\text{lb}} = 0.0046 \frac{\text{gr}}{\text{scf}}$$

The PM emission rate for gas-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).

Emissions Units: Standby Diesel-Fired Engine(s)

- Tier 4, PM Emission Factor = 0.045 g/kW-hr, based on 0.3 g/kW-hr times 1.5 NTE multiplier (worst-case emission factor of the two engine types)
- Emission Factor = 0.011 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 = 0.011 lb/MMBtu
F = 9,190 scf/MMBtu (factor for liquid fuel combustion)
O_2 = 15 percent for diesel-fired RICE

$$C = \frac{0.176\ \text{lb}}{\text{MMBtu}} \times \frac{\text{MMBtu}}{9{,}190\ \text{scf}} \times \frac{(20.9 - 15)}{20.9} \times \frac{7{,}000\ \text{gr}}{\text{lb}} = 0.0023 \frac{\text{gr}}{\text{scf}}$$

The PM emission rate for diesel-fired engines 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: Gas-Fired Equipment

- Convert ppm SO_2 in stack gas to ppmv S (as H_2S) in fuel (fuel gas high heating value = 953.6 Btu/scf; F-factor for natural gas combustion = 8,710 scf/MMBtu):

$$500\ \text{ppm}\ SO_2 = \frac{500\ \text{scf}\ SO_2}{10^6 \text{scf}}$$

$$\frac{500\ \text{scf}\ SO_2}{10^6 \text{scf}} \times \frac{8{,}710\ \text{scf}}{10^6 \text{Btu}} \times \frac{1{,}011\ \text{Btu}}{\text{scf fuel}} = \frac{0.0044\ \text{scf}\ SO_2}{\text{scf fuel}}$$

$$\frac{0.0044\ \text{scf}\ SO_2}{\text{scf fuel}} \times \frac{\text{mol}\ SO_2}{379\ \text{scf}\ SO_2} \times \frac{\text{mol}\ H_2S}{\text{mol}\ SO_2} = \frac{1.16 \times 10^{-5}\ \text{mol}\ H_2S}{\text{scf fuel}}$$

$$\frac{1.16 \times 10^{-5}\ \text{mol}\ H_2S}{\text{scf fuel}} \times \frac{379\ \text{scf}\ H_2S}{\text{mol}\ H_2S} = \frac{4.40 \times 10^{-3}\ \text{scf}\ H_2S}{\text{scf fuel}}$$

$$\frac{4.40 \times 10^{-3}\ \text{scf}\ H_2S}{\text{scf fuel}} \times 10^6 = 4{,}402\ \text{ppmv}$$

The fuel sulfur content of the fuel gas fired at Omega Pad will be less than 4,402 ppmv, so the resulting SO_2 stack gas concentration will comply with the sulfur compound emission standard of 18 AAC 50.055(c).

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 Omega Pad will be less than 0.74 percent by weight, so the resulting SO_2 stack concentration will comply with the sulfur compound emission standard of 18 AAC 50.055(c).

Attachment D

Ambient Demonstration

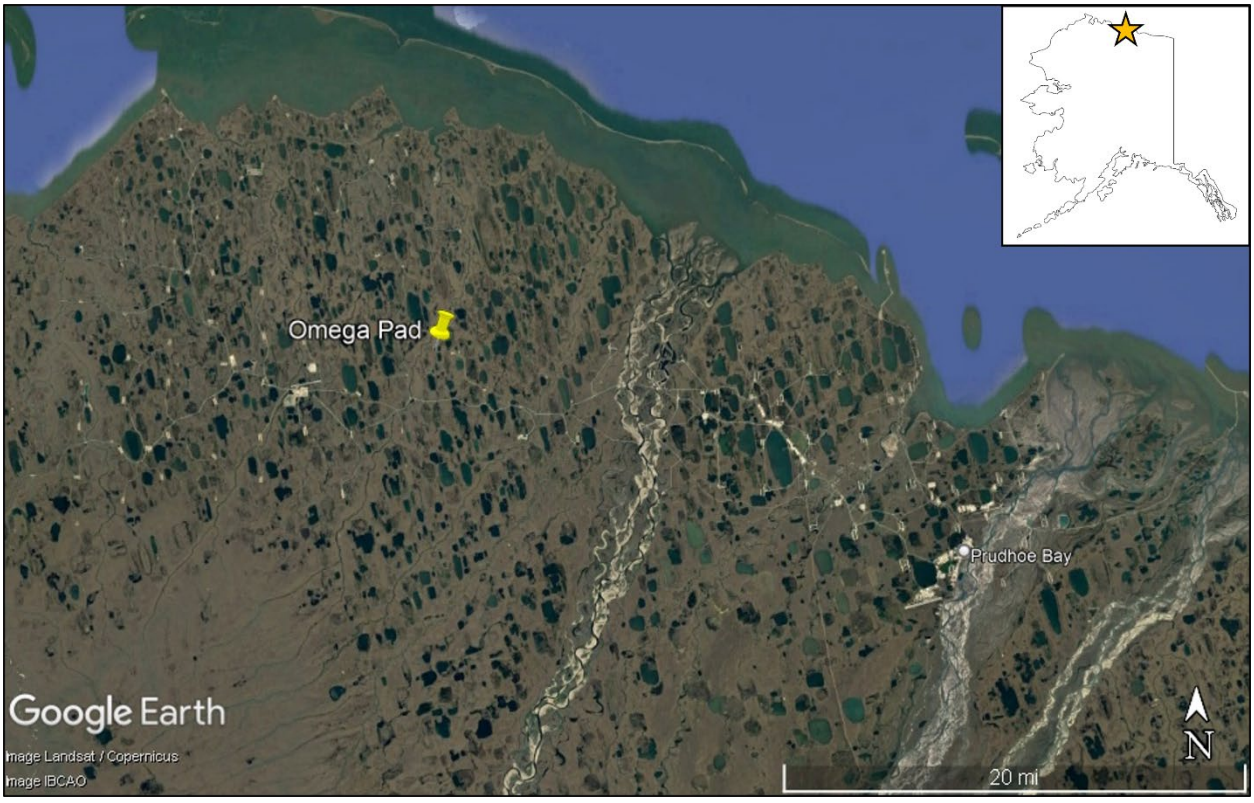
ATTACHMENT D: AMBIENT DEMONSTRATION

1.0 OVERVIEW

Hilcorp North Slope, LLC (Hilcorp) is planning to construct and operate the Omega Pad, which will be a new stationary source located within the Western Operating Area of the Prudhoe Bay Unit (PBU). The project emissions unit (EU) inventory includes four hot oil heaters, one or two standby generator engines, and five storage tanks. Figure 1-1 shows an aerial image of the stationary source location.

The project triggers minor air quality permitting requirements under Title 18 Alaska Administrative Code (18 AAC) 50.502(c)(1) for a new stationary source that has the potential to emit greater than 40 tons per year (tpy) of oxides of nitrogen (NO_X), 40 tpy of sulfur dioxide (SO_2), 10 tpy of particulate matter less than or equal to a nominal 2.5 microns in diameter ($PM_{2.5}$), and 15 tpy of particulate matter less than or equal to a nominal 10 microns in diameter (PM_{10}). As a result, dispersion modeling is required to demonstrate that the stationary source will not cause or contribute to an exceedance of the annual average nitrogen dioxide (NO_2), 1-hour, 3-hour, 24-hour, and annual average SO_2, 24-hour and annual average $PM_{2.5}$, and 24-hour average PM_{10} Alaska Ambient Air Quality Standards (AAAQS), per 18 AAC 50.540(c)(2)(A). The procedures and results of the dispersion modeling analysis are described below. The dispersion modeling results demonstrate that the facility will not cause or contribute to violations of the AAAQS.

Figure 1-1. Project Location Map



2.0 MODELING METHODOLOGY

Dispersion modeling was conducted to estimate the potential ambient air quality impacts from emissions sources at the Omega Pad. The modeling analysis is based on the latest version of the AERMOD (23132) air dispersion model, per Title 40 Code of Federal Regulations (40 CFR) 51, Appendix W. The latest version of AERMET (23132) was used to prepare meteorological data and atmospheric stability parameters for 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.

2.1 MODEL EMISSIONS UNIT INPUT PARAMETERS

Project construction and operation activities are expected to not overlap. Emissions from construction activities are anticipated to occur over a short duration and will be negligible in comparison to emissions from Omega Pad during operations. As such, the dispersion modeling analysis is based on the stationary source operations scenario.

Hilcorp has yet to identify the actual engine or engines that will be installed as EU 5, Standby Engine(s). EU 5 will either be one ultra-low sulfur diesel (ULSD)-fired engine that will have a maximum rated capacity of 1,490 brake-horsepower (bhp) or two ULSD-fired engines that will have a maximum rated capacity of 779 bhp, each. In lieu of conducting separate modeling analyses for the two possible scenarios, a single conservative modeling scenario based on the installation and operation of two ULSD-fired engines was conducted. The modeled emission rates for each engine were based on respective potential NO_X, PM_{10}, $PM_{2.5}$, and SO_2 emissions that correspond to an engine that has a maximum rating of 1,490 bhp, these emissions rates were greater than those from one of the 779 bhp engines for all modeled pollutants. The modeled exhaust parameters for each engine are based on exhaust stack parameters that correspond to an engine that has a maximum rating of 779 bhp. This approach provides a conservative analysis because the stack exhaust parameters that correspond to the engine rated at 779 bhp result in less enhanced dispersion of emissions, and consequently greater modeled impacts, in comparison to stack exhaust parameters that correspond to an engine rated at 1,490 bhp.

Table 2-1 provides the locations and exhaust stack parameters for the modeled EUs. Supporting calculations used to develop these parameters are provided in Attachment E. All modeled EUs and structures were referenced to the Universal Transverse Mercator (UTM) coordinate system. Each modeled EU and structure base elevation was set equal to 1.52 meters (m) (5 feet) based on the Omega Pad grade elevation with respect to the surrounding area. The heaters were each modeled as a point source with a vertical exhaust stack with a rain cap. The standby engines were each modeled as a point source with a horizontal uncapped exhaust stack. Table 2-2 provides the respective NO_X, SO_2, $PM_{2.5}$, and PM_{10} emission rates.

Table 2-1. Modeled EU Exhaust Stack Parameters

Emissions Unit		Exhaust Stack Location UTM			Exhaust Stack Parameters			
Model ID	Description	X (m)	Y (m)	Z (m)	Height (m)	Temp. (K)	Velocity (m/s)	Diameter (m)
HEATER01	Hot Oil Heater 1	411,530	7,807,155	1.52	15.2	422	3.57	2.0
HEATER02	Hot Oil Heater 2	411,516	7,807,160	1.52	15.2	422	3.57	2.0
HEATER03	Hot Oil Heater 3	411,502	7,807,165	1.52	15.2	422	3.57	2.0
HEATER04	Hot Oil Heater 4	411,488	7,807,171	1.52	15.2	422	3.57	2.0
ENGINE01	Standby Engine 1	411,433	7,807,118	1.52	2.1	720	35.9	0.20
ENGINE02	Standby Engine 2	411,437	7,807,116	1.52	2.1	720	35.9	0.20

Table 2-2. Modeled EU Emission Rates

Emissions Unit		Emission Rates (g/s)		
Model ID	Description	NO_X	SO_2	PM_{10} / $PM_{2.5}$
HEATER01	Hot Oil Heater 1	1.45E+00	6.04E-01	1.09E-01
HEATER02	Hot Oil Heater 2	1.45E+00	6.04E-01	1.09E-01
HEATER03	Hot Oil Heater 3	1.45E+00	6.04E-01	1.09E-01
HEATER04	Hot Oil Heater 4	1.45E+00	6.04E-01	1.09E-01
ENGINE01	Standby Engine 1	3.10E-01	2.01E-03	1.39E-02
ENGINE02	Standby Engine 2	3.10E-01	2.01E-03	1.39E-02

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 are modeled to compute a cumulative impact. Section 8.3 of 40 CFR 51, Appendix W, indicates that offsite sources that will cause a significant concentration gradient in the vicinity of the proposed stationary source should be explicitly modeled. The Omega Pad will not be located near any sources that will cause a significant concentration gradient in the area around the Omega Pad. As a result, no offsite sources were explicitly modeled.

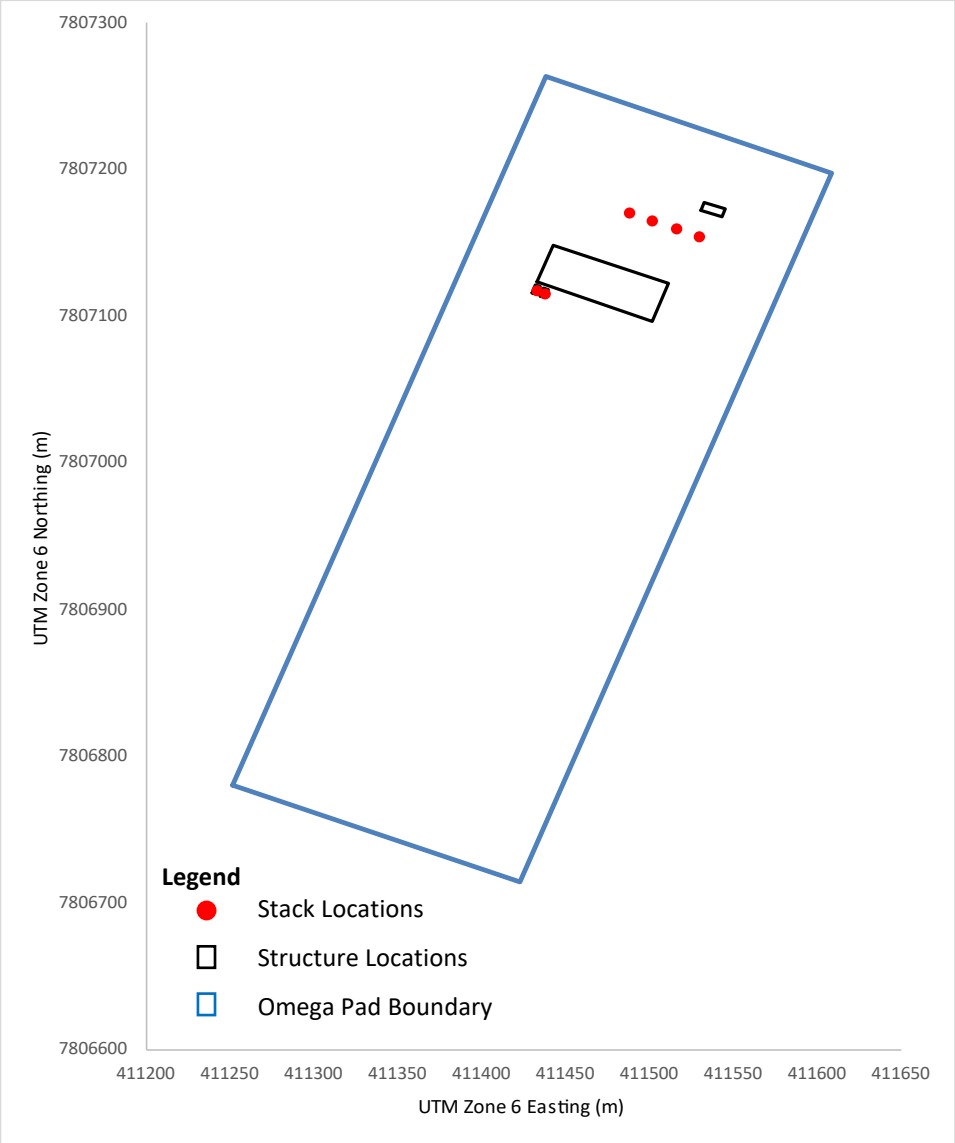
2.3 BUILDING DOWNWASH ANALYSIS

The modeling analysis follows the guidance provided in the United States Environmental Protection Agency (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 parameters. Building coordinates and heights for each structure that could influence a modeled EU were entered into BPIPPRM and the output dimensions were used to ensure that no stack exceeds good engineering practice stack height and to provide the direction-

specific downwash dimensions to the AERMOD model.

Figure 2-1 depicts the proposed Omega Pad layout. The modeled structures are outlined in black and the modeled EU exhaust stack locations are depicted with red circles. BPIPPRM input and output files prepared for the modeling analysis are provided in Attachment E.

Figure 2-1. Modeled EU Stack and Building Locations



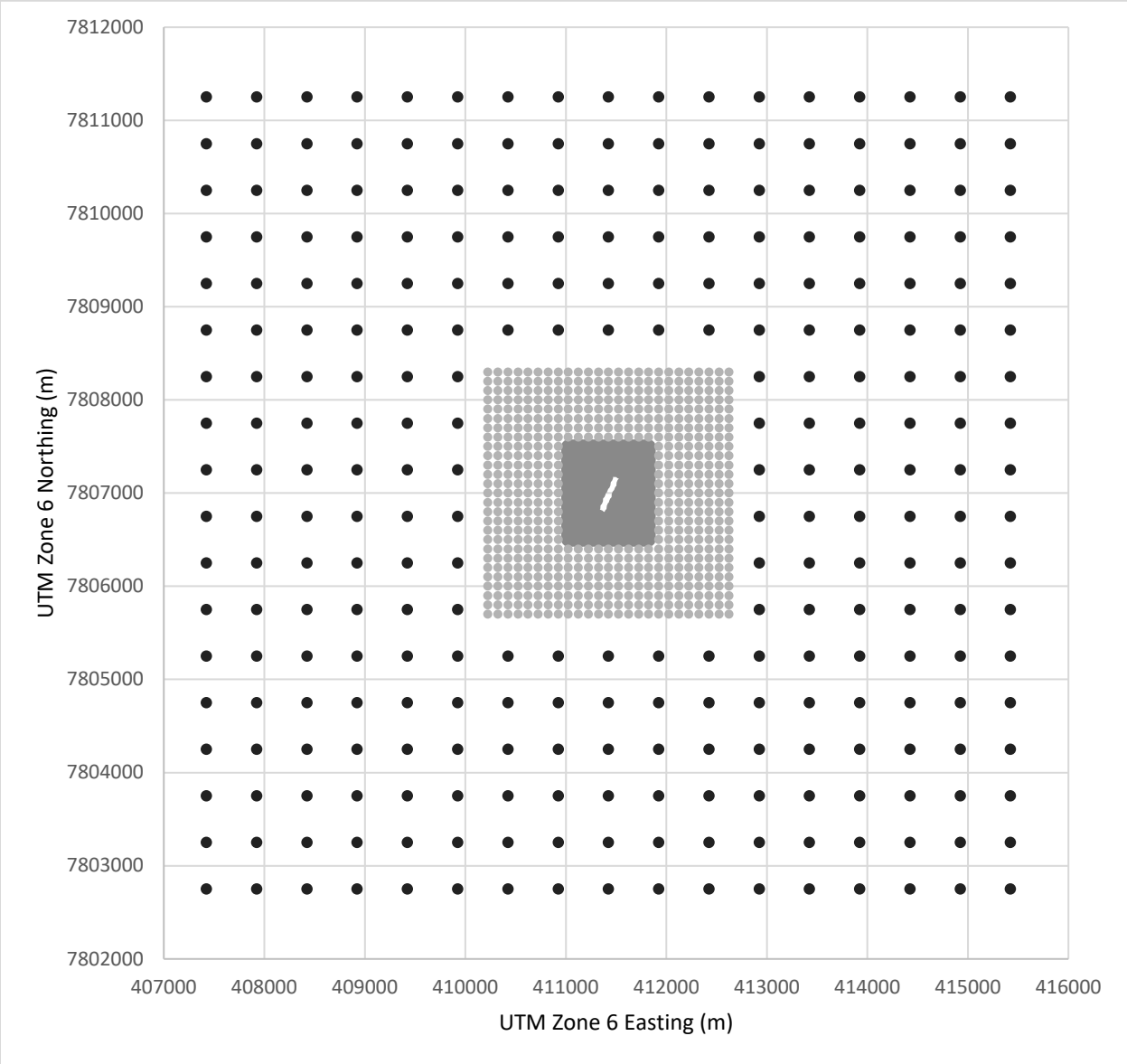
2.4 MODEL RECEPTORS AND TERRAIN

Ambient air is defined as that portion of the atmosphere, external to buildings, to which the general public has access, per 40 CFR 50.1(e), adopted by reference in 18 AAC 50.990(9). Per Alaska Department of Environmental Conservation (ADEC) guidance (ADEC 2018), model receptors were placed along the Omega Pad edges to represent the ambient air boundary. The AERMOD terrain data pre-processor, AERMAP, was not used to calculate receptor elevations and hill height

scales because the area surrounding the proposed project is flat. As a result, receptor elevations and hill height scales were set equal to 0 m.

Figure 2-2 depicts all receptor fields used for the modeling analyses. The receptor fields were developed to capture maximum impacts and for evaluating impacts at locations at and outward from the Omega Pad ambient air boundary. The near field receptors are spaced apart by 25 m within a 0.8 square kilometer (km^2) area centered over the Omega Pad. The mid field receptors are spaced apart by 100 m within a 6.2 km^2 area. The far field receptors are spaced apart by 500 m within a 68 km^2 area.

Figure 2-2. 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. For this analysis, the Plume Volume Molar Ratio Method (PVMRM) was used in accordance with the EPA guidance (EPA 2010, 2011, and 2014). The PVMRM was used because this method is representative of relatively isolated and elevated point sources, like the proposed heaters at the Omega Pad. The PVMRM was used to determine the amount of nitric oxide (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. Source specific NO_2-to-NO_X ratios for all modeled EUs 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, a NO_2-to-NO_X ratio of 0.1 was used for the project heaters and a ratio of 0.3 used for the project engines.

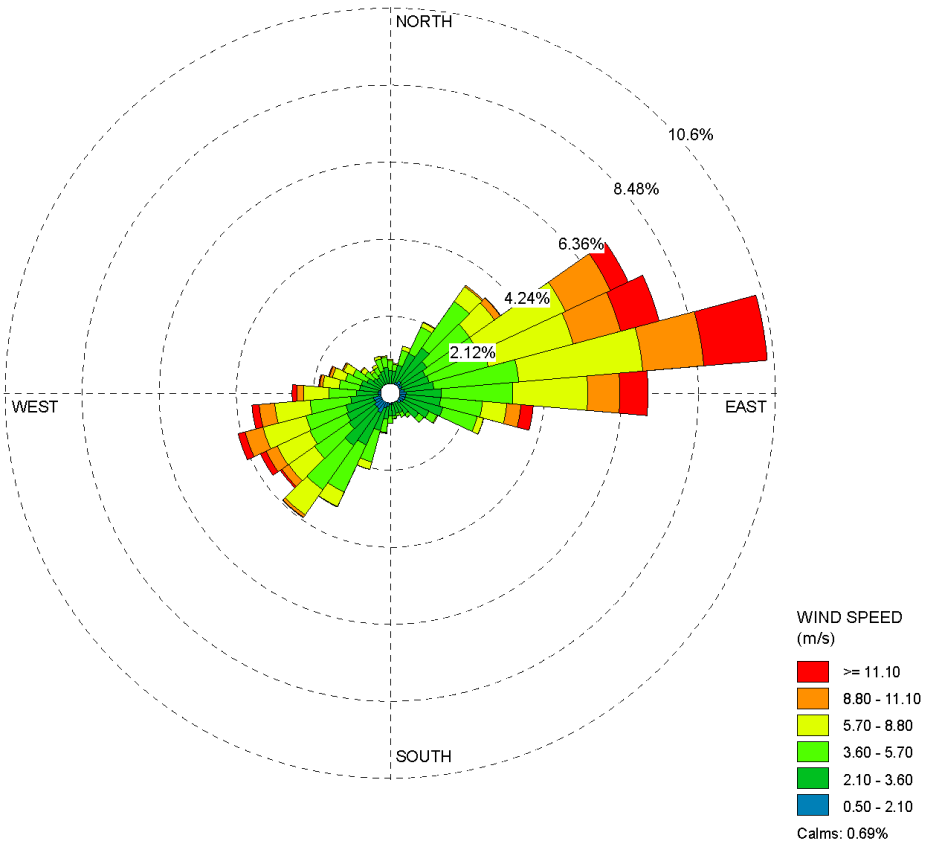
A conservative annual O_3 data set, composed of maximum 1-hour O_3 values from five years of data collected at the PBU A-Pad ambient air and meteorological monitoring station (A-Pad station) during years 2014, 2015, 2016, 2019, and 2020, was used for the modeling analysis. The data set has been reviewed and approved by ADEC for prior ambient demonstrations prepared for Alaska North Slope stationary sources (e.g., Permit No. AQ1727MSS01).

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 due to potential emissions from the Omega Pad. Publicly available hourly surface meteorological data collected during 2014, 2015, 2016, 2019, and 2020 at the A-Pad station and concurrent twice-daily upper air meteorological data collected by the National Weather Service at Utqiagvik, Alaska were processed using AERMET (23132). The ADEC has reviewed the data and determined that the surface meteorological data collected during 2014, 2015, 2016, 2019, and 2020 at the A-Pad station meets the requirements in 40 CFR 51, Appendix W. The A-Pad station meteorological data are representative of meteorological conditions at the facility based on the proximity of the A-Pad station to the proposed Omega Pad location, relatively consistent meteorological conditions across the Alaska North Slope coastal plain, and because the data were recently collected.

The A-Pad station 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 2-3 provides a wind rose based on the wind data collected at the A-Pad station during the 2014, 2015, 2016, 2019, and 2020 monitoring years.

Figure 2-3. A-Pad Monitoring Station Wind Rose
Calendar Years 2014, 2015, 2016, 2019, and 2020



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 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 the ADEC for prior air quality permitting activities.

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

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

Table 2-3 provides a summary of geophysical parameters for the Alaska North Slope, separated by season and land use classification, provided in the *ADEC Modeling Review Procedures Manual* (October 8, 2018) that were used for this modeling analysis.

Table 2-3. Alaska North Slope Geophysical Parameters

Land Use Classification	Season[1]	Albedo	Bowen Ratio	Surface Roughness Length (m)
North Slope (Onshore)	Summer (June through September)	0.18	0.80	0.020
	Winter (October through May)	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 most recent A-Pad station PSD-quality ambient air data (monitoring year 2020) were used to represent the contribution of ambient air pollutant levels from non-modeled sources of NO_2 and SO_2. The most recent PSD-quality PM_{10} and $PM_{2.5}$ ambient air data (monitoring year 2020) collected at the PBU Central Compressor Plant (CCP) monitoring station were used to represent the contribution of ambient PM_{10} and $PM_{2.5}$ levels, respectively, due to non-modeled sources. The background ambient air concentrations collected at the A-Pad and CCP stations have been reviewed by the ADEC and are summarized in Table 2-4.

Table 2-4. Summary of Ambient Background Concentrations

Pollutant	Averaging Period	Background Concentration (µg/m^3)	AAAQS (µg/m^3)
NO_2	Annual	5.7	100
$PM_{2.5}$	24-Hour	7.0 [1]	35
	Annual	1.4	12
PM_{10}	24-Hour	20.0 [2]	150
SO_2	1-Hour	17.0 [3]	196
	3-Hour	0.0 [2]	1,300
	24-Hour	0.0 [2]	365
	Annual	0.0 [2]	80

Notes:
[1] Based on the 98th percentile of 24-hour average $PM_{2.5}$ values during the monitoring year.
[2] Based on the highest-second high value during the monitoring year.
[3] Based on the 99th percentile of the daily maximum 1-hour average values during the monitoring year.

3.0 CRITERIA POLLUTANT DISPERSION MODEL ANALYSIS RESULTS

Table 3-1 provides the maximum ambient air quality impacts for all modeled scenarios. The ambient background concentrations provided in Table 2-4 were added to the modeled impacts to estimate cumulative ambient air quality impacts for comparison to the applicable AAAQS. The results in Table 3-1 show that the modeled impacts, when added to background ambient air levels, are well below the AAAQS.

Table 3-1. Facility Cumulative Impact Analysis Results

Air Pollutant	Averaging Period	Maximum Modeled Impact (µg/m^3)	Background Concentration (µg/m^3)	Maximum Cumulative Impact (µg/m^3)	AAAQS (µg/m^3)	Percent of AAAQS
NO_2	Annual	38.8	5.7	44.5	100	45%
$PM_{2.5}$	24-Hour	11.2 [1]	7.0	18.2	35	52%
	Annual	2.0	1.4	3.4	12	29%
PM_{10}	24-Hour	16.3 [2]	20.0	36.3	150	24%
SO_2	1-Hour	97.0 [3]	17.0	114.0	196	58%
	3-Hour	101.3 [4]	0.0	101.3	1,300	8%
	24-Hour	64.7 [4]	0.0	64.7	365	18%
	Annual	5.7	0.0	5.7	80	7%

Notes:
[1] Based on the maximum five-year average of the highest-eighth high (H8H) 24-hour average PM_{10} values.
[2] Based on the maximum highest-sixth high (H6H) 24-hour average PM_{10} value of the five model years.
[3] Based on the maximum five-year average of the highest-fourth high (H4H) daily maximum 1-hour average SO_2 values.
[4] Based on the maximum highest-second high value of each model year.

4.0 REFERENCES

ADEC, Title 18 Alaska Administrative Code, Chapter 50, Air Quality Control, as amended through September 7, 2022.

ADEC, *NO_2-to-NO_X ratios per Source Tests Approved by the Alaska Department of Environmental Conservation*, Revised August 23, 2013, Retrieved December 5, 2022 from: http://dec.alaska.gov/media/10228/no2-nox-instack-ratios-from-source-tests-082313.xlsx

ADEC, *ADEC Modeling Review Procedures Manual*, October 8, 2018.

EPA, *User's Guide for the AMS/EPA Regulatory Model (AERMOD)*, EPA-454/B-23-008, Office of Air Quality Planning and Standards, Research Triangle Park, N.C., October 2023.

EPA, *User's Guide for the AERMOD Meteorological Preprocessor (AERMET)*, EPA-454/B-23-005. Office of Air Quality Planning and Standards, Research Triangle Park, N.C., October 2023.

EPA, *Revision to the Guideline on Air Quality Model: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter*; Final Rule, 40 CFR 51, Appendix W, January 2017.

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 30, 2014.

EPA, *Additional Clarification Regarding Application 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, March 1, 2011.

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.

EPA, *Guidelines for Determination of Good Engineering Practice Stack Height*, EPA-450/4-80-023R, Office of Air Quality Planning and Standards, Research Triangle Park, N.C., June 1985.

Attachment E

Electronic Files