ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Air Permits Program

TECHNICAL ANALYSIS REPORT
for
Air Quality Control Minor Permit No. AQ0923MSS04

Eni US Operating Co. Inc.
Nikaitchuq Development

Permit Revision

Prepared by: Patrick Dunn
Supervisor: Sally A. Ryan, P.E.
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ABBREVIATIONS/ACRONYMS

AAAQS .....Alaska Ambient Air Quality Standards
AAC .....Alaska Administrative Code
ADEC .....Alaska Department of Environmental Conservation
AS.....Alaska Statutes
ASTM.....American Society of Testing and Materials
BACT .....Best Available Control Technology
BOOS .....Burners out of service
BPXA .....BP Exploration (Alaska), Inc.
C.F.R. .....Code of Federal Regulations
DLN.....Dry Low NO_X Combustors
EPA .....Environmental Protection Agency
FGR .....Flue Gas Recirculation
HP.....High Pressure
LAER .....Lowest Achievable Emission Rate
LNB.....Low NOx Burner
MPI.....Main Production Island
MR&R.....Monitoring, Recordkeeping, and Reporting
NA .....Not Applicable
NESHAP .....National Emission Standards for Hazardous Air Pollutants
NSCR .....Non-selective Catalytic Reduction
NSPS .....New Source Performance Standards
PSD.....Prevention of Significant Deterioration
PTE.....Potential to Emit
RACT .....Reasonably Available Control Technology
RBLC .....RACT/BACT/LAER Clearinghouse
RM.....Reference Method
SCA .....Staged Air Combustion
SDI .....Satellite Drilling Island
SIC.....Standard Industrial Classification
SCR .....Selective Catalytic Reduction
SNCR .....Selective Non-catalytic Reduction
TAR.....Technical Analysis Report
TBD.....To Be Determined
uERD.....ultra-extended-reach drilling
WHRU.....Waste Heat Recovery Unit

Units and Measures

bhp.....brake horsepower or boiler horsepower
gr./dscf.....grains per dry standard cubic feet (1 pound = 7,000 grains)
dscf .....dry standard cubic foot
gph.....gallons per hour
g/hp-hr .....grams per horsepower-hour
g/kW-hr .....grams per kilowatt-hour
GW .....GigaWatt (electric) (= 10^6 kW)
hp.....horsepower
kW .....kilowatts (electric)
lb.....pounds
MMBtu .....million British thermal units
MMBtu/hr.....million British thermal units per hour
MMscf .....million standard cubic feet
MW.....Megawatts (electric)
MWh.....Megawatt hours
ng/J .....nanograms per Joule

ppm.....parts per million
ppmv.....parts per million by volume
ppmvd.....parts per million by volume dry
ppmw.....parts per million by weight
psig.....pounds per square inch gauge (overpressure above atmospheric pressure)
scf.....standard cubic feet (dry gas at 68 °F and absolute pressure of 760 mmHg)
scfm.....standard cubic feet per minute (dry gas at 68 °F and absolute pressure of 760 mmHg)
tph.....tons per hour
tpy.....tons per year
wt%.....weight percent

Pollutants

CO.....Carbon Monoxide
HAPS.....Hazardous Air Pollutants
H_2S.....Hydrogen Sulfide
NMHC.....non-Methane hydrocarbons
NO_X.....Oxides of Nitrogen
NO_2.....Nitrogen Dioxide
NO.....Nitric Oxide
PM-10.....Particulate Matter with an aerodynamic diameter less than 10 microns
S.....Sulfur
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 Minor Permit AQ0923MSS04 to Eni US Operating Co. Inc. (Eni) for the revisions at the Nikaitchuq Development (Nikaitchuq).

Eni requested to revise the emission unit inventory, ambient air quality protection requirements, and Owner Requested Limits (ORLs) to avoid Prevention of Significant Deterioration (PSD) classification authorized in Minor Permit AQ0923MSS01.

The Department issued AQ0923MSS01 to Kerr McGee Oil and Gas Corporation for the onshore oil and gas production pad at Nikaitchuq. The Department issued an administrative revision, AQ0923MSS01, Revision 1 to Eni reflecting the change in ownership of the stationary source. Eni withdrew their applications for AQ0923MSS02 and AQ0923MSS03. AQ0923MSS04 authorizes the addition of the offshore oil and gas production pad at the stationary source.

The Department will rescind AQ0923MSS01, Revision 1 with the issuance of AQ0923MSS04. This TAR only covers the basis for the **revisions described in the April 9, 2009 application**. This TAR revises Sections 2 through 7 in the TAR for Minor Permit AQ0923MSS01 dated May 5, 2006.

1.1 Application Description

Eni requested the following revisions to Minor Permit AQ0923MSS01, Revision 1 in the current application:

- Increase the total electrical generating capacity at the onshore facility from 12 megawatts (MW) of gas turbine generating capacity to 28 MW of gas turbine capacity.
- Increase the capacity of Emission Unit (Emission Unit) 3 from 1,700 hp to 2,000 hp and reclassify Emission Unit 3 from an emergency generator to a black start generator.
- Add several process and storage tanks to the emission unit inventory.
- Add several diesel-fired reciprocating engines and diesel fired boilers/heaters to the emission unit inventory.
- Remove the Frac engine from the intermittent emission unit inventory.
- Revise the oxides of nitrogen (NO_X) and carbon monoxide (CO) PSD avoidance ORLs to include several additional emission units under the annual caps on NO_X and CO emissions. (The annual caps on NO_X and CO emissions under the ORLs remain unchanged at 225 tons per year (tpy) each.)
- Revise the ambient air quality protection requirements specifying stack heights and concurrent operation of the drill rig and intermittent well service equipment.

1.2 Emissions Summary and Permit Applicability

Table 1 shows the Potential to Emit (PTE) in tpy at Nikaitchuq with the revised emission unit inventory and the revised PSD avoidance ORLs for NO_X and CO. Table 1 also shows the PTE at Nikaitchuq before the requested revisions as described in the AQ0923MSS01 TAR. As shown

in Table 1 this project is classified under 18 AAC 50.502(c) (3) for sulfur dioxide (SO_2). Because there are no CO nonattainment areas, the CO threshold in 18 AAC 50.502(c) (3) (A) (iv) does not apply. The drill rig and well servicing equipment engines and the construction camp generators are not included in the PTE because they are classified as non-road engines and their emissions do not count toward permit applicability.

Eni's PTE calculations for the revised emission unit inventory in the application included the following assumptions:

1. All emission units except incinerator (Emission Unit 48) under NO_X and CO annual caps of 225 tpy each.
2. Continuous operation except the following:
   a. 500 hours per year (hpy) each for the Blackstart and Emergency Generators (Emission Units 3 and 47).
   b. 816 hpy for the Well Servicing Equipment Hot Oiler Heater (Emission Unit 23).
   c. 200 hpy for the Well Servicing Equipment Heater (Emission Unit 24).
   d. 1,320 hpy each for the Well Servicing Equipment Boilers and Heaters (Emission Unit s 29 through 31).
   e. 86,112 gallons per year (gpy) fuel consumption each for Drilling Camp Generators (Emission Unit s 49 and 50) and Pump Engines (Emission Units 66 through 68).
   f. 1,041,667 gpy fuel consumption combined for Grind and Inject Power Engines (Emission Units 72 and 73).
   g. 98 million standard cubic feet per year fuel consumption for Safety Flare (Emission Unit 4) in emergency operation.
   h. 364,000 gpy fuel throughput through each for all tanks (Emission Units 5 through 8, 34 through 46, and 51 through 63).
3. AP-42 emission factors for incinerator for NO_X, CO, and Sulfur Dioxide (SO_2).
4. AP-42 emission factors for Particulate Matter with an aerodynamic diameter less than 10 microns (PM-10) for all emission units except tanks.
5. AP-42 emission factors for Volatile Organic Compounds (VOC) for all emission units except tanks.
6. U.S. Environmental Protection Agency (EPA) TANKS program for VOC emissions from all tanks.
7. Sulfur Dioxide (SO_2) emissions calculated by mass balance (except incinerator) as follows:
   a. Diesel fuel sulfur limited to 0.0015 weight percent Sulfur (wt% S) (or Ultra Low Sulfur Diesel (ULSD)) for all generators, Pump Engines, and Well Servicing Equipment[1].
   b. Diesel fuel sulfur limited to 0.30 weight percent Sulfur (wt% S) for all remaining liquid fuel burning emission units[2].

[1] Eni stated these Emission Units are required to burn ULSD under EPA's New Source Performance Standards (NSPS) Subpart IIII.
[2] Eni stated this is the typical wt%S for fuel from the Kuparuk Topping Plant.

c. Gaseous fuel limited to 250 parts per million volume (ppmv) Hydrogen Suflide (H_2S) concentration for Solar Taurus turbines (Emission Units 1, 2, 32, and 33) and Safety Flare[3].

Eni did not take into account the limit on operation of units under the NO_X and CO PSD avoidance ORLs when calculating PTE for PM-10, SO_2 and VOC. Due to the complexity involved in calculating the PTE for PM-10, SO_2, and VOC while considering the NO_X and CO PSD avoidance ORLs the Department accepts Eni's method for calculating the PTE for PM-10, SO_2 and VOC because Eni's method represents a worst-case PTE for these pollutants. Eni calculated the PTE for PM-10, SO_2, and VOC in a manner analogous to the PTE calculations in the application for AQ0923MSS01.

Table 2 shows the stationary source's assessable emissions with the requested revisions and excludes emissions from non-road engines[4].

[3] Eni stated the typical H_2S concentration of fuel gas from Kaparuk is between 150 and 200 ppmv.
[4] April 28, 2009 email from John F. Kuterbach to Department Air Quality staff stating that non road engines are not part of the stationary source and therefore cannot be included in emission fees.

Table 1 – Eni PTE and Minor Permit Applicability with ORLs, tpy

Activity	Emission Unit		PTE (tpy)				
	ID	Description	NO_X	CO	PM-10	VOC	SO_2
Onshore Production	1, 2, 32 and 33	Solar Taurus 70 turbines	Under ORL	Under ORL	9.24	52.56	44.0
	3	Black Start Generator	Under ORL	Under ORL	0.35	0.35	0.0
	4	Process Safety Flare (Pilot & Purge Operation)	Under ORL	Under ORL	1.82	11.73	0.1
		Process Safety Flare (Low Pressure Emergency Operation)	Under ORL	Under ORL	1.35	8.70	2.1
		Process Safety Flare (High Pressure Emergency Operation)					
	5 thru 8 and 34 thru 46	Storage Tanks	N/A	N/A	N/A	3.0	N/A
	69 thru 71	Boilers	Under ORL	Under ORL	0.14	0.02	2.8
	72 thru 73	Grind and Inject Engines	Under ORL	Under ORL	1.48	5.63	21.3
Offshore Production	47	Emergency Generator	Under ORL	Under ORL	0.17	0.35	0.0
	48	Incinerator	1.3	0.4	3.07	1.31	0.6
	49 and 50	Drilling Camp Generators	Under ORL	Under ORL	1.04	0.98	0.0
	51 thru 63	Storage Tanks	N/A	N/A	N/A	2.9	N/A
Onshore and Offshore Rig (Development Drilling)	9 thru 10	Cleaver Brooks Boilers	Under ORL	Under ORL	0.76	0.14	15.6
	11 thru 13	Tioga Rig Heaters	Under ORL	Under ORL	0.99	0.18	20.3
Island Construction and Drilling Support	66 thru 68	Pump Engines	Under ORL	Under ORL	0.72	1.41	0.0
Intermittent Emission Units	23, 24, and 29 thru 31	Boilers/Heaters	Under ORL	Under ORL	0.44	0.07	0.0
PTE (tpy)			**226.3**	**225.4**	**21.6**	**90.1**	**106.8**
PTE (tpy) from AQ0923MSS01 TAR			225	225	8.0	161.0	84
Change in PTE			1.3	0.4	13.6	(70.9)	22.8
Minor Permit Applicability Threshold			10	N/A	N/A[c]	N/A	10
Minor Permit Required?			*No*	*N/A*	*N/A*	*N/A*	*Yes*

Table Notes
a – PTE before modification below 18 AAC 50.502(c)(1) threshold

Table 2– Eni Stationary Source Assessable Emissions Summary, tpy

Pollutant	NO_X	CO	PM-10	SO_2	VOC	Total Assessable
PTE for stationary source	226.3	225.4	21.6	106.8	90.1	670

1.3 Department Findings

The Department made the following findings regarding Eni's application:

(1) Revising the existing Title I permit conditions described in the application requires a minor permit under 18 AAC 50.508(6).

(2) The increase in SO_2 PTE based on the revisions described in the application requires a minor permit under 18 AAC 50.502(c) (3) (See Table 1).

(3) An Alaska Ambient Air Quality Standard (AAAQS) ambient analysis for NO_2, SO_2, and PM-10 is required under 18 AAC 50.540(k) (3). The AAAQS ambient analysis for SO_2 is also required under 18 AAC 50.540(c) (2) (A).

(4) New Emission Units 23, 24, 32, 33, 47, 49 through 50 and 66 through 73 are fuel burning emission units subject to state Air Quality Control regulations 18 AAC 50.055(a)(1) for visible emissions, 18 AAC 50.055(b)(1) for particulate matter, and 18 AAC 50.055(c) for sulfur compound emissions. New Emission Unit 48 is an incinerator subject to state Air Quality Control regulations 18 AAC 50.050(a) for visible emissions and 18 AAC 50.050(b) for particulate matter.

(5) The revisions described in the application to existing emission units and adding new emission units will cause an increase in annual stationary source-wide NO_X, PM-10, SO_2, and CO PTE. The revisions will also cause a decrease in stationary source-wide VOC. The Department is also no longer counting emissions from non-road engines as assessable emissions (See Footnote 4). The Department will revise the stationary source wide assessable PTE listed in AQ0923MSS01, Revision 1.

(6) Nikaitchuq is located in the North Slope Borough coastal district. This project is consistent with the Alaska Coastal Management Program (ACMP) through AS 46.40.040(b)(1). The Department did not notify the local district and resource agencies of the permit action to request additional ACMP review because the North Slope Borough Coastal District does not have a final plan in effect at this time. The Department notified the local district of their opportunity to comment on the preliminary permit during the public notice.

2 PERMIT CONDITIONS

2.1 Requirements for all Minor Permits.

As described in 18 AAC 50.544(a), each minor permit issued under 18 AAC 50.542 must identify the stationary source, the project, the Permittee, and contact information, and the requirement to pay fees.

The permit cover page identifies the stationary source, the project, the Permittee, and contact information as required in 18 AAC 50.544(a)(1). The permit contains a requirement to pay fees

as required in 18 AAC 50.543(a)(2). The assessable emissions for the stationary source are 670 tpy, as shown in Table 2

2.2 Requirements for a Minor Permit for Air Quality Protection

As required under 18 AAC 50.544(c), each minor permit classified under 18 AAC 50.502(c) must contain

(1) terms and conditions as necessary to ensure that the source will not cause or contribute to a violation of an ambient standard,

(2) performance tests for state emission limits, and

(3) maintenance requirements according to the manufacturer's or operator's maintenance procedures.

2.2.1 Ambient Air Quality Analysis

See Section 2.3.1.

2.2.2 State Emission Standards

The new emission units being authorized in AQ0923MSS04 must comply with the state emission standards.

2.2.2.1 Visible Emission Standard

New Emission Units 23, 24, 32, 33, 47, 49 through 50 and 66 through 73 are fuel-burning equipment subject to the state standard for visible emissions in 18 AAC 50.055(a)(1). New emission unit 48 is an incinerator subject to the state standard for visible emissions in 18 AAC 50.050(a).

Eni did not provide a demonstration that these units will comply with the state standard. Because diesel fired reciprocating engines have the potential to exceed the visible emission standard, the Department is requiring Eni to conduct an initial visible emission surveillance test within 90 days of startup for Emission Units 47, 49, 50, 66 through 68, 72 and 73.

2.2.2.2 Particulate Matter Standard

New Emission Units23, 24, 32, 33, 47, 49 through 50 and 66 through 73 are fuel-burning equipment subject to the state standard for PM emissions of 0.05 grains per dry standard cubic foot of exhaust gas (gr./dscf) in 18 AAC 50.055(b)(1). New Emission Unit 48 is an incinerator subject to the state standard for PM emissions in 18 AAC 50.050(b). There is no PM standard under 18 AAC 50.050(b) for Emission Unit 48 because its rated capacity is under 1,000 pounds per hour.

Eni provided an initial compliance demonstration in the application showing the fuel burning units will comply with the standard. In their initial compliance demonstration, Eni used 40 CFR 60, Method 19.

2.2.2.3 Sulfur Dioxide Standard

New Emission Units 23, 24, 32, 33, 47, 49 through 50 and 66 through 73 are fuel-burning equipment subject to the state standard for sulfur emissions in 18 AAC 50.055(c)(1).

Eni provided an initial compliance demonstration in the application for the fuel burning units. In their initial compliance demonstration Eni used 40 CFR 60, Method 19 to show that if a liquid fuel sulfur content less than 0.74 weight percent sulfur is used in the emission units they will comply with the state standard for SO_2. The Department expects Eni's fuel will have a sulfur content low enough to meet the state standard. Eni also showed that if gaseous fuel with an H_2S content less than 5,553 ppmv is used in the emission units the will comply with the state standard for SO_2. The Department expects that Eni's gaseous fuel will have an H_2S content low enough to comply with the state standard.

2.2.3 Maintenance Requirements

As described in 18 AAC 50.544(c)(3), the permit must include maintenance of equipment according to manufacturer's or operator's maintenance procedures, keep records, and keep a copy of the maintenance procedures.

2.3 Requirements for a Minor Permit that Revises or Rescinds a Previous Title I Permit

As described in 18 AAC 50.544(i) a minor permit classified under 18 AAC 50.508(6) must contain terms and conditions as necessary to ensure that the permittee will construct and operate the stationary source in accordance with 18 AAC 50.

2.3.1 Ambient Air Quality Requirements

Eni submitted an ambient air quality modeling assessment to demonstrate that they can comply with the AAAQS listed in 18 AAC 50.010 while operating the revised emission unit inventory. The Department reviewed the modeling assessment and concurs that the revisions authorized by Minor Permit AQ0923MSS04 will comply with the AAAQS. The Department's review of the assessment is included in Appendix A of this TAR.

The Department has included operational limits, minimum stack heights, and fuel sulfur restrictions on the emission units in the minor permit to protect the AAAQS. The Department converted the operational limits required to protect the AAAQS in gpy on Emission Units 49, 50, 66 through 68, 72 and 73 to hpy because Eni will be tracking hours on these emission units as part of the NO_X and CO ORL avoidance limits. The gpy limits were based on AP-42 emission factors for fuel input, the Department used the AP-42 emission factors based on engine output to calculate hpy limits, the resulting PTE is identical.

The Department also is requiring all of the Drilling Rig emission units to burn ULSD fuel while operating offshore even though the ambient analysis demonstrated that the Drilling Rig boilers and heaters can burn 0.30 wt%S fuel while operating offshore. The Department is requiring this additional restriction after consultation with Eni to simplify the monitoring of fuel sulfur content while the Drilling Rig is operating offshore.

2.3.2 Revisions to Permit No. AQ0923MSS01, Revision 1

The Department is rescinding AQ0923MSS01, Revision 1 and incorporating the conditions in Permit No. AQ0923MSS04. The Department carried forward and revised the Permit No. AQ0923MSS01, Revision 1 Title I conditions as shown in Table 3.

Table 3 **– Description of AQ0923MSS01, Revision 1 Revisions**

AQ0923MSS01, Revision 1 Condition Number and Description	Description of how revised
1, Emission Unit authorization	Emission Unit inventory revised to include new emission units and revised ratings.
2, Drilling Rig authorization	Drilling Rig Emission Unit inventory revised to include new emission units and new cumulative rating.
3, Intermittent Well Servicing Equipment authorization	Intermittent Well Servicing Equipment Emission Unit inventory revised to remove emission units and to include new emission units.
6, Submittal of turbine specifications	Revised to include new turbines.
7, Submittal of diesel fired emission unit specifications	Revised to include new emission units under NO_X and CO PSD avoidance ORLs. Revised to require submittal of NO_X and CO emission factors for Department approval to be used in showing compliance with NO_X and CO PSD avoidance ORLs.
8, Drilling Rig notification	Revised to require Drilling Rig information submittals after Drilling Rig modification.
9, State Emission Standards	Revised to include new emission units under state emission standards. Revised to include PM and SO_2 state emission standards for all emission units.
10, CO PSD avoidance ORL	Revised to include additional emission units and use of Department approved CO emission factors for reciprocating engines
11, NO_X PSD avoidance ORL	Revised to include additional emission units and use of Department approved NO_X emission factors for reciprocating engines.
12, Turbine Emission Factors	Revised to include new turbines.
13, Ambient Air Quality Protection Requirements	Revised to include revised stack height requirements, revised fuel sulfur limits, revised operating limits, revised Public Access Control Plan and On-Site Housing requirements.
Appendix A, Turbine emission factors	Revised with new factors.
Appendix B, Public Access Control Plan	Revised with new plan.

3 PERMIT ADMINISTRATION

Eni has not obtained a Title V operating permit at this time. The Department intends to incorporate AQ0923MSS04 into Eni's initial Title V operating permit. Eni will need to submit a

Title V permit application within 12-months of beginning operation of the stationary source. Eni may operate under AQ0923MSS04 upon issuance.

Appendix A

Modeling Review Memorandum, dated 01/05/2010

(Inserted as a word document, formatting and page numbers may be different from original)

MEMORANDUM

State of Alaska
Department of Environmental Conservation
Division of Air Quality

TO: File

DATE: January 5, 2010

FILE NO.: AQ0923MSS04

THRU: Alan Schuler, P.E.
Environmental Engineer
Air Permits Program

PHONE: 269-7577
FAX: 269-7508

FROM: Patrick Dunn
Environmental Engineer Associate
Air Permits Program

SUBJECT: Review of Nikaitchuq Ambient Assessment

This memorandum summarizes the Department's findings regarding the ambient assessments submitted by Eni US Operating Co. Inc. (Eni) for the Nikaitchuq Development Project. Eni submitted this analysis in support of their April 2009 minor permit application (AQ0923MSS04). Eni intends to revise the emission unit inventory and add an offshore oil and gas production pad to the Nikaitchuq Project authorized in Minor Permit AQ0923MSS01. Eni is also requesting to revise conditions established to protect ambient air quality in Minor Permit AQ0923MSS01.

Eni's ambient air quality analysis adequately demonstrates that operating the Nikaitchuq Development Project emission units within the requested constraints will not cause or contribute to a violation of the Alaska Ambient Air Quality Standards (AAAQS) provided in 18 AAC 50.010.

The Department has previously reviewed and approved the Nikaitchuq "Phase 1" ambient assessment submitted by Kerr-McGee[5] in support of Minor Permit AQ0923MSS01. The Department's findings are described in the November 7, 2005 memorandum, "Review of Nikaitchuq Phase 1 Ambient Assessment." Kerr-McGee used the U.S. Environmental Protection Agency's (EPA's) *Industrial Source Complex Short-Term 3* (ISCST3) model for the ambient analysis described in the November 7, 2005 memorandum. In the ambient analysis for the current minor permit application Eni used EPA's subsequent replacement to ISCST3, the *AERMOD Modeling System* (AERMOD). Therefore, today's memorandum supersedes the November 7, 2005 memorandum, including any conclusions drawn for the Nikaitchuq Stationary Source.

BACKGROUND

Eni is constructing a new offshore oil and gas production pad at the Nikaitchuq Development Stationary Source on Alaska's North Slope, at Oliktok Point. The area is unclassified in regards to compliance with the ambient air quality standards. The Department previously authorized an

[5] Kerr-McGee was the Nikaitchuq Development Stationary Source owner at the time Minor Permit AQ0923MSS01 was issued. Eni subsequently became owner of this stationary source. In the AQ0923MSS01 application Kerr-McGee referred to the onshore production pad as Phase I and the future offshore pad as Phase II. Eni has dropped the Phase I and Phase II terminology in their application for AQ0923MSS04. Eni refers to the Nikaitchuq Development Project as including both onshore and offshore pads.

onshore pad in Minor Permit AQ0923MSS01. Eni subsequently applied for Minor Permits AQ0923MSS02 and AQ0923MSS03 but withdrew their applications.

Eni's current application triggers minor permit review under 18 AAC 50.502(c)(3)(A) for sulfur dioxide (SO_2) and 18 AAC 50.508(6). Per 18 AAC 50.540(c) (2) (A), applicants subject to 18 AAC 50.502(c) (3) (A) must provide an ambient AAAQS analysis for each pollutant for which a permit is required under 50.502(c) (3) (A). Per 18 AAC 50.540(k) (3), applicants subject to 18 AAC 50.508(6) must include in their application the effects of revising permit terms and conditions. Therefore, Eni provided an AAAQS ambient analysis for nitrogen dioxide (NO_2), SO_2, and particulate matter less than 10 microns in diameter (PM-10) under 18 AAC 50.540(k)(3). The AAAQS ambient analysis for SO_2 was also required under 18 AAC 50.540(c) (2) (A).

Eni did not submit a modeling protocol for Department review.

APPROACH

Eni used computer analysis (modeling) to predict the ambient air quality impacts. Hoefler Consulting Group conducted the modeling analysis on behalf of Eni.

Eni utilized the Department's *Intermittently Used Oilfield Support Equipment* guidance (Policy and Procedure No. 04.02.105, November 20, 2006) in their analysis. The Department noted in this document that current air quality models were not designed for estimating the ambient impact from small, intermittent, portable units and that a better way to manage the air impacts from these units is through the use of "cleaner" diesel fuel. Therefore, the Department is allowing applicants to exclude oil field support equipment rated at less than 400 brake-horsepower (bhp), or an equivalent heater rating, from the AAAQS analysis, if they agree to use fuel that essentially meets the guidance's fuel sulfur limits when operating those units. Policy and Procedure 04.02.105 requires a maximum fuel sulfur limit of 15 parts per million by weight (ppmw) after January 31, 2009. Fuel with a maximum sulfur content of 15 ppmw is also referred to as Ultra Low Sulfur Diesel (ULSD) fuel. Eni stated their intention to comply with the above fuel sulfur target when operating intermittent oilfield support equipment.

Eni modeled two different scenarios. Scenario 1 has the workover rig operating at the offshore pad concurrently with the drill rig operating at the onshore pad. The other oil field support equipment is operating concurrently at both the onshore and offshore pads. All other onshore and offshore emission units are operating concurrently. Scenario 2 is similar except the workover rig is operating at the onshore pad concurrently with the drill rig operating at the offshore pad. All other emission units are operating concurrently as in Scenario 1.

Model Selection

There are a number of air dispersion models available to applicants and regulators. The EPA lists these models in their *Guideline on Air Quality Models* (Guideline). As previously stated Eni used AERMOD for the ambient analysis. AERMOD is an appropriate model for this analysis.

The AERMOD Modeling System consists of three components: AERMAP (which is used to process terrain data and develop elevations for the receptor grid/emission units), AERMET

(which is used to process the meteorological data), and AERMOD (which is used to estimate the ambient concentrations). Eni used the current version for AERMET (version 06341). Eni also used the current version of AERMOD (version 07026) at the time of their application. Eni did not use AERMAP in this modeling analysis because the terrain is flat surrounding Nikaitchuq. Eni's approach is acceptable.

The EPA has subsequently released AERMOD version 09292 after Eni's application submittal. The Department generally does not make applicants update their permit applications if there is a subsequent model change. Eni nevertheless evaluated the potential effects of the changes with their subsequent modeling submittal to account for downwash as described in the 'Downwash' discussion later in this memorandum.

Meteorological Data

AERMOD requires hourly meteorological data to estimate plume dispersion. According to the Guideline, five years of adequately representative data should be used (when available) to account for year-to-year variation. Eni used two sites for surface meteorological data as described below.

Eni used three years (November 1, 1990 through October 31, 1992 and July 1, 2001 through June 30,2002) of surface data collected at Drill Site 1F (DS1F) of the Kuparuk River Unit. This three year data set was the maximum number of years of data available at DS1F. DS1F is located approximately 26 kilometers south-southeast of Oliktok Point. Eni used the 1990-1992 data because this data is a long standing data set used in other ambient analyses. The 1990-1992 data was supplemented with the newer 2001-2002 data. As described in Heidi Strader's January 31, 2007 memorandum, *Review of DS1F Data Jul 2001 – June 2002*, the 2001-2002 data complies with EPA's quality assurance requirements.

AERMET requires either solar radiation/delta-temperature (SRDT) or cloud cover data for characterizing atmospheric stability. The 2001-2202 data included SRDT data (which Eni used), but the 1990-1992 data did not. Therefore Eni used the best alternative for the 1990 -1992 data set, cloud cover data collected during the same time periods at the Deadhorse Airport National Weather Service (NWS) station. This station is located 45 kilometers east-southeast of DS1F. The measured cloud cover adequately represents the expected cloud-cover at DS1F.

Eni used concurrent upper air data from the nearest available source, the NWS station in Barrow.

AERMET requires site-specific values (representative of the meteorological site) for the following three surface characteristics: noon-time albedo, bowen ratio, and surface roughness length. Eni used one sector to define the DS1F site-specific values because the area surrounding DS1F is homogeneous. Eni used the values previously approved by the Department for the North Slope Coastal Plain. The values are described in the Department's January 25, 2006 protocol approval letter to ConocoPhillips Alaska, Inc. (CPAI) for the Central Production Facility #3 (CPF-3) ULSD Project. At the time the AERMET site-specific values were approved for DS1F by the Department, the meteorological data was processed with surface parameters based on a weighted average over a radius of 3 kilometers measured from the meteorological site. The EPA has since updated the methods for calculating the weighted average of the surface

parameters. Although Eni did not reprocess the meteorological data with AERMET using the updated methods the Department finds this acceptable because the area is primarily homogeneous and any changes that would result in reprocessing the meteorological data with AERMET would be minor.

Eni also used five years (January 1, 2001 through December 31, 2005) of surface meteorological data collected at the Milne Point F Pad (F pad). This five year data set was collected by the Minerals Management Service (MMS). The F pad is located approximately 8 kilometers east of Oliktok Point. Although this data has not yet been reviewed for compliance with EPA's quality assurance requirements, it provides a potential representation of the coastal surface meteorological conditions that may occur on the North Slope. Eni used this coastal fiver year data set to supplement the DS1F data because the DS1F site is located inland.

As discussed previously AERMET requires either SRDT or cloud cover data for characterizing atmospheric stability. SRDT data was not collected at F Pad; therefore Eni used cloud cover data collected during the same time periods at the Deadhorse Airport NWS station. This station is located approximately 56 kilometers southeast of F Pad. The measured cloud cover adequately represents the expected cloud cover at F Pad.

Analogous to the DS1F data, Eni used concurrent upper air data from the nearest available source to the F pad, the NWS station in Barrow.

As discussed previously, AERMET requires site-specific values (representative of the meteorological site) for the following three surface characteristics: noon-time albedo, bowen ratio, and surface roughness length. Eni used two sectors to define the F pad site-specific values, one for water and one for land. Eni used the land values previously approved by the Department for the North Slope Coastal Plain. These values are described in the Department's January 25, 2006 protocol approval for CPAI's CPF-3 ULSD project. Eni used the water values previously approved by the Department for the Beaufort Sea. These values are described in the Department's April 26, 2007 protocol approval letter to BPXA for the Liberty Project.

EPA allows applicants to compare the high second-high (h2h) modeled concentration to the short-term air quality standards if at least one year of temporally representative site-specific, or five years of representative off-site data, are used. When these criteria are not met, then applicants must use the high first-high (h1h) concentration. In all cases, applicants must compare the h1h modeled concentration to the annual average standards. The Department allowed Eni to compare the h2h modeled concentration to the short-term standards since they used more than one year of site-specific data.

Eni used the concatenated November 1, 1990 through October 31, 1992 DS1F data set to model both annual and short term impacts. While use of a concatenated meteorological data set will not underestimate short term impacts compared to using the two years of data as individual annual data sets, it will underestimate the "annual" impacts since the impacts are averaged over two years rather than one year. The Department will nevertheless accept the use of the concatenated two year data set for this application, since the "annual" impacts of the concatenated two year

data set are well below the AAAQS. However, ***Eni must use non-concatenated annual data sets in all future modeling of annual overage impacts.***

Emission Unit Inventory
Eni modeled the emission units listed in Table 1 of Tab J of their application. The on-site inventory includes the permanent emission units, the Nabors 245E drilling rig, and intermittent oil-field support equipment with ratings larger than 400 bhp. The permanent emission units consist of four 7.5 megawatt (MW) Solar Taurus gas turbines, one emergency diesel-fired generator, one diesel-fired blackstart generator, two grind and inject diesel-fired engines, three diesel-fired pump engines, two drilling camp diesel-fired generators, three diesel-fired boilers, a diesel-fired incinerator, and a process safety flare. Eni is not planning to install any process or space heaters. They instead plan to install a waste-heat recovery unit on each turbine to meet their heating needs. The approximate locations of the modeled units are shown in of Tab D of their application.

Emission Rates and Stack Parameters
The assumed emission rates and stack parameters have significant roles in an ambient demonstration. Therefore, the Department checks these parameters very carefully. The following parameters or assumptions warrant special comment. Due to the number of topics associated with the Solar Taurus turbines, the emission rates and stack parameters associated with the turbines is discussed in a separate section of this memorandum.

Minor Permit AQ0923MSS01 contained an Owner Requested Limit (ORL) for potential NO_X emissions to prevent the Nikaitchuq Development Stationary Source being classified as a Prevention of Significant Deterioration (PSD) major stationary source. This condition is being carried forward in Minor Permit AQ0923MSS04. Eni did not include any assumptions associated with the ORL when calculating emission rates.

<u>Ambient SO_2 Modeling</u>
SO_2 emissions are directly related to the amount of sulfur in the fuel. Eni will use both fuel gas and liquid fuel (diesel) to operate their combustion units. The sulfur in fuel gas is in the form of hydrogen sulfide (H_2S). Eni assumed the maximum H_2S content of the fuel gas is 250 parts per million by volume (ppmv). The Department is including this assumption as a permit condition.

Eni assumed the sulfur content of the diesel fuel as follows:

- Drill rig operating onshore, all emission units 0.30 percent, by weight (wt%S)
- Drill rig operating offshore, boilers and heaters 0.30 wt%S and ULSD in the reciprocating internal combustion engines.
- Onshore production emission units, 0.3 wt%S with the exception of ULSD in the black start generator.
- Offshore production units, ULSD.
- Island Construction and Drilling Support emission units, ULSD.
- Intermittent emission units, ULSD.

Because these sulfur content values are lower than the maximum allowed by the American Society for Testing and Materials (ASTM) for #1 and #2 diesel fuel, the Department is limiting the sulfur content for purposes of protecting the SO_2 AAAQS.

Generators, Pump Engines, and Grind and Inject Power Engines

Eni assumed the emergency generator and blackstart generator only operate 500 hours per year (hr/yr) each. Eni assumed the maximum fuel consumption in the mud pump, cement pump, the grind and inject pump, and the drilling camp generators is 86,112 gallons per year (gal/yr) each. Eni also assumed the combined maximum fuel consumption in the grind and inject power engines is 1,041,667 gal/yr. The Department is including these assumptions to protect the annual average NO_2 and SO_2 AAAQS as an ambient air condition in the minor permit.

Peak and Manitowoc Cranes, boilers/heaters and vibration hammer

The 500 ton "Peak" crane, the 300 ton "Manitowoc" crane, the hot oiler boiler/heater, the boiler heater and the vibration hammer are intermittent well servicing equipment that warrant special discussion. The Peak crane has a 650 bhp engine, the Manitowoc crane has a 575 bhp engine, the hot oiler boiler/heater has a rating of 6.0 MMBtu/hr, the boiler/heater has a rating of 9.5 MMBtu/hr and the vibration hammer has a rating of 625 bhp. This makes them subject to the ambient air analysis. However, unlike the other intermittent well servicing equipment, Eni-assumed these units operate concurrently with the drill rig at the same pad. (see following discussions). Therefore, the Department is specifically listing these units in the minor permit to distinguish them from all other intermittent well servicing equipment.

The Department limited the hours of operation of both the Peak and Manitowoc cranes to protect the annual average NO_2 AAAQS in Minor Permit AQ923MSS01 based on the modeled assumptions. In the current ambient analysis Eni increased the assumed operation of the Manitowoc crane to 4,380 hr/yr and assumed the Peak crane operates continuously (i.e., 8760 hr). Therefore, the Department is removing the operating limit on the Peak crane since it is no longer necessary to protect the annual average NO_2 AAAQS and revising the operating limit of the Manitowoc Crane to protect the annual average NO_2 AAAQS. The Department is also including the operating limit on the Manitowoc Crane to protect the annual average SO_2 AAAQS because of the compliance margin in the current ambient analysis.

Eni assumed the hot oiler boiler/heater operates 816 hr/yr, the boiler/heater operates 2,000 hr/yr and the vibration hammer operates 252 hr/yr. The Department is including these assumptions in the minor permit to protect the annual average NO_2 and SO_2 AAAQS.

Drill Rig

Eni assumed none of the intermittent well servicing equipment operates concurrently with the drill rig at the same pad, except for the Peak and Manitowoc cranes, the boilers/heaters and the vibration hammer. Therefore, the Department is including this assumption as a condition in the minor permit.

Workover Rig

Eni included a workover rig in the intermittent well servicing emission inventory. They assumed the workover rig only operates 1,320 hr/yr (55 days per year) and never concurrently with the drill rig at the same pad.

The 1,320 hr/yr operating assumption was included by the Department to protect the NO_2 AAAQS in Minor Permit AQ923MSS01. The Department will carry this condition forward in Minor Permit AQ0923MSS04. The Department is also including this operating limit to protect the annual average SO_2 AAAQS because of the compliance margin in the current ambient analysis.

As previously noted, Eni assumed the workover rig and drill rig are not operating concurrently at the same pad. Even with these assumptions, the maximum 24-hour SO_2 impact (with background) is 337.9 $\mu g/m^3$, which is 93-percent of the AAAQS. The maximum 24-hour PM-10 impact (with background) is 148.1 $\mu g/m^3$, which is 99-percent of the AAAQS. Therefore, in order to protect the 24-hour SO_2 and PM-10 AAAQS, the Department is prohibiting concurrent operation of the drill rig and intermittent well servicing equipment at the same pad (except for the cranes, boilers/heaters and vibration hammer).

Horizontal/Capped Stacks

The presence of horizontal stacks or stacks with rain caps requires special handling in an AERMOD analysis and can greatly increase the ambient impacts. Eni assumed the exhaust stacks on all permanent, drilling rigs, and intermittent well servicing emission units have vertical outlets without raincaps. Due to the fairly high ambient impacts and the critical nature of this assumption, the Department is including a permit condition to require uncapped stacks with vertical outlets for all fuel burning units (except for intermittent well servicing equipment smaller than 400 bhp or 2.8 MMBtu/hr).

Stack Heights

Due to the fairly high ambient impacts the Department is including a permit condition to require minimum stack heights for all fuel burning units rated at greater than 400 bhp or 2.8 MMBtu/hr and with modeled stack heights greater than 4.0 meters.

The Department included minimum stack height requirements in Minor Permit AQ0923MSS01 to protect ambient air quality. In the current application Eni requested to revise some of the minimum stack heights based on the current ambient analysis. There was some inconsistency between what Eni requested and the modeled stack heights in the current ambient analysis. Eni requested to lower the stack height of the emergency generator but it was modeled at a higher stack height than the minimum stack height established in Minor Permit AQ0923MSS01. Eni also modeled the workover rig engines at a higher stack height than the minimum stack height established in Minor Permit AQ0923MSS01. Therefore, the Department is revising stack heights as requested by Eni only if the modeled stack heights in the current ambient analysis are lower than the minimum stack height requirements in Minor Permit AQ0923MSS01. All minimum stack height requirements in Minor Permit AQ0923MSS04 are based on the modeled stack heights in the current ambient analysis. The required stack heights are shown in Table 3.

Solar Taurus Turbine Parameters

Eni intends to install four 7.5 MW Solar Taurus turbines. Eni stated in their application that they intend to only operate three turbines at a time, while keeping the fourth turbine in standby. However, for purposes of the ambient demonstration, they took the conservative approach of assuming both turbines are fully operating.

Eni intends to use an electrical inlet preheater on each turbine during sub-zero conditions. The 760 kilowatt preheater will increase the combustion air temperature up to 0^0F. The use of inlet preheating is a critical component of Eni's PSD avoidance strategy for CO, and also reduces the worst-case short-term NOx emissions. Eni also intends to install a waste heat recovery unit (WHRU) on all four turbines to obtain process and space heat. The WHRU will *not* include a supplemental burner. The turbines will *not* have a separate stack for the WHRU bypass.

The maximum ambient concentration does not always occur during the full-load conditions that typically produce the largest emissions. The relatively poor dispersion that occurs with cooler exhaust temperatures and slower part-load exit velocities may produce the maximum ambient impacts. Therefore, EPA recommends that part-load conditions by analyzed as well as full-load conditions. In addition to part-load concerns, turbine emissions, stack temperatures and exhaust flow rates vary with ambient temperatures. Therefore, ambient temperatures must also be evaluated when modeling turbines.

Eni used the largest short-term NOx emission factor and the worst case stack parameters regardless of load provided by the vendor for an ambient temperature of 0^0F. The Department finds Eni's approach acceptable. For the current ambient analysis the Department is relying on a previous load analysis provided by Kerr-McGee and a Department sensitivity analysis on the relationship between ambient temperatures and NO_2 impacts conducted in support of Minor Permit AQ0923MSS01. As previously stated, the ambient analysis for Minor Permit AQ0923MSS01 used ISCST3 while the current ambient analysis used AERMOD. Because the compliance margin for the NO_2 impacts in the ambient analysis for Minor Permit AQ0923MSS01 were much smaller than for the current ambient analysis and the turbine stack heights have been increased more than three fold in the current ambient analysis, the Department believes the conclusions from the previous load analysis and sensitivity analysis are still valid despite the use of different models.

The Department is including the text describing the previous load analysis and sensitivity analysis below in italics.

Kerr-McGee used the stack parameters from other North Slope turbines in the August 2005 submittal. However, they later conducted a load analysis using unit-specific stack parameters provided by Solar. They also used the worst-case stack parameters for any given ambient temperature. Kerr-McGee showed that the turbines have relatively small impacts (compared to the cumulative impact) and that the potential change in impacts due to load are too small to jeopardize their August 2005 compliance demonstration.

The Department conducted a sensitivity test to determine whether the use of inlet preheating is a critical component of Kerr-McGee's November 2, 2005 NO_2 demonstration. The Department

ran the worst-case meteorological year (1990) using the largest short-term NOx emission factor provided by the vendor. The Department also used the worst-case stack parameters. The maximum NO_2 impact (including the background concentration) increased from 98.4 micrograms per cubic meter ($\mu g/m^3$) to 99.6 $\mu g/m^3$. This still complies with the 100 $\mu g/m^3$ AAAQS. Due to the conservative nature of Kerr-McGee's characterization of the Solar Taurus turbines, the Department is not imposing any permit restrictions on the turbines for purposes of protecting the AAAQS.

Ambient NO_2 Modeling

The modeling of ambient NO_2 concentrations can sometimes be refined through the use of ambient air data or assumptions. Eni used the *Plume Volume Molar Ratio Method* (PVMRM) to refine the estimated ambient NO_2 impacts from the Nikaitchuq emission units. The use of the PVMRM method is appropriate for the Nikaitchuq emission units.

EPA and Department Approval

PVMRM is a non-Guideline method and therefore, requires EPA and Department approval per 18 AAC 50.215(c)(2). EPA Region 10 (R10) granted Eni permission to use PVMRM for the Nikaitchuq application on November 16, 2009.[6] The Air Permits Program Manager[7] gave approval on October 20, 2009.

Public Comment

The use of a non-Guideline method is subject to public comment. Therefore, the Department is seeking comment regarding the use of PVMRM in the public notice for the preliminary permit decision.

In-Stack NO_2-to-NOx Ratio

The NO_X emissions created during combustion is partly nitric oxide (NO) and partly NO_2. EPA's long-standing practice is to assume that 90 percent (by volume) of the in-stack emissions is NO, and 10 percent is NO_2. After the combustion gas exits the stack, additional NO_2 is created as the exhaust mixes with atmospheric ozone.

The assumed NO_2-to-NO_X in-stack ratio is a variable that must be set in PVMRM. Eni used the 10 percent NO_2 assumption in their application for the reciprocating internal combustion engines, boilers, heaters and the incinerator. This is a reasonable assumption for these emission units. Eni used the 30 percent NO_2 assumption in their application for the turbines. This is a reasonable assumption for the turbines. Eni stated no vendor data for the NO_2-to-NO_X in-stack ratio for the turbines was available.

Ozone Data

PVMRM requires ambient ozone data in order to determine how much of the NO is converted to NO_2. BPXA collects ambient ozone data at their Prudhoe Bay A-Pad ambient monitoring station. Eni used the same compiled A-Pad ozone data set as previously used for the Liberty Project. The Department has previously approved this approach for BPXA's Endicott Stationary Source

[6] E-mail from Herman Wong (R10) to Patrick Dunn; *Re: FW: PVMRM Request*; November 16, 2009.

[7] The Commissioner delegated his authority regarding the use of non-guideline models to the Air Permits Program Manager on June 3, 2008

as described in the November 22, 2008 memorandum "Review of BP Liberty Modeling Ambient Air Assessment REVISED." The Department continues to find this approach acceptable for ozone data.

Ambient Air Boundary and Receptor Grid

For 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. Eni used the pad edge of both the onshore and offshore pads as the ambient air boundary.

The ambient air boundary at both pads will be indicated by markers and signs, and will be controlled according to Eni's October 21, 2009 Public Access Control Plan. The Department is incorporating these provisions as permit conditions.

Eni constructed the receptor grid as follows:

- Approximately 10 meter spacing along the ambient air boundary,
- 50 meter radius incremental rings centered at the center of each pad from the edge of each pad to a distance of 400 meters,
- 100 meter radius incremental rings centered at the center of each pad from a distance of 400 meters from each pad boundary to 1000 meters, and
- A rectangular grid with 100 meter spacing in the space between the outer edges of the two circular grids.

The receptor grid is adequate for this analysis since the maximum impacts occur in the near field (due to downwash). Because past ambient assessments used a 25 meter spacing receptor grid, the Department investigated the effect of adding additional receptors in the vicinity of the maximum impacts for the worst case short term analyses for PM-10 and SO_2 which had the smallest margin of compliance. The Department found no difference in maximum impacts. The Department acknowledges that the grid does not extend far enough for Eni to determine the size of their significant impact area (SIA), which would be needed if there are distant areas of concern with potential overlapping impacts. However, as discussed later in this memorandum, Eni adequately accounted for off-site impacts. The Department further notes that there are no off-site sources of concern (other than Kuparuk Seawater Treatment Plant (KSTP), the Oooguruk Development Project and the Oliktok Construction Camp) that warrant an extended grid.

Worker Housing

Eni has not decided whether to house their employees and contractors on-site so they did not include any worker housing within the ambient air boundary. Therefore, Eni will need to follow the requirements described in Eni's November 3, 2009 Eni Working Times and Hours Policy document if employees and contractors are housed on-site. This document contains the provisions of the Department's October 8, 2004 Policy and Procedure "Ambient Air Quality Issues at Worker Housing" (Procedure No. 04.02.108).

Downwash

Downwash refers to conditions where nearby structures influence the plume pattern. Downwash can occur when a stack height is less than a height derived by a procedure called "Good

Engineering Practice," as defined in 18 AAC 50.990(42). The modeling of downwash-related impacts requires the inclusion of dimensions from nearby buildings. EPA has established specific algorithms for determining which buildings must be included in the analysis and for determining the profile dimensions that would influence the plume from a given stack. EPA has incorporated these algorithms in a separate computer program called the "Building Profile Input Program Prime" (BPIPPRM).

Eni used BPIPPRM (version 04274) to determine the building profiles needed by AERMOD for the site-specific emission units. This is the current version of BPIPPRM.

Eni included downwash for some of the off-site sources in the initial modeling analysis (see "Off-site Impacts" discussion). Eni included downwash for the Oooguruk Development Project emission units. Because of the distance between the Nikaitchuq Development and the Oliktok Construction Camp downwash was not included for Oliktok emission units.

Eni did not account for downwash for the KSTP emission units in their initial modeling analysis. The Department requested Eni account for downwash for the KSTP emission units due to their proximity to the Nikaitchuq Development. The Department also requested that Eni use the latest version of AERMOD with their subsequent analysis accounting for downwash for the KSTP emission units. Eni demonstrated compliance with the short term AAAQS in their subsequent analysis by using the worst case short term pollutant and the worst case meteorological data year from the initial modeling analysis. This corresponded to the 24-hr PM-10 impact and the 2004 meteorological data for each scenario. Eni demonstrated compliance with the annual AAAQS in their subsequent modeling analysis by using the worst case NO_2 impact and the worst case meteorological data year from the initial modeling analysis for each scenario. This corresponded to the 2004 meteorological data year for each scenario. The maximum increase in impact for the short term and annual impacts for each scenario in the subsequent analysis was no greater than 0.2 $\mu g/m^3$.

The Department expects a similar increase in impact would occur for all pollutants and averaging periods when accounting for downwash for the KSTP emission units for all of the meteorological data used in the initial analysis. Therefore, the Department finds Eni's subsequent analysis only addressing the worst case 24-hr PM-10 impacts and the worst case NO_2 impacts acceptable to show compliance with the AAAQS for all pollutants and averaging periods while accounting for downwash from the KSTP emission units.

Off-Site Impacts

In a cumulative impact analysis, the applicant must include impacts from large sources located within 50 km of the applicant's SIA. These impacts from "off-site" sources are typically assessed through modeling. However, the off-site impacts in an AAAQS analysis can also be accounted for with ambient monitoring data, if representative data is available.

Eni included the KSTP, the Oooguruk Development Project and the Oliktok Construction Camp emission units in the modeling analysis. This approach is appropriate due to the close proximity of these off-site sources and the steep concentration gradients associated with building downwash. Eni used DS-1F ambient monitoring data (see "Background Concentrations"

discussion) to account for the impact from regional off-site sources. The Department agrees that the DS-1F data adequately represents the worst-case impact from regional off-site sources.

Background Concentrations

The background concentration represents impacts from sources not included in the modeling analysis. Typical examples include natural, area-wide, and long-range transport sources. The background concentration must be evaluated on a case-by-case basis for each ambient analysis. Once the background concentration is determined, it is added to the modeled concentration to estimate the total ambient concentration.

Eni used the maximum concentrations measured at DS1F during the July 1, 2001 through June 30, 2002 monitoring program to represent the background concentrations at Oliktok Point. The Department has and is continuing to accept these data as regional background concentrations for the Kuparuk River area. The background concentrations are provided in the results section of this memorandum.

RESULTS AND DISCUSSION

The maximum NO_2, SO_2 and PM-10 AAAQS impacts for the Nikaitchuq Development Project for Offshore and Onshore operations are shown in Table 1 and Table 2 respectively. The background concentration, total impact and ambient standard are also shown. The total impacts are less than the applicable AAAQS. Therefore, Eni has demonstrated compliance with the NO_2, SO_2 and PM-10 AAAQS for the Nikaitchuq Development Project.

Table 1 – Scenario 1 - Workover Drill Rig Offshore Maximum AAAQS Impacts

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)[a]	Bkgd Conc ($\mu g/m^3$)	TOTAL IMPACT: Max conc plus bkgd ($\mu g/m^3$)	Ambient Standard ($\mu g/m^3$)
NO_2	Annual	81.3	5.6	**86.9**	100
SO_2	3-hr	604.6	28.8	**633.4**	1,300
	24-hr	324.8	13.1	**337.9**	365
	Annual	72.9	0.1	**73.0**	80
PM-10	24-hr	83.2	60.4	**143.6**	150
	Annual	11.0	6.2	**17.2**	50

Table Notes:

[a] – Annual NO_2 impact and 24-hr PM-10 impact includes downwash from KSTP emission units and AERMOD version 09292

Table 2 – Scenario 2 - Workover Drill Rig Onshore Maximum AAAQS Impacts

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)[a]	Bkgd Conc ($\mu g/m^3$)	TOTAL IMPACT: Max conc plus bkgd ($\mu g/m^3$)	Ambient Standard ($\mu g/m^3$)
NO_2	Annual	75.1	5.6	**80.7**	100
SO_2	3-hr	645.6	28.8	**674.4**	1,300
	24-hr	319.0	13.1	**332.1**	365
	Annual	48.5	0.1	**48.6**	80
PM-10	24-hr	87.7	60.4	**148.1**	150
	Annual	13.3	6.2	**19.52**	50

Table Notes:
[a] – Annual NO_2 impact and 24-hr PM-10 impact includes downwash from KSTP emission units and AERMOD version 09292

It is important to note that since ambient concentrations vary with distance from each emission unit, the maximum values shown represent the highest value that may occur within the area. The concentrations at other locations within the area should be less than the values reported above.

CONCLUSION

The Department reviewed Eni's ambient analysis for the Nikaitchuq Development Project and concluded the following:

1. The NO_2, PM-10 and SO_2 emissions associated with operating the stationary source within the requested operating limits will not cause or contribute to a violation of the AAAQS listed in 18 AAC 50.010.
2. Eni's modeling analysis fully complies with the showing requirements of 18 AAC 50.540(c)(2) and 18 AAC 50.540(k)(3).
3. Eni conducted their modeling analysis in a manner consistent with EPA's *Guideline on Air Quality Models*.

The Department developed conditions in the minor permit to ensure Eni complies with the AAAQS. These conditions are summarized below.

1. Establish and maintain the ambient boundaries described in the October 21, 2009 Public Access Control Plan using the procedures therein.
2. If on-site housing for employees and contractors is provided, follow the requirements described in the November 3, 2009 Eni Working Times and Hours Policy document.
3. For all fuel burning units (except for intermittent well servicing equipment smaller than 400 bhp or 2.8 MMBtu/hr), use uncapped stacks with vertical outlets. The stacks may have flapper valve rain covers, but no cap design that hinders the vertical momentum of the exhaust plume.
4. For all gas-fired emission units, limit the maximum H_2S content to 250 ppmv.
5. For all liquid-fired emission units, limit the maximum fuel sulfur content as follows:
    - Drill rig operating onshore , all emission units 0.30 wt%S

- Drill rig operating offshore, boilers and heaters 0.30 wt%S and ULSD in the reciprocating internal combustion engines.
- Onshore production emission units, 0.30 wt%S with the exception of ULSD in the black start generator.
- Offshore production units, ULSD.
- Island Construction and Drilling Support emission units, ULSD.
- Intermittent emission units, ULSD.

6. For the emergency and black start generators, limit the operation to 500 hr/yr each.
7. For the intermittent well service equipment hot oiler boiler/heater, limit the operation to 816 hr/yr.
8. For the intermittent well service equipment boiler/heater, limit the operation to 2,000 hr/yr.
9. For the intermittent well service equipment vibration hammer, limit the operation to 252 hr/yr.
10. For the drilling camp generators and pump engines, limit the fuel consumption to 86,112 gal/yr each (or hr/yr equivalent).
11. For the grind and inject power engines, limit the fuel consumption to 1,041,667 gal/yr *combined* (or hr/yr equivalent).
12. Do not operate the drill rig and workover rig concurrently at the same pad.
13. For the workover rig, limit the operation to 55 days per year.
14. For the Manitowoc crane, limit the operation to 4,380 hr/yr.
15. Maintain the above ground stack heights of the Nikaitchuq Development emission units as shown in Table 3.

Table 3 Minimum Stack Height Requirements

Emission Unit ID	**Unit Description**	**Minimum Stack Height Above Ground (meters)**
1, 2, 32 and 33	Gas Turbines	28.0
3 and 47	Black Start Generator and Emergency Generator	10.7
9 through 12, 49 and 50	Drill Rig Boilers and Heaters and Drilling Camp Generators	12.8
14 through 17	Drill Rig Engines	14.8
26 through 28	Workover Rig Engines	11.6

31	Workover Rig Boilers and Heaters	9.1
66 through 68	Pump Engines	8.2
72 and 73	Grind and Inject Power Engines	9.8