ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AIR PERMITS PROGRAM

TECHNICAL ANALYSIS REPORT
FOR
AIR QUALITY CONTROL MINOR PERMIT NO. AQ0064MSS01

HILCORP ALASKA, LLC
BRUCE PLATFORM

TURBINE INSTALLATION PROJECT

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ACRONYMS and ABBREVIATIONS

Acronyms

AAC .....Alaska Administrative Code
CFR.....Code of Federal Regulations
Department.....Alaska Department of Environmental Conservation
EU .....Emission Unit
Hilcorp .....Hilcorp Alaska, LLC
PSD .....Prevention of Significant Deterioration
TAR.....Technical Analysis Report

Units and Measures

bhp.....brake horsepower
lb/1,000 gal .....pounds per 1,000 gallons
lb/bhphr.....pounds per brake horsepower hour
lb/MMBtu .....pounds per million British thermal unit
MMBtu/hr .....million British thermal units per hour
MMscf/yr .....million standard cubic feet per year
tpy .....tons per year

Pollutants

CO .....Carbon Monoxide
NOx.....Oxides of Nitrogen
PM-10 .....Particulate Matter with a nominal aerodynamic diameter ≤ 10 microns
SO_2 .....Sulfur Dioxide
VOC .....Volatile Organic Compound

1. Introduction

This Technical Analysis Report (TAR) provides the Alaska Department of Environmental Conservation's (Department's) basis for issuing Air Quality Control (AQC) Minor Permit AQ0064MSS01 to Hilcorp Alaska, LLC (Hilcorp) for the Bruce Platform. The Department is issuing this permit under 18 AAC 50.502(c)(3) for a physical change to an existing stationary source with that causes an increase in potential to emit that is greater than 10 tpy of nitrogen oxides. The permit is also issued under 18 AAC 50.508(6) to rescind terms and conditions of a Title I permit. The minor permit application was dated November 25, 2013. An addendum was submitted on April 11, 2014.

2. Stationary Source Description

The Bruce Platform is an existing offshore drilling facility, producing natural gas and oil, located in Cook Inlet southwest of Tyonek. Oil and natural gas are processed through oil/gas separators on the platform. Product oil/natural gas is pumped through underwater pipelines to the Granite Point Tank Farm (GPTF) for sale. The natural gas is also used for fuel on Bruce Platform or flared.

Application Description

Hilcorp submitted an application under 18 AAC 50.502(c)(3) to add an 970 kW Solar gas turbine (EU ID 29), which would constitute a physical change to the existing stationary source which causes an increase in PTE of greater than 10 tpy NO_X. It was also submitted under 18 AAC 508(6) to rescind conditions in AQ0064CPT01. The purpose of these revisions is to add conditions for the new turbine and to remove conditions which only pertain to several EUs which have been removed.

Hilcorp originally requested the conditions of this permit be incorporated into the Title V permit with an administrative amendment under 18 AAC 50.326(c)(2). Hilcorp later requested an integrated review under 18 AAC 50.326(c)(1) with AQ0064TVP03, Revision 1.

Project Emissions Summary

Table 1 shows the emission summary and permit applicability with assessable emissions from the stationary sources. Emission factors and detailed calculations are provided in Appendix A.

Table 1- Emissions Summary (tpy)

Parameter	NO_X	CO	SO_2	VOC	$PM_{10}/PM_{2.5}$
Previous PTE	552.6	984.3	43.3	362.4	73.8
New PTE	571.8	998.2	43.5	362.6	74.2
Total PTE	2,050.3				
Change in PTE	19.2	13.9	0.2	0.1	0.4
502(c)(3) Thresholds	10	N/A	10	N/A	10
502(c)(3) Applicability	Yes	No	No	No	No
Assessable Emissions	572	998	44	363	74
Total Assessable	2,051				

The Department determined that the proposed modification would not result in a significant emissions increase and is therefore not subject to PSD review. **Table 2** shows the change in emissions due to the proposed modification. The potential emissions increase of the project was determined not to exceed the PSD significance thresholds under Step 1 of the PSD permit applicability two-step process. The Department assumed the PM emissions were equal to the PM-10 emissions.

Table 2 - Prevention of Significant Deterioration Analysis, tons per year (TPY)

Parameter	NO_X	CO	SO_2	VOC	PM	PM_{10}	$PM_{2.5}$
Increase in PTE	19.2	13.9	0.2	0.1	0.4	0.4	0.4
PSD Thresholds	40	100	40	40	25	15	10
Significant Increase?	No	No	No	No	No	No	No

Due to the June 23, 2014 U.S. Supreme Court decision the PSD threshold for greenhouse gases does not apply unless PSD is triggered for another pollution; therefore, greenhouse gases were not considered in Step 1 of the PSD permit applicability analysis.

3. Department Findings

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

- This project is classified under 18 AAC 50.502(c)(3) because it will result in an increase in NO_X of greater than 10 tpy at an existing stationary source.
- CPAI submitted an ambient analysis as required under 18 AAC 50.540(c)(2)(A) because of the permit classification under 18 AAC 50.502(c)(3). The Department's review of the ambient analysis is contained in Appendix B.
- Hilcorp used vendor data to calculate the PTE of EU ID 29 for NO_X and CO. It was unclear from this vendor data if the values given were worst-case values. The vendor sheet provided stated that emission testing was conducted under conditions not representative of Cook Inlet (for example, 80°F inlet temperature). However, in comparison to emissions calculated by the Department using EPA's AP-42 and Reference Method 19, the vendor data yielded higher emissions. Therefore, the Department considers Hilcorp's PTE calculations to be adequately conservative. The Department will not require a source test to verify the emission factors because there is a large margin of compliance with the PSD major modification thresholds and the NO_2 ambient standard is not being threatened.
- Hilcorp used AP-42 emission factors to calculate the PTE of EU ID 29 for PM-2.5, PM-10, and VOC. They assumed all PM-10 to also be PM-2.5. They also assumed an H_2S concentration of 25 ppmv for calculating the SO_2 PTE of EU ID 29. This is a reasonable assumption for fuel gas H_2S concentration.
- This project is also classified under 18 AAC 50.508(6) because Hilcorp is requesting revisions to AQ0064CPT01. Hilcorp also requested revisions to Title I conditions in AQ0064TVP02 under 18 AAC 50.508(6). Hilcorp has permanently removed Emission Unit (EU) IDs 8 through 13 from the stationary source and requested applicable conditions in the Title V permit for these EU IDs be removed or revised as applicable. Revisions to a Title V permit cannot be made under 18 AAC 50.508(6). The requested revisions to AQ0064CPT01 are the result of the removal of EU IDs 12 and 13. The other requested revisions to AQ0064TVP02 are the result of the removal of EU IDs 8 through 11. The Department has previously removed any applicable requirements for EU IDs 8 through 13 from the Title V permit with the issuance of AQ064TVP03 on June 3, 2014.
- AQ0064CPT01 authorized the installation of EU IDs 12 and 13 and established Owner Requested Limits on these EU IDs to avoid a PSD major modification. With the removal of EU IDs 12 and 13 from the stationary source Condition 8 is the only applicable requirement from AQ0064CPT01. This is a condition to protect ambient air quality standards and maximum allowable increases. The Department's current policy is not to rescind construction permits with the issuance of a minor permit, but in this case because there is only one applicable requirement the Department will include this requirement in AQ0064MSS01 and rescind AQ0064CPT01 with the issuance of AQ0064MSS01.
- Hilcorp is requesting the minor permit be incorporated into the Title V permit by integrated review under 18 AAC 50.326(c)(1).

4. Permit Requirements

State regulations in 18 AAC 50.544 describe the elements that the Department must include in minor permits. This section of the TAR provides the technical and regulatory basis for the permit requirements in Minor Permit AQ0064MSS01, which is classified under 18 AAC 50.502(c)(3) and 18 AAC 50.508(6).

General Requirements for All Minor Permits

As described in 18 AAC 50.544(a)(1), this minor permit identifies the stationary source, the project, the Permittee, and contact information in the cover page.

Emission fee requirements are required for each minor permit issued under 18 AAC 50.542 as described in 18 AAC 50.544(a)(2). Because the Department is public noticing AQ0064MSS01 and AQ0064MSS2 simultaneously the Department is only including a fee requirement in AQ0064MSS02 which will cover both projects.

As required in 18 AAC 50.544(a)(5), this permit includes the standard permit conditions in Sections 4 through 7 of the permit.

18 AAC 50.544(a)(6) requires conditions necessary to protect ambient air quality. Upon review of Hilcorp's ambient analysis the Department determined that the project would not cause or contribute to a violation of the Alaska Ambient Air Quality Standards and that Hilcorp did not include any operational restrictions or critical assumptions in their analysis. Therefore no permit conditions are necessary to protect ambient air quality.

Requirements for a Permit Classified Under 18 AAC 50.502(c)

This permit contains the following provisions for a permit classified under 18 AAC 502(c) as required by 18 AAC 50.544(c):

State Emission Standards

The permit does not include conditions for ongoing MR&R to ensure compliance with State Emission Standards under 18 AAC 50.055 because AQ0064MSS01 will be incorporated into the Title V permit which will include the required ongoing MR&R conditions.

Visible Emission Standard

EU ID 29 is a fuel-burning unit subject to 18 AAC 50.055(a)(1) for visible emissions. The Department did not require the Permittee to demonstrate initial compliance with the State visible emissions standard because the unit burns fuel gas and it is assumed that it will not violate the visible emission standard.

Particulate Matter Standard

EU ID 29 is a fuel-burning unit subject to 18 AAC 50.055(b)(1) for particulate matter emissions. Hilcorp submitted an initial compliance demonstration showing that the turbine complies with the 0.05 grans/dscf standard. The demonstration is satisfactory for the Department and a requirement for an initial source test not was not included in the permit.

Sulfur Dioxide Standard

The Department did not require the Permittee to demonstrate initial compliance with the State sulfur compound emission standards. Hilcorp submitted an initial compliance demonstration with their application for EU ID 29 showing that this unit will meet the SO_2 standard assuming a fuel gas H_2S content of 25 ppmv. This is a reasonable assumption for H_2S concentration.

Requirements for a Permit Classified under 18 AAC 50.508(6)

This permitting action is classified under 18 AAC 50.508(6) to revise or rescind conditions of a Title I permit; therefore it contains all the applicable requirements described in 18 AAC 50.544(i).

The Department reviewed Hilcorp's requests, rescinded AQ0064CPT01, and re-established Condition 8 from AQ0064CPT01 in AQ0064MSS01.

5. Permit Administration

Hilcorp may operate under minor permit AQ0064MSS01 upon issuance. The Department intends to incorporated AQ0064MS01 into the Title V operating permit via the integrated review process under 18 AAC 50.326(c)(1).

Appendix A: PTE Calculations

EU ID	Description	Operating Hours	NOx		CO		SO2		PM-2.5/PM-10		VOC	
			EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)	EF	PTE (tpy)
1	Gas Lift Compressor	8,760 hr/yr	0.32 lb/ MMBtu	15.6	0.082 lb/ MMBtu	4.0	25 ppmv H_2S	0.2	0.0066 lb/ MMBtu	0.3	0.0021 lb/ MMBtu	0.1
2	AC Generator Drive	8,760 hr/yr	0.32 lb/ MMBtu	15.6	0.082 lb/ MMBtu	4.0	25 ppmv H_2S	0.2	0.0066 lb/ MMBtu	0.3	0.0021 lb/ MMBtu	0.1
3	Kobe #1 Drive	8,760 hr/yr	4.08 lb/ MMBtu	38.0	0.317 lb/ MMBtu	3.0	25 ppmv H_2S	0.03	0.00991 lb/ MMBtu	0.1	0.12 lb/ MMBtu	1.1
4	Kobe #2 Drive	8,760 hr/yr	4.08 lb/ MMBtu	38.0	0.317 lb/ MMBtu	3.0	25 ppmv H_2S	0.03	0.00991 lb/ MMBtu	0.1	0.12 lb/ MMBtu	1.1
5	Kobe #3 Drive	8,760 hr/yr	4.08 lb/ MMBtu	38.0	0.317 lb/ MMBtu	3.0	25 ppmv H_2S	0.03	0.00991 lb/ MMBtu	0.1	0.12 lb/ MMBtu	1.1
6	Kobe #4 Drive	8,760 hr/yr	4.08 lb/ MMBtu	38.0	0.317 lb/ MMBtu	3.0	25 lb/ MMBtu	0.03	0.00991 lb/ MMBtu	0.1	0.12 lb/ MMBtu	1.1
7	Kobe #5 Drive	8,760 hr/yr	4.08 lb/ MMBtu	38.0	0.317 lb/ MMBtu	3.0	25 lb/ MMBtu	0.03	0.00991 lb/ MMBtu	0.1	0.12 lb/ MMBtu	1.1
14	Emergency Air Compressor Drive	200 hr/yr	0.031 lb/hp-hr	0.6	0.00668 lb/hp-hr	0.1	0.5 wt %S	0.1	0.0022 lb/hp-hr	0.04	0.00247 lb/hp-hr	0.0
15	Fire Water Pump Drive	200 hr/yr	0.031 lb/hp-hr	0.7	0.00668 lb/hp-hr	0.1	0.5 wt %S	0.1	0.0022 lb/hp-hr	0.05	0.00247 lb/hp-hr	0.1
16	Emergency AC Gen.	200 hr/yr	0.031 lb/hp-hr	0.7	0.00668 lb/hp-hr	0.2	0.5 wt %S	0.1	0.0022 lb/hp-hr	0.1	0.00247 lb/hp-hr	0.1
17	Backup AC Gen.	6,500 hr/yr	0.024 lb/hp-hr	93.6	0.0055 lb/hp-hr	21.5	0.5 wt %S	13.9	0.0007 lb/hp-hr	2.7	0.000705 lb/hp-hr	2.7
18	Sea King Crane Engine	8760 hr/yr	0.031 lb/hp-hr	44.1	0.00668 lb/hp-hr	9.5	0.5 wt %S	5.1	0.0022 lb/hp-hr	3.1	0.00247 lb/hp-hr	3.5

19	Seatrax Crane Engine	8,760 hr/yr	1624 g/hr	15.6	276 g/hr	2.7	0.5 wt %S	7.8	23 g/hr	0.2	48.3 g/hr	0.5
20	Flares	365 day/yr	0.068 lb/ MMBtu	169.8	0.37 lb/ MMBtu	923.7	25 lb/ MMBtu	7.7	0.0264 lb/ MMBtu	65.9	0.14 lb/ MMBtu	349.5
21	Dehydration Unit	365 day/yr	N/A	--	N/A	--	N/A	--	N/A	--	N/A	--
	Boiler	8,760 hr/yr	100 lb/ MMscf	1.9	84 lb/ MMscf	1.6	25 lb/ MMBtu	0.1	7.6 lb/ MMscf	0.1	5.5 lb/ MMscf	0.1
	Boiler	8,760 hr/yr	100 lb/ MMscf	1.9	84 lb/ MMscf	1.6	25 lb/ MMBtu	0.1	7.6 lb/ MMscf	0.1	5.5 lb/ MMscf	0.1
	Pressure Washer	8,760 hr/yr	20 lb/ 1000 gal	0.1	5 lb/ 1000 gal	0	0.5 wt %S	0.5	2 lb/ 1000 gal	0.01	0.2 lb/ 1000 gal	0
	Pressure Washer	8,760 hr/yr	20 lb/ 1000 gal	0.2	5 lb/ 1000 gal	0.1	0.5 wt %S	0.7	2 lb/ 1000 gal	0.02	0.2 lb/ 1000 gal	0
	Portable Heaters	8,760 hr/yr	20 lb/ 1000 gal	1.9	5 lb/ 1000 gal	0.5	0.5 wt %S	6.7	2 lb/ 1000 gal	0.2	0.2 lb/ 1000 gal	0

Emission Factors and PTE of Existing Units

PTE Calculations for EU 29

Pollutant	Emission Factor	E-Factor Units	PTE (tpy)
NO_X	69	ppmv	19.2
CO	81	ppmv	13.9
PM	0.0066	lb/MMBtu	0.4
VOC	0.0021	lb/MMBtu	0.1
SO_2	25	ppmv H_2S	0.21

Appendix B: Modeling Memo

MEMORANDUM

State of Alaska
Department of Environmental Conservation
Division of Air Quality

TO:	File	DATE:	29 August, 2014
THRU:	Alan Schuler, PE Engineer, DEC Air Permits Program	FILE NO: PHONE: FAX:	AQ0064MSS01 (907) 465-5324 (907) 465-5129
FROM:	James Julian Renovatio, EIT Engineering Assistant, DEC Air Permits Program	SUBJECT:	Review of Hilcorp Alaska, LLC's Ambient Analysis for the Turbine Installation Project at the Bruce Platform

INTRODUCTION

This memorandum summarizes the Department's findings regarding the ambient analysis submitted by Hilcorp Alaska, LLC (Hilcorp) for the Turbine Installation Project at the Bruce Platform. Hilcorp submitted this analysis in support of their 25 November, 2013 minor permit application (AQ0064MSS01). The pollutant subject to review is oxides of nitrogen (NOx).

Hilcorp's analysis adequately demonstrates that operating the Turbine Installation Project emissions unit (EU) within the restrictions listed in this memorandum will not cause or contribute to a violation of the annual nitrogen dioxide (NO_2) Alaska Ambient Air Quality Standard (AAAQS) provided in 18 AAC 50.010.

BACKGROUND

Hilcorp proposes to install a turbine[1] on the Bruce Platform, which is located in the Cook Inlet southwest of Tyonek, Alaska. The purpose of this installation is to replace power lost through the removal of EU 13[2]. The Bruce Platform is an existing stationary source used in the development of offshore oil and gas that operates under Construction Permit AQ0064CPT01 and Title V Operating Permit AQ0064TVP02 Revision 3[3]. This stationary source consists of both diesel- and fuel gas-fired reciprocating engines, turbines, boilers, flares, heaters, and other miscellaneous equipment. Hilcorp additionally proposes the use of a portable drill rig, the Kuukpik V, on the Bruce Platform stationary source in accordance with Minor Permit application AQ0064MSS02; they propose to remove and relocate the rig at an unspecified time in the future.

[1] Hilcorp's application, as supplemented, describes this unit as an 970 kilowatt fuel gas-fired Solar Saturn T-1301.
[2] Hilcorp will remove this EU, a 1,215 horsepower fuel gas-fired engine, before the issuance of AQ0064MSS01.
[3] Hilcorp is currently operating under a permit shield for the renewal of AQ0064TVP03.

Project Classification

Hilcorp's minor permit application is classified under **18 AAC 50.502(c)(3)** for changes to an existing stationary source. In accordance with the application information requirements of 18 AAC 50.540(c)(2)(A), applicants must provide an ambient AAAQS analysis for each triggered pollutant. Hilcorp fulfilled this requirement by submitting an AAAQS analysis for annually averaged NO_2 with their minor permit application. Minor permit applicants are not required to demonstrate compliance with the one-hour NO_2 AAAQS in accordance with 18 AAC 50.540(l).

Hilcorp's minor permit application is also classified under **18 AAC 50.508(6)** for their request to revise terms and conditions in AQ0064TVP02. In accordance with application information requirements of 18 AAC 50.540(k)(3)[4], applicants must include the effects of revising the permit terms and conditions in their application. Hilcorp fulfilled this requirement by submitting an AAAQS analysis for annually averaged NO_2 with their minor permit application.

Modeling Protocol Submittal

The Department does not typically require a modeling protocol to be submitted with minor permit applications[5]. However, a protocol is helpful to ensure that the modeling tools, procedures, input data, and assumptions that are used by an applicant are consistent with both State and Federal guidance.

The Department did not request Hilcorp submit a modeling protocol, nor did they elect to submit one, for AQ0064MSS01.

Application Submittal

Hilcorp submitted a minor permit application with an ambient analysis on 25 November, 2013. They submitted a supplement[6] to this submission on 15 April, 2014. SLR International Corporation (SLR) prepared the application, its supplement, and ambient analysis on their behalf.

SOURCE IMPACT ANALYSIS

Hilcorp used computer analysis (modeling) to predict the ambient NO_2 air quality impacts. SLR performed the modeling analysis on their behalf. The Department's findings regarding Hilcorp's ambient analysis are provided below.

[4] 18 AAC 50.540(k)(3) only requires applicants to update the previously modeled pollutants and averaging periods. It does not require applicants to conduct an ambient analysis for newly developed air quality standards. Hilcorp conducted their previous ambient analysis prior to the Department's adoption of the one-hour NO_2 and SO_2 AAAQS. Therefore, they were not required to provide a one-hour NO_2 and SO_2 analysis with their minor permit application.

[5] The Department may request an applicant submit a modeling protocol in accordance with 18 AAC 50.540(c)(2).

[6] Hilcorp submitted this supplement due to an increase in the rated power of the proposed turbine. They included updated emissions information, vendor data, application forms, and dispersion modeling with their supplement.

Approach

Hilcorp compared their project impacts, for annually averaged NO_2, to the significant impact level (SIL) listed in Table 5 of 18 AAC 50.215(d)(2). Impacts that are less than the SIL are considered negligible, while a cumulative analysis is warranted for significant impacts.

Hilcorp's annual NO_2 project impacts were below the SIL and, therefore, considered negligible.

Model Selection

There are a number of air dispersion models available to applicants and regulators. The U.S. Environmental Protection Agency (EPA) lists these models in their *Guideline on Air Quality Models* (Guideline), which the Department has adopted by reference in 18 AAC 50.040(f).

Hilcorp used EPA's Off-Shore Coastal Dispersion (OCD) model (version 5.0) for their ambient analysis. OCD is an appropriate model for this permit application.

Meteorological Data

OCD requires hourly meteorological data, which includes on-shore data, in order to estimate the plume dispersion and impact from off-shore sources at on-shore locations. According to the Guideline, a *minimum* of one-year of site-specific data, or five years of representative National Weather Service (NWS) data should be used. When modeling with site-specific data, the Guideline states that up to five additional years should be used, when available, to account for year-to-year variation in meteorological conditions.

Hilcorp used one year of off-shore meteorological data previously collected at the ConocoPhillips Alaska, Incorporated (CPAI) Tyonek Platform. These data were collected as part of CPAI's 1 August, 1993 through 31 July, 1994 *Tyonek Deep Development Project*[7] prevention of significant deterioration monitoring effort. The Department has accepted these data for use with the ambient analyses of other nearby Cook Inlet sources. Therefore, Hilcorp's use of the Tyonek off-shore data is similarly appropriate since it adequately represents the off-shore meteorology at the proposed Bruce Platform site.

Coordinate System

Air quality models need to know the relative location of the EUs, structures (if applicable), and receptors, in order to properly estimate ambient pollutant concentrations. Therefore, applicants must use a consistent coordinate system in their analysis.

Hilcorp used a local coordinate system, measured in meters, with an origin located at the center of the Bruce Platform. They used engineering drawings, photographs, and mapping software to locate the relative placement of the EU stacks.

EU Inventory

Hilcorp only included the proposed turbine, EU 22, in their ambient analysis. They did not include any other EUs, e.g. those from nearby off-site sources or the Kuukpik V portable drill rig to be placed on the Bruce Platform in accordance with Minor Permit application

[7] Formerly named *ARCO/Phillips Sunfish*

AQ0064MSS02. This approach is appropriate because their annual NO_2 impacts are below the SIL and, therefore, do not warrant a cumulative analysis. The turbine EU was characterized as a point source. A table of the EUs currently authorized to operate at the Bruce Platform is included in the preliminary permit.

EU Release Parameters

The assumed EU emission rates and characterization of how their emissions enter the atmosphere will significantly influence the modeled results. Therefore, the Department reviews these parameters very carefully.

Emission Rates

The Department found the modeled turbine emission rate to be consistent with the emissions information Hilcorp provided in their permit application. The items that warrant additional discussion, however, are presented below.

Turbine Emission Rate Assumptions

Hilcorp used vendor-specified turbine emissions data[8] and its assumed release parameters to model annual NO_2. The vendor data for this EU is homogeneously specified in terms of nominal performance, at sea level, with no duct losses, while 80˚ Fahrenheit, and as subject to 60-percent relative humidity. These conditions do not appropriately characterize the anticipated annual operating conditions at the Bruce Platform. However, significant increases in the assumed NOx emission factor for this EU, while potentially necessitating a cumulative analysis, are unlikely to present a threat to the annually averaged NO_2 standard. Therefore, the Department is not including any terms or conditions with AQ0064MSS01 to protect the ambient standard for this pollutant. The Department, nevertheless, recommends that Hilcorp evaluate the appropriateness of its underlying emissions assumptions, with future submissions.

Operationally Limited Emission Rates

The modeled emission rate for a given pollutant and EU should generally reflect the maximum emissions possible during a given averaging period.

Hillcorp did not request any annual operational limits for the Turbine Installation Project EU, i.e. they assumed the turbine operated 8,760 hours-per-year.

Point Source Parameters

Applicants must provide the stack height, diameter, location, orientation angle, and base elevation in addition to the pollutant emission rates, exhaust plume exit velocity, and exhaust temperature for each modeled point source.

The Department generally found Hilcorp's modeled turbine stack parameters to be consistent with the vendor information or expectations for similarly sized EUs. The items that warrant additional discussion, are presented below.

[8] Hilcorp provided a vendor datasheet, *Turbine T1301 Data Sheet.pdf*, with their 15 April, 2014 supplement. This datasheet specifies a NOx emission rate of 69 ppmv as subject to several environmental assumptions.

Load Analysis

The maximum ambient pollutant concentration does not always occur during the full-load operating conditions that typically produce the maximum emissions. The relatively poor dispersion that occurs with cooler exhaust temperatures and slower part-load exit velocities may produce the maximum ambient impacts. Turbine emissions also tend to greatly vary by fuel type, operating load, and inlet air temperature. Therefore, EPA recommends that a load analysis be conducted on the primary EUs to determine the worst-case conditions.

Hilcorp did not conduct a load analysis[9] of the Turbine Installation Project EU, the Solar Saturn T-1301. The Department does not anticipate that sensitivity runs, which account for the emissions potential at different operating loads, would change the outcome of Hilcorp's SIL-centric OCD modeling approach. Moreover, it is unlikely that a cumulative analysis would present a threat to the annual NO_2 standard based on the case-specific emissions associated with this permit application; see the Department's associated comments regarding Hilcorp's use of vendor data for this EU under the *Turbine Emission Rate Assumptions* sub-section. Therefore, the Department is not asking Hilcorp to provide a load analysis with AQ0064MSS01. The Department, however, recommends that Hilcorp perform such an analysis, and evaluate the merit of its underlying assumptions, with future submissions.

Stack Orientations

OCD allows users to specify the stack angle, in degrees from vertical, of discrete emissions release points. This modeled angle is intended to represent the presence of non-vertical stacks. Assuming non-vertical releases will change the plume dispersion characteristics of a particular point source. Therefore, the Department reviews these assumptions very carefully.

Hillcorp modeled the Turbine Installation Project EU using a horizontal release, i.e. specified in OCD as 90-degrees from vertical. This approach is appropriate.

Ambient NO_2 Modeling

The modeling of ambient NO_2 concentrations can sometimes be refined through the use of ambient air data or assumptions. Section 5.2.4 of the Guideline describes several approaches that may be considered in modeling the annual average NO_2 impacts.

Hillcorp used the national default ambient NO_2-to-NOx ratio of 0.75, as provided in the Guideline, to improve their estimated annual average NO_2 concentrations. Hillcorp's use of this ratio is reasonable.

Downwash

An off-shore platform presents an obstacle to airflow over the water and causes a turbulent wake that can result in "down washing" of pollutant plumes on the downwind side. This phenomenon increases the initial rates of plume dispersion in the turbulent wake and

[9] E.g. by performing separate screening runs at various operating load conditions.

restricts plume rise. The OCD model incorporates algorithms to account for both of these plume effects based on the dimensions of platform structures, stack heights, and other stack parameters for individual emissions releases on the platform.

Hillcorp appropriately used the lesser width of the Bruce Platform downwash parameters. They also used the maximum height of the solid platform structures[10], excluding the derricks, for the aforementioned sources. This approach is adequate to characterize said structures. Hillcorp's OCD downwash parameters are listed in Table 1.

Table 1. Downwash parameters used in AQ0064MSS01

Parameter Modeled	Building Width (meter)	Building Height (meter)
Bruce Platform	29.4	21.0

Ambient Air Boundary

For the purposes of air quality modeling, *ambient air* means outside air to which the public has access. Ambient air typically excludes that portion of the atmosphere within a stationary source's boundary.

Hillcorp used a 100-meter maritime safety stand-off around the Bruce Platform as their ambient air boundary. This is an appropriate boundary for off-shore platforms in the Cook Inlet due to the strong tidal currents that occur there.

Receptor Grid

Hillcorp used a polar receptor grid, distinguished by placement along 10-degree arcs, which increased in spacing with outward distance from the ambient air boundary. The spacing between each concentric ring of receptors was 50-meters from the ambient air boundary to a distance of 500-meters.

The Department generally prefers that applicants use finer near-field receptor grids, such as those with 25-meter spacing. Using fine receptor grid offers a greater degree of confidence in identifying the potential locations of high pollutant concentrations. Hillcorp's medium-density polar receptor grid does not demonstrate any significant pollutant concentration gradients. Therefore, their receptor grid has sufficient resolution and coverage to determine the maximum impacts for AQ0064MSS01.

Design Concentrations

EPA generally allows applicants to use modeled concentrations that are consistent with the form of the standard if at least one year of representative site-specific, or five years of representative NWS data are used. When these criteria are not met, then applicants must use the highest modeled concentration. In all cases, applicants must compare the highest modeled concentration to the deterministic annual average standards and SILs.

Hillcorp used the highest modeled concentration for annually averaged NO_2 throughout their ambient analysis. This approach is consistent with the forms of this ambient standard.

[10] Hilcorp indicates that the worker housing is 21.0 meters above the reference base of the Bruce Platform and is taller than the solid structures of the Kuukpik V rig, which is approximately 17 meters, respectively.

RESULTS AND DISCUSSION

The maximum annual NO_2 project impact, in micrograms-per-cubic meter ($\mu g/m^3$) is presented in Table 2; the SIL is also presented for comparison. The project impact is below the SIL. Therefore, a cumulative analysis is not warranted.

Table 4. Maximum project impacts as compared to the SIL

Pollutant	Avg. Period	Max. Modeled Concentration ($\mu g/m^3$)	SIL ($\mu g/m^3$)
NO_2	Annual	0.77	1.0

Table Notes:
The maximum modeled concentration value reflects the use of ARM, i.e. a 0.75 ratio.
The point of maximum estimated impact, in the local coordinate system, is -114.91(x), -96.42(y).

CONCLUSION

The Department reviewed Hillcorp's modeling analysis for the Turbine Installation Project and concluded the following:

1. The annual NOx emissions associated with operating the proposed turbine EU will not cause or contribute to a violation of the annual NO_2 AAAQS listed in 18 AAC 50.010.
2. Hillcorp's modeling analysis fully complies with the showing requirements of 18 AAC 50.540(c)(2) and 18 AAC 50.540(k)(3).
3. Hillcorp conducted their modeling analysis in a manner consistent with the Guideline as required under 18 AAC 50.215(b)(1).

Hillcorp's analysis did not include any operational restrictions or critical assumptions that need to be incorporated as permit conditions. Therefore, the Department is not including any ambient air related conditions in Minor Permit AQ0064MSS01.