Shell Offshore Inc.
3601 C Street, Suite 1314
Anchorage, AK 99503

March 29, 2011

Mr. Doug Hardesty
OCS/PSD Air Quality Permits
U.S. EPA Region 10, AWT-107
1200 Sixth Avenue, Suite 900
Seattle, WA 98101

Re: OCS Permit Applications, Conical Drilling Unit Kulluk, Beaufort Sea
EPA Additional Information Request

Dear Mr. Hardesty:

Shell is providing the following information in support of its *OCS Permit Application, Conical Drilling Unit Kulluk, Beaufort Sea* application package. This submission addresses issues raised in EPA Region 10's March 18, 2011 letter identifying initial concerns with the application that Shell submitted on February 28, 2011.

Shell's February 28 application had two parts: the first titled *EPA Outer Continental Shelf (OCS) Operating Permit Application*; the second titled *Supplement to EPA Outer Continental Shelf (OCS) Operating Permit Application*. In order to provide a clear response to EPA's request for clarification, Shell has reworked the first part in its entirety and revised the second part slightly.

Application Forms

In response to EPA's first two initial concerns, Shell is providing applications in three parts. Shell is applying for three permits: a federal Part 71 operating permit; a minor permit under Alaska rules; and an associated Title V operating permit under Alaska rules. In each case, the applications seek permit limits that will ensure the project will not result in NAAQS violations and ensure that project emissions will remain below major source thresholds.

The need for three permits results from the fact that Shell is seeking approval to operate both within and beyond 25 miles of Alaska's seaward boundary. EPA is the permitting authority in both cases under the OCS air regulations, but the applicable permitting rules differ. For operations outside the boundary (referred to as the "outer OCS"), the federal 40 C.F.R. Part 71 Operating Permit rules apply. Shell's application for a federal Part 71 Operating Permit for operations in this area, comprised of EPA's Part 71 forms, is the first component of the enclosed submission.

For operations within the seaward boundary (referred to as the "inner OCS"), EPA applies the corresponding onshore area (COA) rules – in this case the Alaska permitting rules in 18 AAC 50. Shell's application for a minor permit for air quality protection under 18 AAC

50.502(c), using ADEC's Minor Permit Application Forms, is the second component of the attached submission.

The third component of the attached submission is an operating permit application for inner OCS operations. Alaska does not have its own Title V forms, so for ease of processing Shell has used the federal Part 71 forms to provide the application information required by the Alaska Title V permit rule. Shell asks that EPA process the minor and Title V permits concurrently to the fullest extent possible.

Shell also requests that EPA consolidate the federal Part 71 and Alaska Title V permits into a single permit to facilitate the notice and comment process as well as operational use. Alaska rules adopt by reference much of the federal Part 71, therefore, consolidating should be straightforward.

Modeling

Shell is in ongoing discussions with Region 10 and Alan Schuler to address the modeling issues raised in EPA's March 18 letter.

Lease Block Map

Shell is providing a figure consistent with EPA's request for a large-scale map showing all OCS lease blocks currently issued in the Beaufort Sea, including a list showing lease block designations and associated ownership.

Fees

Shell will transmit a payment of $15,456 under separate cover to Region 10 in payment of the Part 71 operating permit fees after EPA confirms the amount and location of receipt for the payment. Shell and EPA are still discussing the mechanics for payment of the fees related to the permits being issued under Alaska rules, and therefore there are no fee forms included in the Alaska Title V operating permit application.

Emission Inventories

Each of the three sets of application forms enclosed includes its own emissions inventory, which replaces the emission inventory submitted with the February 28 *Supplement*. The new inventories add an owner restriction of 6,000,000 gallons of diesel consumed. This limit is to more directly limit emissions that are related nearly entirely to fuel consumption, including greenhouse gases and trace pollutants.

The Alaska minor permit application also includes a separate emission inventory in accordance with the state rule on "Owner Requested Limits" (ORLs). The application seeks Alaska ORLs for a subset of the owner restrictions requested. Specifically, Shell is requesting four ORLs to ensure that the project remains a minor source and thus not be categorized as a PSD source. The separate emission inventory demonstrates that these four ORLs are sufficient to achieve this. This separate inventory is ORL-specific and is not

relevant to any other purpose. As noted in the application, potential emissions for this inventory are, for the Kulluk, based on design capacity, and for the associated fleet, based on maximum anticipated emissions while within 25-miles of the Kulluk, consistent with the definition of potential emissions in 40 C.F.R. §55.2.

If you need additional information or you have questions regarding the attached information, please contact Rodger Steen (303-807-8024), or Pauline Ruddy (907-771-7243) regarding any additional details. We appreciate your early attention to this application supplement.

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

Sincerely,

Shell Offshore Inc.

Susan Childs
Alaska Venture Support Integrator Manager

Attachments

cc: *Natasha Greaves, EPA R10*
Susan Childs, Shell
Lance Tolson, Shell
Pauline Ruddy, Shell
Nicole StAmand, Shell
Jeffrey Walker, BOEMRE
Mark Schindler, Octane LLC
Alan Schuler, ADEC, DAQ
Duane Siler, Crowell & Moring LLP
Kirk Lilley, Kirk Lilley PLLC
Eric Hansen, ENVIRON Int.
Kirk Winges, ENVIRON Int.
Rodger Steen, Air Sciences Inc.
Tim Martin, Air Sciences Inc.

AIR SCIENCES INC.

DENVER • PORTLAND

OCS Permit Applications
Conical Drilling Unit
Kulluk
Beaufort Sea

PREPARED FOR:
SHELL OFFSHORE INC.

PROJECT NO. 180-20-4
MARCH 29, 2011

CONICAL DRILLING UNIT KULLUK IN THE BEAUFORT SEA
FEDERAL OPERATING PERMIT APPLICATION
(40 CFR PART 71) FOR OPERATION ON THE OUTER OCS

CONTENTS

Page

GENERAL INFORMATION AND SUMMARY (GIS) 1
EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1) 6
INSIGNIFICANT EMISSIONS (IE) 82
EMISSION CALCULATIONS (EMISS) 84
POTENTIAL TO EMIT (PTE) 86
FEE CALCULATION WORKSHEET (FEE) 89
FILING FEE FORM (FF) 96
INITIAL COMPLIANCE PLAN AND COMPLIANCE CERTIFICATION (I-COMP) 98
ALTERNATE OPERATING SCENARIO 108
CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS (CTAC) 109

Appendices

Federal OP-Appendix A: Beaufort Sea Lease Block Map and List
Federal OP-Appendix B: General Information and Summary (GIS) Table 1
Federal OP-Appendix C: Emission Calculations (EMISS) – Tables 1 & 2
Federal OP-Appendix D: Updated Emission Inventory

SECTION 1

GENERAL INFORMATION AND SUMMARY (GIS)

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

GENERAL INFORMATION AND SUMMARY (GIS)

A. Mailing Address and Contact Information

Facility name __Shell Offshore, Inc. – Conical Drilling Unit Kulluk_____

Mailing address: Street or P.O. Box __3601 C Street, Suite 1334_____

City __Anchorage_____ State __AK___ ZIP _99503_____-_____

Contact person: _Susan Childs_____ Title _Alaska Venture Support Integrator Manager_____

Telephone (_907__) _646___ - __7112_ Ext. _____

Facsimile (_907__) _770____ - _7145_____

B. Facility Location

Temporary source? __Yes _X_No Plant site location _ all OCS leases currently issued in the Beaufort Sea (see Appendix A: Beaufort Sea Lease Block Map and List)_____

City _____ State_AK__ County_____ EPA Region_10_

Is the facility located within:

Indian lands? ___YES _X_ NO OCS waters? _X_YES ___ NO

Non-attainment area? ___ YES _X_NO If yes, for what air pollutants? _____

Within 50 miles of affected State? _X_ YES __ NO If yes, What State(s)? _AK__

C. Owner

Name _Shell Offshore, Inc._____ Street/P.O. Box _3601 C Street, Suite 1334_____

City _Anchorage_____ State_AK___ ZIP_99503___ - _____

Telephone (_907_) _770__ - _3700_____ Ext_____

D. Operator

Name ___Same as owner _____ Street/P.O. Box _____

City _____ State _____ ZIP _____ - _____

Telephone (_____) _____ - _____ Ext_____

E. Application Type

Mark only one permit application type and answer the supplementary question appropriate for the type marked.

_X_Initial Permit ___ Renewal ___ Significant Mod ___ Minor Permit Mod(MPM)

___ Group Processing, MPM ___ Administrative Amendment

For initial permits, when did operations commence? _future_ /_____ /_____

For permit renewal, what is the expiration date of current permit? _TBD_/____/_____

F. Applicable Requirement Summary

Mark all types of applicable requirements that apply.

___ SIP ___ FIP/TIP ___ PSD ___Non-attainment NSR

_X_ Minor source NSR ___ Section 111 ___ Phase I acid rain ___Phase II acid rain

___ Stratospheric ozone _X_ OCS regulations ___ NESHAP ___ Sec. 112(d) MACT

___ Sec. 112(g) MACT ___ Early reduction of HAP ___ Sec 112(j) MACT ___ RMP [Sec.112(r)]

___ Tank Vessel requirements, sec. 183(f)) ___ Section 129 Standards/Requirement

___ Consumer / comm.. products, ' 183(e) _X_ NAAQS, increments or visibility (temp. sources)

Has a risk management plan been registered? ___YES _X_NO Regulatory agency _____

Phase II acid rain application submitted? ___YES _X_NO If yes, Permitting authority _____

G. Source-Wide PTE Restrictions and Generic Applicable Requirements

Cite and describe any emissions-limiting requirements and/or facility-wide "generic" applicable requirements.

1. The permittee shall not have the Kulluk engage in its Mud Line Cellar activity for more than 480 hours, in aggregate, during a calendar year.
2. The permittee shall not have the Kulluk engage in its Well Drilling activity for more than 1,632 hours, in aggregate, during a calendar year.
3. The permittee shall not have the Kulluk occupy Drill Sites, in aggregate, for more than 2,880 hours, in aggregate during a calendar year.
4. The permittee shall not have the Kulluk incinerator operate for more than between 8 am and 8 pm (12 hours).
5. The permittee shall purchase only ultra low sulfur diesel (ULSD) and not combust any liquid fuel with sulfur content greater than 0.01 percent by weight in any emission unit on the Kulluk or a support vessel.
6. The permittee shall not allow the sum of NO_x emissions from the Kulluk and support vessels within 25 miles of that Exploratory Operation to equal or exceed 250.0 tons during a calendar year.
7. The permittee shall not allow the sum of NO_x emissions from the each specified source to exceed the limits set forth in Appendix B: GIS Table 1 during a calendar year.
8. The permittee shall not allow the sum of $PM_{2.5}$ emissions from the each specified source to exceed the limits set forth in Appendix B: GIS Table 1 during a calendar year.
9. The permittee shall not allow the sum of PM_{10} emissions from the each specified source to exceed the limits set forth in Appendix B: GIS Table 1 during a calendar year.
10. The permittee shall not allow more than 24 resupply and waste removal vessel trips to the Kulluk during a calendar year.

11. 40 CFR Part 60.4200, NSPS Subpart IIII: Applicable to certification of CI engines. Certifications are required according to year of manufacture.
12. 40 CFR Part 6-.110a, NSPS part Ka: Diesel fuel tanks manufactured prior to 1984.
13. The permittee shall not allow more than 6,000,000 gallons of fuel to be combusted.

H. Process Description

List processes, products, and SIC codes for the facility.

Process	Products	SIC
Exploratory Drilling for oil and gas	Information on oil & gas resource	1311

I. Emission Unit Identification

Assign an emissions unit ID and describe each emissions unit at the facility. Control equipment and/or alternative operating scenarios associated with emissions units should by listed on a separate line. Applicants may exclude from this list any insignificant emissions units or activities.

Emissions Unit ID	Description of Unit	Capacity Value
Kulluk – Gens	Generation	8,500 horsepower (hp)
Kulluk – MLCHPUs	MLC HPU's	1,500 hp
Kulluk – Comps	Air Compressors	1,500 hp
Kulluk – Cranes	Cranes	900 hp
Kulluk – Heaters	Heaters & Boilers	6 MMBtu/hour
Kulluk – Seldom	Seldom-used units	566 gallons/month
Kulluk – Egen	Emergency Generator	77 gallons/month
Kulluk – Incin	Incinerator	276 pounds(lb)/hour
Ice – P&G	Propulsion & Generation	32,200 hp
Ice – Heaters	Heaters & Boilers	10 MMBtu/hour
Ice – Seldom	Seldom-used units	100 gallons/week
Ice – Incin	Incinerator	154 lb/hr
AH – P&G	Propulsion & Generation	32,200 hp
AH – Heaters	Heaters & Boilers	10 MMBtu/hour
AH – Seldom	Seldom-used units	100 gallons/week
AH – Incin	Incinerator	154 lb/hr
Resupply – P&G	Propulsion & Generation	12,000 hp
Resupply – Seldom	Seldom-used units	20 gallons/week
OSR – P&G	Propulsion & Generation	3,487 hp
OSR – Seldom	Seldom-used units	100 gallons/week
OSR – Incin	Incinerator	125 lb/hr
Quartering – P&G	Propulsion & Generation	10,061 hp
Quartering – Seldom	Seldom-used units	100 gallons/week
Quartering – Incin	Incinerator	125 lb/hr
OSR Work Boats	Work Boats	3,789 gallons/week

J. Facility Emissions Summary

Enter potential to emit (PTE) for the facility as a whole for each air pollutant listed below. Enter the name of the single HAP emitted in the greatest amount and its PTE. For all pollutants stipulations to major source status may be indicated by entering "major" in the space for PTE. Indicate the total actual emissions for fee purposes for the facility in the space provided. Applications for permit modifications need not include actual emissions information.

NOx _<250___ tons/yr VOC __50_____ tons/yr SO2 __5_____ tons/yr

PM-10 _30_____ tons/yr CO __192_____ tons/yr Lead __0.09_____ tons/yr

Total HAP _0.69_____ tons/yr

Single HAP emitted in the greatest amount _Formaldehyde___ PTE _0.18__ tons/yr

Total of regulated pollutants (for fee calculation), Sec. F, line 5 of form FEE _336_ tons/yr

K. Existing Federally-Enforceable Permits

NONE

Permit number(s) _____ Permit type _____ Permitting authority _____

Permit number(s) _____ Permit type _____ Permitting authority _____

L. Emission Unit(s) Covered by General Permits

Emission unit(s) subject to general permit _NONE_____

Check one: ___ Application made ___ Coverage granted

General permit identifier _____ Expiration Date ____/____/____

M. Cross-referenced Information

Does this application cross-reference information? _X_ YES ___ NO (If yes, see instructions)

Appendix A: Beaufort Sea Lease Block Map and List
Appendix B: GIS Table 1

SECTION 2

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Gens Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20100102

B. Emissions Unit Description

Primary use Electrical generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 50.58 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[1]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	375 gallons	941,422 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Gens Device type Selective Catalytic Reduction (SCR), Oxidation Catalyst (OxyCat)

Air pollutant(s) Controlled NOx, PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) NOx-1.6 g/kW-hr, PM-50%, CO-80%, VOC-70%

Efficiency estimation method Manufacture Guarantee

1 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 45	Inside stack diameter (ft) 1.97
Stack temp(^{o}F) 632	Design stack flow rate (ACFM) 18,273
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 100.07

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – MLCHPUs Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Hydralic pumps Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 10.5 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[2]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	78 gallons	37,333 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – MLCHPUs Device type OxyCat

Air pollutant(s) Controlled PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) PM-50%, CO-80%, VOC-70%

Efficiency estimation method Manufacture Guarantee

2 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 34 Inside stack diameter (ft) 0.6

Stack temp(^{o}F) 800 Design stack flow rate (ACFM) 2,243

Actual stack flow rate (ACFM) not yet operating Velocity (ft/sec) 131.23

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Comps Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Compressors Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 10.5 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[3]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	78 gallons	37,333 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Comps Device type OxyCat

Air pollutant(s) Controlled PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) PM-50%, CO-80%, VOC-70%

Efficiency estimation method Manufacture Guarantee

3 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 36	Inside stack diameter (ft) 1.97
Stack temp(^{o}F) 632	Design stack flow rate (ACFM) 18,273
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 100.07

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Cranes Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Powering Cranes Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 2.52 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[4]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	19 gallons	20,787 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Cranes Device type OxyCat

Air pollutant(s) Controlled PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) PM-50%, CO-80%, VOC-70%

Efficiency estimation method Manufacture Guarantee

4 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 79.75 Inside stack diameter (ft) 0.83

Stack temp(^{o}F) 750 Design stack flow rate (ACFM) 2,154

Actual stack flow rate (ACFM) not yet operating Velocity (ft/sec) 65.82

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Heaters Description Heaters & Boilers

SIC Code (4-digit) 1311 SCC Code 10300503

B. Emissions Unit Description

Primary use Heat Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: X Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 6 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[5]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	44 gallons	128,000 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Heaters Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

5 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 45	Inside stack diameter (ft) 0.5
Stack temp(^{o}F) 200	Design stack flow rate (ACFM) 622
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 52.82

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Seldom Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Power smaller engines Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 0.11 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[6]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	0.79 gallons	2,264 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Seldom Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

6 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 42.9	Inside stack diameter (ft) 0.59
Stack temp(^{o}F) 800	Design stack flow rate (ACFM) 2,157
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 131.23

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Egen Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Emergency generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 5.2 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[7]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	38.50 gallons	308 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Egen Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

7 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 42.9	Inside stack diameter (ft) 0.59
Stack temp(^{o}F) 800	Design stack flow rate (ACFM) 2,157
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 131.23

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Incin Description Incinerator

SIC Code (4-digit) 1311 SCC Code 50300101

B. Emissions Unit Description

Primary use Domestic Waste Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input N/A MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[8]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	276 lbs of waste	199 tons of waste

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Incin Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

8 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 52.9	Inside stack diameter (ft) 1.5
Stack temp(^{o}F) 662	Design stack flow rate (ACFM) 3,479
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 32.81

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Ice – P&G Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 28000212

B. Emissions Unit Description

Primary use Propulsion & Generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 225 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[9]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	1,670 gallons	1,827,243 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Ice – P&G Device type SCR, OxyCat

Air pollutant(s) Controlled NOx, PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) PM-50%, CO-80%, VOC-70%

Efficiency estimation method Manufacture Guarantee

9 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Ice – Heaters Description Heaters & Boilers

SIC Code (4-digit) 1311 SCC Code 10300503

B. Emissions Unit Description

Primary use Heat Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: X Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 10 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[10]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	74 gallons	81,067 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Ice – Heaters Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

10 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Ice – Seldom Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Power smaller engines Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 0.08 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[11]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	0.60 gallons	651 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Ice – Seldom Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

11 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Ice – Incin Description Incinerator

SIC Code (4-digit) 1311 SCC Code 50300101

B. Emissions Unit Description

Primary use Domestic Waste Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input N/A MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[12]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	154 lbs of waste	84 tons waste

E. Associated Air Pollution Control Equipment

Emissions unit ID Ice – Incin Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

12 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID AH – P&G Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 28000212

B. Emissions Unit Description

Primary use Propulsion & Generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 225 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[13]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	1,670 gallons	1,827,243 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID AH – P&G Device type SCR, OxyCat

Air pollutant(s) Controlled NOx, PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) PM-50%, CO-80%, VOC-70%

Efficiency estimation method Manufacture Guarantee

13 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID AH – Heaters Description Heaters & Boilers

SIC Code (4-digit) 1311 SCC Code 10300503

B. Emissions Unit Description

Primary use Heat Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: X Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 10 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[14]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	74 gallons	81,067 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID AH – Heaters Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

14 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID AH – Seldom Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Power smaller engines Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 0.08 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[15]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	0.60 gallons	651 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID AH – Seldom Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

15 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID AH – Incin Description Incinerator

SIC Code (4-digit) 1311 SCC Code 50300101

B. Emissions Unit Description

Primary use Domestic Waste Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input N/A MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[16]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	154 lbs of waste	84 tons waste

E. Associated Air Pollution Control Equipment

Emissions unit ID AH – Incin Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

16 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Resupply – P&G Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 28000217

B. Emissions Unit Description

Primary use Propulsion & Generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 84 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[17]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	622 gallons	172,800 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Resupply – P&G Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

17 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 60	Inside stack diameter (ft) 1.97
Stack temp(^{o}F) 709	Design stack flow rate (ACFM) 8,759
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 47.97

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Resupply – Seldom Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Power smaller engines Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 0.016 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[18]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	0.12 gallons	686 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Resupply – Seldom Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

18 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID OSR – P&G Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 28000212

B. Emissions Unit Description

Primary use Propulsion & Generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 16 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[19]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	117 gallons	201,600 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID OSR – P&G Device type Catalyzed Diesel Particulate Filter (CDPF)

Air pollutant(s) Controlled PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) PM-85%, CO, VOC-90%

Efficiency estimation method Manufacture Guarantee

19 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID OSR – Seldom Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Power smaller engines Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 0.08 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[20]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	0.60 gallons	1,714 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID OSR – Seldom Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

20 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID OSR – Incin Description Incinerator

SIC Code (4-digit) 1311 SCC Code 50300101

B. Emissions Unit Description

Primary use Domestic Waste Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input N/A MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[21]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	125 lbs of waste	180 tons of waste

E. Associated Air Pollution Control Equipment

Emissions unit ID OSR – Incin Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

21 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Quartering – P&G Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 28000212

B. Emissions Unit Description

Primary use Propulsion & Generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 27 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[22]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	200 gallons	345,600 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Quartering – P&G Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

22 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Quartering – Seldom Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Power smaller engines Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 0.08 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[23]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	0.60 gallons	1,714 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Quartering – Seldom Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

23 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Quartering – Incin Description Incinerator

SIC Code (4-digit) 1311 SCC Code 50300101

B. Emissions Unit Description

Primary use Domestic Waste Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input N/A MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[24]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	125 lbs of waste	180 tons of waste

E. Associated Air Pollution Control Equipment

Emissions unit ID Quartering – Incin Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

24 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID OSR Work Boats Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 28000212

B. Emissions Unit Description

Primary use Propulsion & Generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 3.05 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[25]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	23 gallons	64,960 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID OSR Work Boats Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

25 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

SECTION 3

INSIGNIFICANT EMISSIONS (IE)

Federal Operating Permit Program (40 CFR Part 71)

INSIGNIFICANT EMISSIONS (IE)

On this page list each insignificant activity or emission unit. In the "number" column, indicate the number of units in this category. Descriptions should be brief but unique. Indicate which emissions criterion of part 71 is the basis for the exemption.

Number	Description of Activities or Emissions Units	RAP, except HAP	HAP
1	Kulluk Fuel Tank A, 680 m^3	X	X
1	Kulluk Fuel Tank B, 676 m^3	X	X
1	Kulluk Fuel Tank C, 247 m^3	X	X
1	Drilling Mud De-gassing	X	X

SECTION 4

EMISSION CALCULATIONS (EMISS)

Federal Operating Permit Program (40 CFR Part 71)

EMISSION CALCULATIONS (EMISS)

Calculate potential to emit (PTE) for applicability purposes and actual emissions for fee purposes for each emissions unit, control device, or alternative operating scenario identified in section I of form **GIS**. If form **FEE** does not need to be submitted with the application, do not calculate actual emissions.

A. Emissions Unit ID Kulluk and Associated Fleet (See Appendix C: EMISS Tables for all units)

B. Identification and Quantification of Emissions

First, list each air pollutant that is either regulated at the unit or present in major amounts, then list any other regulated pollutant (for fee calculation) not already listed. HAP may be simply listed as "HAP." Next, calculate PTE for applicability purposes and actual emissions for fee purposes for each pollutant. Do not calculate PTE for air pollutants listed solely for fee purposes. Include all fugitives for fee purposes. You may round to the nearest tenth of a ton for yearly values or tenth of a pound for hourly values.

Air Pollutants	Emission Rates			CAS No.
	Actual Annual Emissions (tons/yr)	Potential to Emit		
		Hourly (lb/hr)	Annual (tons/yr)	
NO_x	<250	638	<250	NO_2 - 10102-44-0
VOC		69	50	N/A
SO_2		8	5	7446-09-5
PM_{10}		54	30	N/A
CO		311	192	630-08-0
Lead		0.11	0.09	7439-92-1
HAP		1.29	0.69	Various
Formaldehyde		0.35	0.18	50-00-0

SECTION 5

POTENTIAL TO EMIT (PTE)

Federal Operating Permit Program (40 CFR Part 71)

POTENTIAL TO EMIT (PTE)

For each unit with emissions that count towards applicability, list the emissions unit ID and the PTE for the air pollutants listed below and sum them up to show totals for the facility. You may find it helpful to complete form **EMISS** before completing this form. Show other pollutants not listed that are present in major amounts at the facility on attachment in a similar fashion. You may round values to the nearest tenth of a ton. Also report facility totals in section **J** of form **GIS**.

Emissions Unit ID	Regulated Air Pollutants and Pollutants for which the Source is Major (tons/yr)						
	NOx	VOC	SO2	PM10	CO	Lead	HAP
Kulluk emission units							
Kulluk – Gens	23.9	1.7	6.7E-01	3.7	10.8	1.8E-03	7.7E-02
Kulluk – MLCHPUs	8.9	0.3	2.6E-02	0.4	0.5	7.3E-05	3.1E-03
Kulluk – Comps	7.1	0.1	2.6E-02	0.1	0.4	7.3E-05	3.1E-03
Kulluk – Cranes	4.9	0.1	1.5E-02	0.2	0.3	4.1E-05	1.7E-03
Kulluk – Heaters	1.3	0.1	9.1E-02	0.2	0.3	7.8E-05	2.8E-03
Kulluk – Seldom	5.4E-01	5.3E-02	1.6E-03	4.3E-02	1.5E-01	4.4E-06	6.0E-04
Kulluk – Egen	7.3E-02	7.3E-03	2.2E-04	5.9E-03	2.0E-02	6.0E-07	8.2E-05
Kulluk – Incin	0.3	9.9	2.5E-01	1.6	29.8	2.1E-02	2.5E-02
Ice Management							
Ice – P&G	46.3	3.3	1.3E+00	7.2	21.0	3.6E-03	1.5E-01
Ice – Heaters	0.8	0.0	5.7E-02	0.1	0.2	4.9E-05	1.8E-03
Ice – Seldom	1.5E-01	1.5E-02	4.6E-04	1.2E-02	4.2E-02	1.3E-06	1.7E-04
Ice – Incin	0.1	4.2	1.1E-01	0.7	12.6	9.0E-03	1.1E-02
Anchor Handler							
AH – P&G	46.3	3.3	1.3E+00	7.2	21.0	3.6E-03	1.5E-01
AH – Heaters	0.8	0.0	5.7E-02	0.1	0.2	4.9E-05	1.8E-03
AH – Seldom	1.5E-01	1.5E-02	4.6E-04	1.2E-02	4.2E-02	1.3E-06	1.7E-04
AH – Incin	0.1	4.2	1.1E-01	0.7	12.6	9.0E-03	1.1E-02
Resupply Ship - transport							
Resupply – P&G	11.0	0.3	4.1E-02	0.5	3.3	1.1E-04	1.5E-02
Resupply – Seldom	8.2E-02	8.1E-03	2.4E-04	6.5E-03	2.2E-02	6.7E-07	9.1E-05
Resupply Ship - DP mode							
Resupply – P&G	21.9	0.7	8.2E-02	0.9	6.6	2.3E-04	3.1E-02
Resupply – Seldom	8.2E-02	8.1E-03	2.4E-04	6.5E-03	2.2E-02	6.7E-07	9.1E-05
OSR vessel							
OSR – P&G	38.4	1.2	1.4E-01	1.6	11.6	3.9E-04	5.3E-02

	OSR – Seldom	4.1E-01	4.1E-02	1.2E-03	3.3E-02	1.1E-01	3.4E-06	4.5E-04
	OSR – Incin	0.3	9.0	2.3E-01	1.5	27.0	1.9E-02	2.3E-02
Quartering vessel								
	Quartering – P&G	49.3	0.2	2.5E-01	0.4	2.0	6.8E-04	9.2E-02
	Quartering – Seldom	4.1E-01	4.1E-02	1.2E-03	3.3E-02	1.1E-01	3.4E-06	4.5E-04
	Quartering – Incin	0.3	9.0	2.3E-01	1.5	27.0	1.9E-02	2.3E-02
OSR Work Boats								
	OSR Work Boats	15.4	1.5	4.6E-02	1.2	4.2	1.3E-04	1.7E-02
FACILITY TOTALS:		**<250**	**50**	**5**	**30**	**192**	**0.09**	**0.69**

SECTION 6

FEE CALCULATION WORKSHEET (FEE)

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

FEE CALCULATION WORKSHEET (FEE)

Use this form initially, or thereafter on an annual basis, to calculate part 71 fees.

A. General Information

Type of fee (Check one): X Initial ___Annual

Deadline for submitting fee calculation worksheet ____/____/_____

For initial fees, emissions are based on (Check one): No actual emissions yet emissions are based on PTE.

___ Actual emissions for the preceding calendar year. (Required in most circumstances.)

___ Estimates of actual emissions for the current calendar year. (Required when operations commenced during the preceding calendar year.)

Date commenced operations ____/____/_____

___ Estimates of actual emissions for the preceding calendar year. (Optional after a part 71 permit was issued to replace a part 70 permit, but only if initial fee payment is due between January 1 and March 31; otherwise use actual emissions for the preceding calendar year.)

For annual fee payment, you are required to use actual emissions for the preceding calendar year.

B. Source Information: Complete this section only if you are paying fees but not applying for a permit.

Source or facility name _____

Mailing address: Street or P.O. Box _____

City_____ State_____ ZIP_____ - _____

Contact person_____ Title_____

Telephone (_____) _____ - _____ Ext_____ Part 71 permit no. _____

C. Certification of Truth, Accuracy and Completeness: Only needed if not submitting a separate form CTAC.

I certify under penalty of law, based on information and belief formed after reasonable inquiry, the statements and information contained in this submittal (form and attachments) are true, accurate and complete.

Name (signed) _____

Name (typed) _____ Date:____ /____ /_____

D. Annual Emissions Report for Fee Calculation Purposes -- Non-HAP

You may use this to report actual emissions (tons per year) of regulated pollutants (for fee calculation) on a calendar-year basis for both initial and annual fee calculation purposes. Section E is designed to report HAP emissions. Quantify all actual emissions, including fugitives, but do not include insignificant emissions and certain regulated air pollutants that are not counted for fee purposes, such as CO (see instructions). You may round to the nearest tenth of a ton on this form. Sum the emissions in each column and enter a subtotal at the bottom of the page. If any subtotal exceeds 4,000 tons, enter 4,000 for that column.

This data is for 2012 (year)

Emission Unit ID	NOx	VOC	SO2	PM10	Lead	Other
Kulluk emission units						
Kulluk – Gens	23.9	1.7	6.7E-01	3.7	1.8E-03	
Kulluk – MLCHPUs	8.9	0.3	2.6E-02	0.4	7.3E-05	
Kulluk – Comps	7.1	0.1	2.6E-02	0.1	7.3E-05	
Kulluk – Cranes	4.9	0.1	1.5E-02	0.2	4.1E-05	
Kulluk – Heaters	1.3	0.1	9.1E-02	0.2	7.8E-05	
Kulluk – Seldom	5.4E-01	5.3E-02	1.6E-03	4.3E-02	4.4E-06	
Kulluk – Egen	7.3E-02	7.3E-03	2.2E-04	5.9E-03	6.0E-07	
Kulluk – Incin	0.3	9.9	2.5E-01	1.6	2.1E-02	
Ice Management						
Ice – P&G	46.3	3.3	1.3E+00	7.2	3.6E-03	
Ice – Heaters	0.8	0.0	5.7E-02	0.1	4.9E-05	
Ice – Seldom	1.5E-01	1.5E-02	4.6E-04	1.2E-02	1.3E-06	
Ice – Incin	0.1	4.2	1.1E-01	0.7	9.0E-03	
Anchor Handler						
AH – P&G	46.3	3.3	1.3E+00	7.2	3.6E-03	
AH – Heaters	0.8	0.0	5.7E-02	0.1	4.9E-05	
AH – Seldom	1.5E-01	1.5E-02	4.6E-04	1.2E-02	1.3E-06	
AH – Incin	0.1	4.2	1.1E-01	0.7	9.0E-03	
Resupply Ship - transport						
Resupply – P&G	11.0	0.3	4.1E-02	0.5	1.1E-04	
Resupply – Seldom	8.2E-02	8.1E-03	2.4E-04	6.5E-03	6.7E-07	
Resupply Ship - DP mode						
Resupply – P&G	21.9	0.7	8.2E-02	0.9	2.3E-04	
Resupply – Seldom	8.2E-02	8.1E-03	2.4E-04	6.5E-03	6.7E-07	
OSR vessel						
OSR – P&G	38.4	1.2	1.4E-01	1.6	3.9E-04	
OSR – Seldom	4.1E-01	4.1E-02	1.2E-03	3.3E-02	3.4E-06	
OSR – Incin	0.3	9.0	2.3E-01	1.5	1.9E-02	

Quartering vessel						
Quartering – P&G	49.3	0.2	2.5E-01	0.4	6.8E-04	
Quartering – Seldom	4.1E-01	4.1E-02	1.2E-03	3.3E-02	3.4E-06	
Quartering – Incin	0.3	9.0	2.3E-01	1.5	1.9E-02	
OSR Work Boats						
OSR Work Boats	15.4	1.5	4.6E-02	1.2	1.3E-04	
SUBTOTALS:	**<250**	**50**	**5**	**30**	**0.09**	

E. Annual Emissions Report for Fee Calculation Purposes -- HAP

HAP Identification. Identify individual HAP emitted at the facility, identify the CAS number, and assign a unique identifier for use in the second table in this section. Whenever assigning identifier codes, use "HAP1" for the first, "HAP2" for the second, and so on.

Name of HAP	CAS No	Identifier
Formaldehyde	50-00-0	HAP 1

HAP Emissions. Report the actual emissions of individual HAP identified above. Use the identifiers assigned in the table above. Include all emissions, including fugitives, and do not include insignificant emissions. You may round to the nearest tenth of a ton. Sum the emissions in each column and enter a subtotal at the bottom of the page. If any subtotal exceeds 4,000 tons, enter 4,000.

This data is for 2012 (year)

Emissions Unit ID	Actual Emissions (Tons/Year)							
	Total HAPs	HAP 1	HAP___	HAP___	HAP___	HAP___	HAP___	HAP___
See PTE Form	0.69	0.18						
SUBTOTALS	0.69	0.18						

F. Fee Calculation Worksheet

This section is used to calculate the total fee owed for both initial and annual fee payment purposes. Reconciliation is only for cases where you are paying the annual fee and you used any type of estimate of actual emissions when you calculated the initial fee. If you do not need to reconcile fees, only complete line 1-5 and then skip down to lines 21 – 26. See instructions for more detailed explanation.

1. Sum the emissions from section D of this form (non-HAP) and enter the total (tons).	335.09
2. Sum the emissions from section E of this form (HAP) and enter the total (tons).	0.69
3. Sum lines 1 and 2.	335.78
4. Enter the emissions that were counted twice. If none, enter "0."	0.09 (Lead)
5. Subtract line 4 from line 3, round to the nearest ton, and enter the result here.	336

RECONCILIATION
(WHEN INITIAL FEES WERE BASED ON ESTIMATES FOR THE "CURRENT" CALENDAR YEAR)

Only complete lines 6-10 if you are paying the first annual fee and initial fees were based on estimated actual emissions for the calendar year in which you paid initial fees; otherwise skip to line 11 or to line 21.

6. Enter the total estimated actual emissions for the year the initial fee was paid (previously reported on line 5 of the initial fee form).	
7. If line 5 is greater than line 6, subtract line 6 from line 5, and enter the result. Otherwise enter "0."	
8. If line 6 is greater than line 5, subtract line 5 from line 6, and enter the result. Otherwise enter "0."	
9. If line 7 is greater than 0, multiply line 7 by last year's fee rate ($/ton) and enter the result here. This is the underpayment. Go to line 21.	
10. If line 8 is greater than 0, multiply line 8 by last year's fee rate ($/ton) and enter the result here. This is the overpayment. Go to line 21.	

RECONCILIATION
(WHEN INITIAL FEES WERE BASED ON ESTIMATES FOR THE "PRECEDING" CALENDAR YEAR)

Only complete lines 11-20 if you are paying the first annual fee and initial fees were based on estimated actual emissions for the calendar year preceding initial fee payment; otherwise skip to line 21. If completing this section, you will also need to complete sections D and E to report actual emissions for the calendar year preceding initial fee payment.

11. Sum the actual emissions from section D (non-HAP) for the calendar year preceding initial fee payment and enter the result here.	
12. Sum the actual emissions from section E (HAP) for the calendar year preceding initial fee payment and enter the result here.	
13. Add lines 11 and 12 and enter the total here. These are total actual emissions for the calendar year preceding initial fee payment.	
14. Enter double counted emission from line 13 here. If none, enter "0."	
15. Subtract line 14 from line 13, round to the nearest ton, and enter the result here.	
16. Enter the total estimated actual emissions previously reported on line 5 of the initial fee form. These are estimated actual emissions for the calendar year preceding initial fee payment.	

17. If line 15 is greater than line 16, subtract line 16 from line 15, and enter the result here. Otherwise enter "0."	
18. If line 16 is greater than line 15, subtract line 15 from line 16, and enter the result here. Otherwise enter "0."	
19. If line 17 is greater than 0, multiply line 17 by last year's fee rate ($/ton) and enter the result here. This is the underpayment.	
20. If line 18 is greater than 0, multiply line 18 by last year's fee rate ($/ton) and enter the result on this line. This is the overpayment.	
FEE CALCULATION	
21. Multiply line 5 (tons) by the current fee rate ($/ton) and enter the result here.	$15,456
22. Enter any underpayment from line 9 or 19 here. Otherwise enter "0."	0
23. Enter any overpayment from line 10 or 20 here. Otherwise enter "0."	0
24. If line 22 is greater than "0," add it to line 21 and enter the result here. If line 23 is greater than "0," subtract this from line 21 and enter the result here. Otherwise enter the amount on line 21 here. This is the fee adjusted for reconciliation.	$15,456
25. If your account was credited for fee assessment error since the last time you paid fees, enter the amount of the credit here. Otherwise enter "0."	0
26. Subtract line 25 from line 24 and enter the result here. Stop here. This is the total fee amount that you must remit to EPA.	$15,456

SECTION 7

FILING FEE FORM (FF)

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

FEE FILING FORM (FF)

Complete this form each time you prepare form **FEE** and send this form to the appropriate lockbox bank address, along with full payment. This form required at time of initial fee payment, and thereafter, when paying annual fees.

Source or Facility Name Shell Offshore, Inc. – Conical Drilling Unit Kulluk

Mailing Address:

Street/P.O. Box 3601 C Street, Suite 1334 City Anchorage

State AK ZIP 99503

Contact Person: Susan Childs Title Alaska Venture Support Integrator Manager

Telephone (907) 646 - 7112 Ext. _____

Total Fee Payment Remitted: $ 15,456.00

SECTION 8

INITIAL COMPLIANCE PLAN AND COMPLIANCE CERTIFICATION (I-COMP)

Federal Operating Permit Program (40 CFR Part 71)

INITIAL COMPLIANCE PLAN AND COMPLIANCE CERTIFICATION (I-COMP)

SECTION A - COMPLIANCE STATUS AND COMPLIANCE PLAN

Complete this section for each unique combination of applicable requirements and emissions units at the facility. List all compliance methods (monitoring, recordkeeping and reporting) you used to determine compliance with the applicable requirement described above. Indicate your compliance status at this time for this requirement and compliance methods and check "YES" or "NO" to the follow-up question.

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not have the Kulluk engage in its Mud Line Cellar activity for more than 480 hours, in aggregate, during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by recording beginning and end time of activity while the Kulluk is an OCS source.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not have the Kulluk engage in its Well Drilling activity for more than 1,632 hours, in aggregate, during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of each event while the Kulluk is an OCS source.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not have the Kulluk occupy Drill Sites, in aggregate, for more than 2,880 hours, in aggregate during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of each event while the Kulluk is an OCS source.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk – Incin

Applicable Requirement (Describe and Cite):

The permittee shall not have the Kulluk incinerator operate for more than between 8 am and 8 pm (12 hours).

Compliance Methods for the Above (Description and Citation):

To be demonstrated by recording of start and stop times while the Kulluk is an OCS source.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall purchase only ULSD and not combust any liquid fuel with sulfur content greater than 0.01 percent by weight in any emission unit on the Kulluk or a support vessel.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by fuel purchase records and / or representative fuel sampling and determination of sulfur content using ASTM D 5453-08b, prior to the beginning of each drilling season and thereafter each fuel shipment. To be determined while the Kulluk is an OCS source.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not allow the sum of NO_x emissions from the Kulluk and support vessels within 25 miles of that Exploratory Operation to equal or exceed 250.0 tons during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of the annual rolling weekly sum of NOx emissions.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not allow the sum of NO_x emissions from the each specified source to exceed the limits set forth in Appendix B: GIS Table 1 during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of daily and/or weekly NOx emissions, calculated from fuel consumption records and acceptable NOx emission factors for the fuel-burning equipment, and calculated from time interval of incineration assumed to be at capacity rate and the acceptable NOx emission factor.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not allow the sum of $PM_{2.5}$ emissions from the each specified source to exceed the limits set forth in Appendix B: GIS Table 1 during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of daily and/or weekly $PM_{2.5}$ emissions, calculated from fuel consumption records and acceptable PM emission factors.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not allow the sum of PM_{10} emissions from the each specified source to exceed the limits set forth in Appendix B: GIS Table 1 during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of daily and/or weekly PM_{10} emissions, calculated from fuel consumption records and acceptable PM emission factors.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not allow more than 24 resupply and waste removal vessel trips to the Kulluk during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by manual recording of resupply and waste removal events while the Kulluk is an OCS source.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk – Gens, MLCHPUs, Comps, Cranes, Seldom, Egen

Applicable Requirement (Describe and Cite):

40 CFR Part 60.4200, NSPS Subpart IIII: Applicable to certification of CI engines. Certifications are required according to year of manufacture.

Compliance Methods for the Above (Description and Citation):

Shell will maintain the applicable certification for the size and model year of CI engines.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk Fuel tank A, B, and C

Applicable Requirement (Describe and Cite):

40 CFR Part 6-.110a, NSPS part Ka: Diesel fuel tanks manufactured prior to 1984.

Compliance Methods for the Above (Description and Citation):

Vapor pressure of diesel fuel is less than 1.5 psia (60.112 (a)). Diesel fuel MSDS lists vapor pressure at 0.4 mm Hg (<0.01 psia). Shell will maintain a record of these tank sizes.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not allow more than 6,000,000 gallons of fuel to be combusted.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of daily and/or weekly fuel consumption records.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

B. SCHEDULE OF COMPLIANCE – To start in the future

Complete this section if you answered "NO" to any of the questions in section A. Also complete this section if required to submit a schedule of compliance by an applicable requirement. Please attach copies of any judicial consent decrees or administrative orders for this requirement.

Unit(s)_____ Requirement_____

Reason for Noncompliance. Briefly explain reason for noncompliance at time of permit issuance or that future-effective requirement will not be met on a timely basis:

Narrative Description of how Source Compliance Will be Achieved. Briefly explain your plan for achieving compliance:

Schedule of Compliance. Provide a schedule of remedial measures, including an enforceable sequence of actions with milestones, leading to compliance, including a date for final compliance.

Remedial Measure or Action	Date to be Achieved

C. SCHEDULE FOR SUBMISSION OF PROGRESS REPORTS – To start in the future

Only complete this section if you are required to submit one or more schedules of compliance in section B or if an applicable requirement requires submittal of a progress report. If a schedule of compliance is required, your progress report should start within 6 months of application submittal and subsequently, no less than every six months. One progress report may include information on multiple schedules of compliance.

Contents of Progress Report (describe):

First Report____/____/___ Frequency of Submittal_____

Contents of Progress Report (describe):

First Report____/____/___ Frequency of Submittal_____

D. SCHEDULE FOR SUBMISSION OF COMPLIANCE CERTIFICATIONS

This section must be completed once by every source. Indicate when you would prefer to submit compliance certifications during the term of your permit (at least once per year).

Frequency of submittal Annual_____ Beginning____/____/____

E. COMPLIANCE WITH ENHANCED MONITORING & COMPLIANCE CERTIFICATION REQUIREMENTS

This section must be completed once by every source. To certify compliance with these, you must be able to certify compliance for every applicable requirement related to monitoring and compliance certification at every unit.

Enhanced Monitoring Requirements: ____ In Compliance ____ Not In Compliance

Compliance Certification Requirements: ____ In Compliance ____ Not In Compliance

SECTION 9

ALTERNATE OPERATING SCENARIO

Shell requests that it have the flexibility of repowering the Kulluk so that any one or more of the three source groups:

- Kulluk – MLCHPU
- Kulluk – Comps
- Kulluk – Cranes

be electrified and powered by the Kulluk–Gens. If this were to occur, the Kulluk –Gens would be increased in power rating, fuel consumption and emission allowances (NOx and PM) equal to the power, fuel consumption and emission allowances allotted to the group or groups being electrified.

SECTION 10

CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS (CTAC)

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS (CTAC)

This form must be completed, signed by the "Responsible Official" designated for the facility or emission unit, and sent with each submission of documents (i.e., application forms, updates to applications, reports, or any information required by a part 71 permit).

A. Responsible Official

Name: (Last) Childs (First) Susan (MI) ____

Title Alaska Venture Support Integrator Manager

Street or P.O. Box 3601 C Street, Suite 1334

City Anchorage State AK ZIP 99503 - _____

Telephone (907) 646 - 7112 Ext. _____ Facsimile (907) 770 - 7145

B. Certification of Truth, Accuracy and Completeness (to be signed by the responsible official)

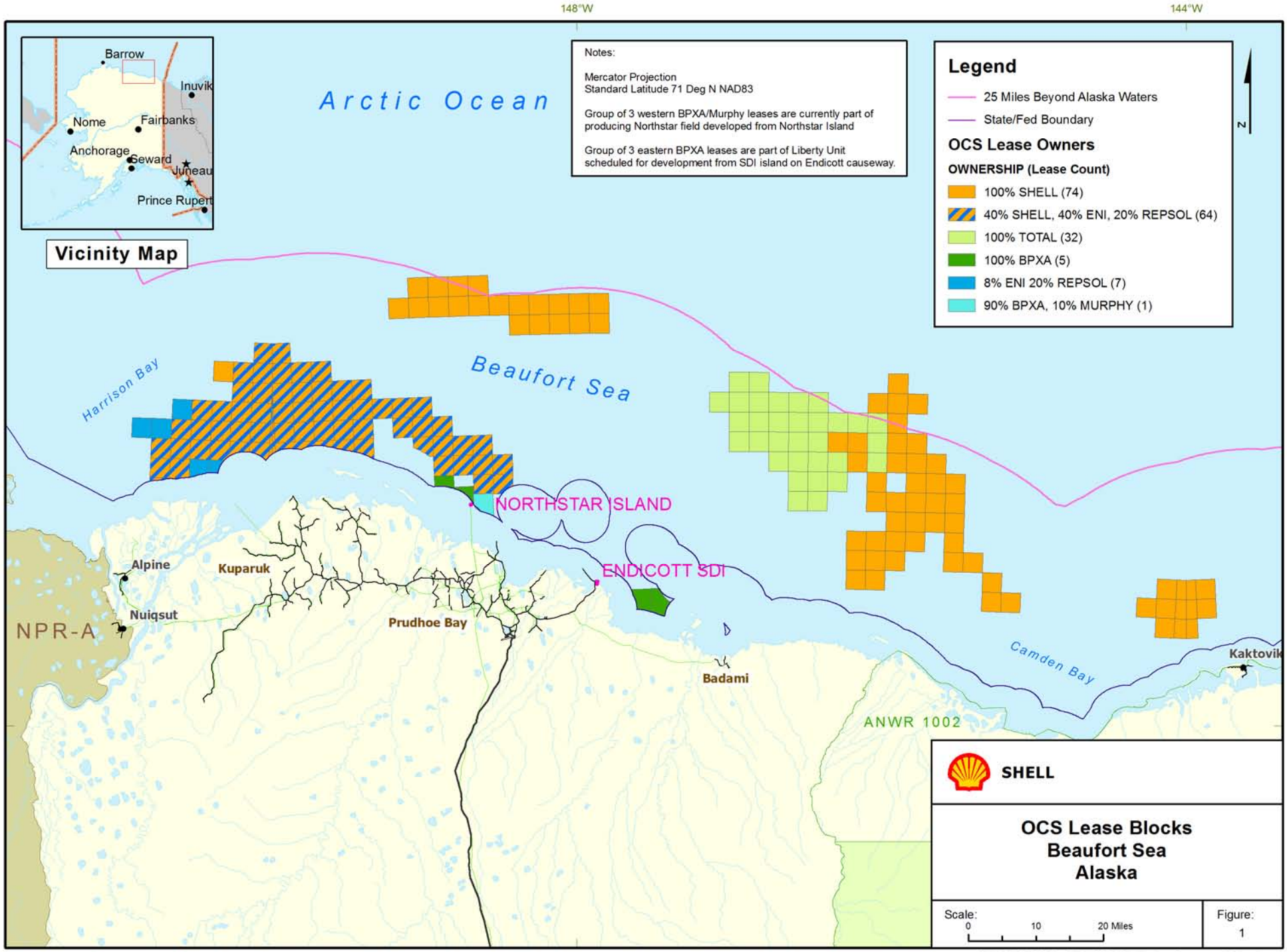
I certify under penalty of law, based on information and belief formed after reasonable inquiry, the statements and information contained in these documents are true, accurate and complete.

Name (signed) Susan Childs

Name (typed) Susan Childs Date: 3/29/2011

FEDERAL OP-APPENDIX A

Beaufort Sea Lease Block Map and List


148°W
144°W
Arctic Ocean
Notes:
Mercator Projection
Standard Latitude 71 Deg N NAD83
Group of 3 western BPXA/Murphy leases are currently part of producing Northstar field developed from Northstar Island
Group of 3 eastern BPXA leases are part of Liberty Unit scheduled for development from SDI island on Endicott causeway.
Legend
25 Miles Beyond Alaska Waters
State/Fed Boundary
OCS Lease Owners
OWNERSHIP (Lease Count)
100% SHELL (74)
40% SHELL, 40% ENI, 20% REPSOL (64)
100% TOTAL (32)
100% BPXA (5)
8% ENI 20% REPSOL (7)
90% BPXA, 10% MURPHY (1)
N
Barrow
Inuvik
Nome
Fairbanks
Anchorage
Seward
Juneau
Prince Rupert
Vicinity Map
Harrison Bay
Beaufort Sea
NORTHSTAR ISLAND
ENDICOTT SDI
Alpine
Kuparuk
Nuiqsut
NPR-A
Prudhoe Bay
Badami
Camden Bay
Kaktovik
ANWR 1002
70°N
SHELL
OCS Lease Blocks
Beaufort Sea
Alaska
Scale:
0
10
20 Miles
Figure:
1
Shell AV GIS/3-23-2011/OCS_Blocks_By_Operator_Fig1_v1.mxd

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y0179	Inside	08/01/1980	BF	470(1) 470(2) 471 515	NR06-0327		12/19/1979	NORTHSTAR	BPXA	BPXA	100
Y0181	Inside	08/01/1980	BF	516 560	NR06-0327		12/19/1979	NORTHSTAR	BPXA	BPXA	90
										MURPHY AK	10
Y1585	Inside	08/01/1991	124	745 746 789	NR06-0327		6/1/1991	LIBERTY	BPXA	BPXA	100
Y1645	Inside	12/01/1996	144	6510C	NR06-03	Beechey Point	9/1/1996	NORTHSTAR	BPXA	BPXA	100
Y1650	Inside	06/27/2003	144	6819B 6820B 6870B 6871G	NR06-03	Beechey Point	9/1/1996	LIBERTY	BPXA	BPXA	100
Y1699	Inside	07/01/2007	186	6369	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1700	Inside	07/01/2007	186	6370	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1701	Inside	07/01/2007	186	6419	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1702	Inside	07/01/2007	186	6420	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1703	Inside	07/01/2007	186	6421BC	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1704	Inside	07/01/2007	186	6352	NR06-03	Beechey Point	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1705	Inside	07/01/2007	186	6402A 6403B	NR06-03	Beechey Point	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1742	Inside	07/01/2007	195	6173	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1743	Inside	07/01/2007	195	6222	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1744	Inside	07/01/2007	195	6223	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1745	Inside	07/01/2007	195	6272	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1746	Inside	07/01/2007	195	6273	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1747	Inside	07/01/2007	195	6320	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1748	Inside	07/01/2007	195	6321	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1749	Inside	07/01/2007	195	6322	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1750	Inside	07/01/2007	195	6323	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1751	Inside	07/01/2007	195	6371	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1752	Inside	07/01/2007	195	6372	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1753	Inside	07/01/2007	195	6373	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1754	Inside	07/01/2007	195	6374BC 6424C	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1755	Inside	07/01/2007	195	6418	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1756	Inside	07/01/2007	195	6422B	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1757	Inside	07/01/2007	195	6423B	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1758	Inside	07/01/2007	195	6468	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1759	Inside	07/01/2007	195	6469B	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1760	Inside	07/01/2007	195	6518B 6519A	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1761	Inside	07/01/2007	195	6152	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1762	Inside	07/01/2007	195	6202	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1763	Inside	07/01/2007	195	6203	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1764	Inside	07/01/2007	195	6204	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1765	Inside	07/01/2007	195	6251A 6301B	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1766	Inside	07/01/2007	195	6252	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1767	Inside	07/01/2007	195	6253	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1768	Inside	07/01/2007	195	6254	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1769	Inside	07/01/2007	195	6255	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1770	Inside	07/01/2007	195	6256	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1771	Inside	07/01/2007	195	6302	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1772	Inside	07/01/2007	195	6303	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1773	Inside	07/01/2007	195	6304	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1774	Inside	07/01/2007	195	6305	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1775	Inside	07/01/2007	195	6306	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1776	Inside	07/01/2007	195	6307	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1777	Inside	07/01/2007	195	6308	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1778	Inside	07/01/2007	195	6309	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1779	Inside	07/01/2007	195	6351AB 6401C	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1780	Inside	07/01/2007	195	6353	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1781	Inside	07/01/2007	195	6354	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1782	Inside	07/01/2007	195	6355	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1783	Inside	07/01/2007	195	6356	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1784	Inside	07/01/2007	195	6358	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1785	Inside	07/01/2007	195	6359	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1786	Inside	07/01/2007	195	6360	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1787	Inside	07/01/2007	195	6404A 6405B	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1788	Inside	07/01/2007	195	6406B	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1789	Inside	07/01/2007	195	6409B	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1790	Inside	07/01/2007	195	6410	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1791	Inside	07/01/2007	195	6411	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1792	Inside	07/01/2007	195	6412	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1793	Inside	07/01/2007	195	6460	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1794	Inside	07/01/2007	195	6461	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1795	Inside	07/01/2007	195	6462	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1796	Inside	07/01/2007	195	6463	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1799	Inside	07/01/2007	195	6512ABC	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1800	Inside	07/01/2007	195	6513BCE	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1804	Inside	08/01/2005	195	6657	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1805	Inside	08/01/2005	195	6658	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1806	Inside	08/01/2005	195	6659	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1807	Inside	08/01/2005	195	6707	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1808	Inside	08/01/2005	195	6708	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1809	Inside	08/01/2005	195	6709	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1810	Inside	08/01/2005	195	6712	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1811	Inside	08/01/2005	195	6713	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1812	Inside	08/01/2005	195	6757	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1813	Inside	08/01/2005	195	6758	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1816	Inside	08/01/2005	195	6764	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1820	Inside	08/01/2005	195	6773	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1821	Inside	08/01/2005	195	6774	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1822	Inside	08/01/2005	195	6814	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1823	Inside	08/01/2005	195	6815	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1826	Inside	08/01/2005	195	6822	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1827	Inside	08/01/2005	195	6823	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1828	Inside	08/01/2005	195	6824	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1833	Inside	08/01/2005	195	6873	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1834	Inside	08/01/2005	195	6874	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1839	Inside	08/01/2005	195	6751	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1840	Inside	08/01/2005	195	6752	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1841	Inside	08/01/2005	195	6801	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1842	Inside	08/01/2005	195	6802	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1843	Inside	08/01/2005	195	6851	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1857	Inside	07/01/2007	202	6221	NR05-04	Harrison Bay	4/18/2007		SHELL	SHELL	100
Y1858	Inside	07/01/2007	202	6274	NR05-04	Harrison Bay	4/18/2007		ENI US	SHELL	40
										ENI US	40
										REPSOL	20
Y1859	Inside	12/15/2008	202	6319	NR05-04	Harrison Bay	4/18/2007		ENI US	ENI US	80
										REPSOL	20
Y1860	Inside	07/01/2007	202	6324	NR05-04	Harrison Bay	4/18/2007		ENI US	SHELL	40
										ENI US	40
										REPSOL	20
Y1861	Inside	07/01/2007	202	6367	NR05-04	Harrison Bay	4/18/2007		ENI US	ENI US	80
										REPSOL	20
Y1862	Inside	07/01/2007	202	6368	NR05-04	Harrison Bay	4/18/2007		ENI US	ENI US	80
										REPSOL	20
Y1863	Inside	07/01/2007	202	6470	NR05-04	Harrison Bay	4/18/2007		ENI US	SHELL	40
										ENI US	40
										REPSOL	20
Y1864	Inside	07/01/2007	202	6471	NR05-04	Harrison Bay	4/18/2007		ENI US	SHELL	40
										ENI US	40
										REPSOL	20
Y1865	Inside	08/01/2007	202	6009	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1866	Crossing	08/01/2007	202	6010	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1867	Crossing	08/01/2007	202	6011	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1868	Crossing	08/01/2007	202	6012	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1869	Inside	08/01/2007	202	6058	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1870	Inside	08/01/2007	202	6059	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1871	Inside	08/01/2007	202	6060	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1872	Inside	08/01/2007	202	6061	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1873	Crossing	08/01/2007	202	6062	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1874	Inside	08/01/2007	202	6063	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1875	Inside	08/01/2007	202	6064	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1876	Inside	08/01/2007	202	6065	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1877	Inside	08/01/2007	202	6066	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1878	Inside	08/01/2007	202	6067	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1879	Inside	08/01/2007	202	6068	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1880	Inside	08/01/2007	202	6114	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1881	Inside	08/01/2007	202	6115	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1882	Inside	08/01/2007	202	6116	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1883	Inside	08/01/2007	202	6117	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1884	Inside	08/01/2007	202	6118	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1885	Inside	08/01/2007	202	6324	NR06-03	Beechey Point	4/18/2007		TOTAL	TOTAL	100
Y1886	Inside	07/01/2007	202	6871	NR06-03	Beechey Point	4/18/2007		BPXA	BPXA	100
Y1887	Inside	08/01/2007	202	6251	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1888	Inside	08/01/2007	202	6252	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1889	Outside	08/01/2007	202	6259	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1890	Inside	08/01/2007	202	6301	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1891	Inside	08/01/2007	202	6302	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1892	Inside	08/01/2007	202	6303	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1893	Crossing	08/01/2007	202	6304	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1894	Crossing	08/01/2007	202	6305	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1895	Outside	08/01/2007	202	6308	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1896	Outside	08/01/2007	202	6309	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1897	Outside	08/01/2007	202	6310	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1898	Inside	08/01/2007	202	6351	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1899	Inside	08/01/2007	202	6352	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1900	Inside	08/01/2007	202	6353	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1901	Inside	08/01/2007	202	6354	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1902	Inside	08/01/2007	202	6355	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1903	Inside	08/01/2007	202	6356	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1904	Crossing	08/01/2007	202	6357	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1905	Crossing	08/01/2007	202	6358	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1906	Crossing	08/01/2007	202	6359	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1907	Inside	08/01/2007	202	6401	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1908	Inside	08/01/2007	202	6402	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1909	Inside	08/01/2007	202	6403	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1910	Inside	08/01/2007	202	6404	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1911	Inside	08/01/2007	202	6405	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1912	Inside	07/01/2007	202	6406	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1913	Inside	07/01/2007	202	6407	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1914	Inside	08/01/2007	202	6408	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1915	Inside	08/01/2007	202	6409	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1916	Inside	08/01/2007	202	6410	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1917	Inside	08/01/2007	202	6453	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1918	Inside	08/01/2007	202	6454	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1919	Inside	08/01/2007	202	6455	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1920	Inside	08/01/2007	202	6456	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1921	Inside	07/01/2007	202	6457	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1922	Inside	08/01/2007	202	6458	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1923	Inside	08/01/2007	202	6459	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1924	Inside	08/01/2007	202	6460	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1925	Inside	08/01/2007	202	6461	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1926	Inside	08/01/2007	202	6504	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1927	Inside	08/01/2007	202	6505	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1928	Inside	08/01/2007	202	6506	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1929	Inside	08/01/2007	202	6508	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1930	Inside	08/01/2007	202	6510	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1931	Inside	08/01/2007	202	6511	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1932	Inside	08/01/2007	202	6512	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1933	Inside	08/01/2007	202	6554	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1934	Inside	08/01/2007	202	6555	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1935	Inside	08/01/2007	202	6558	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1936	Inside	07/01/2007	202	6559	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1937	Inside	07/01/2007	202	6560	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1938	Inside	08/01/2007	202	6561	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1939	Inside	08/01/2007	202	6562	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1940	Inside	07/01/2007	202	6609	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1941	Inside	07/01/2007	202	6610	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1942	Inside	07/01/2007	202	6611	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1943	Inside	08/01/2007	202	6612	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1944	Inside	07/01/2007	202	6660	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1945	Inside	08/01/2007	202	6662	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

FEDERAL OP-APPENDIX B

General Information and Summary (GIS) Table 1

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
ENGINEERING CALCULATIONS	PROJECT NO: 180-20-6	PAGE: 1	OF: 1	APPENDIX B
	SUBJECT: Title V Form Tables	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group

GIS TABLE 1

Source Group by Vessel	MLC NO_X lb/day	Drill NO_X lb/day	C/L NO_X lb/day	MLC $PM_{2.5}$ lb/day	Drill $PM_{2.5}$ lb/day	C/L $PM_{2.5}$ lb/day	MLC PM_{10} lb/day	Drill PM_{10} lb/day	C/L PM_{10} lb/day
Kulluk									
Generation	456.1	456.1	322.0	71.3	71.3	50.3	71.3	71.3	50.3
MLC HPU'S	887.8	0.0	0.0	35.5	0.0	0.0	35.5	0.0	0.0
Air compressors	710.2	0.0	0.0	14.8	0.0	0.0	14.8	0.0	0.0
Cranes	63.9	63.9	106.5	2.6	2.6	4.3	2.6	2.6	4.3
Heaters & Boilers	21.3	21.3	21.3	3.5	3.5	3.5	3.5	3.5	3.5
Seldom-used units	9.0	9.0	9.0	0.7	0.7	0.7	0.7	0.7	0.7
Emergency Generator	36.6	36.6	36.6	2.9	2.9	2.9	2.9	2.9	2.9
Incinerator	5.0	5.0	5.0	23.2	23.2	23.2	27.2	27.2	27.2
Primary Ice Management									
Propulsion & Generation	2,032.8	2,032.8	2,032.8	317.6	317.6	317.6	317.6	317.6	317.6
Heaters & Boilers	35.6	35.6	35.6	5.9	5.9	5.9	5.9	5.9	5.9
Seldom-used units	6.8	6.8	6.8	0.5	0.5	0.5	0.5	0.5	0.5
Incinerator	5.5	5.5	5.5	25.9	25.9	25.9	30.3	30.3	30.3
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	2,032.8	2,032.8	2,032.8	317.6	317.6	317.6	317.6	317.6	317.6
Heaters & Boilers	35.6	35.6	35.6	5.9	5.9	5.9	5.9	5.9	5.9
Seldom-used units	6.8	6.8	6.8	0.5	0.5	0.5	0.5	0.5	0.5
Incinerator	5.5	5.5	5.5	25.9	25.9	25.9	30.3	30.3	30.3
Resupply Ship - transport mode									
Propulsion & Generation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Seldom-used units	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Resupply Ship - DP mode									
Propulsion & Generation	1,826.2	1,826.2	1,826.2	76.1	76.1	76.1	76.1	76.1	76.1
Seldom-used units	1.4	1.4	1.4	0.1	0.1	0.1	0.1	0.1	0.1
OSR vessel									
Propulsion & Generation	1,065.3	1,065.3	1,065.3	44.4	44.4	44.4	44.4	44.4	44.4
Seldom-used units	6.8	6.8	6.8	0.5	0.5	0.5	0.5	0.5	0.5
Incinerator	4.5	4.5	4.5	21.0	21.0	21.0	24.6	24.6	24.6
Quartering vessel									
Propulsion & Generation	1,369.7	1,369.7	1,369.7	11.4	11.4	11.4	11.4	11.4	11.4
Seldom-used units	6.8	6.8	6.8	0.5	0.5	0.5	0.5	0.5	0.5
Incinerator	4.5	4.5	4.5	21.0	21.0	21.0	24.6	24.6	24.6
OSR work boats									
Work boats	257.4	257.4	257.4	20.6	20.6	20.6	20.6	20.6	20.6
TOTAL- (lb/day)	**10,894**	**9,296**	**9,204**	**1,050**	**1,000**	**980**	**1,070**	**1,020**	**1,000**
TOTAL- (lb/day)-w/o Egen	**10,600**	**9,002**	**8,910**	**1,026**	**976**	**957**	**1,046**	**996**	**977**

shading represents proposed OR to be demonstrated on a daily basis

shading represents OR to be demonstrated by on weekly basis

MLC=Mud-line Cellar Activity

Drill=Well Drilling Activity

C/L=Cementing/Logging Activity

FEDERAL OP-APPENDIX C

Emission Calculations (EMISS) – Tables 1 & 2

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 1	OF: 2	APPENDIX C
ENGINEERING CALCULATIONS	SUBJECT: Title V Form Tables	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Hourly and Annual Emissions

EMISS TABLE 1

Source Group by Vessel	NO_X lb/hr	NO_X tons/year	VOC lb/hr	VOC tons/year	SO_2 lb/hr	SO_2 tons/year	PM_{10} lb/hr	PM_{10} tons/year
Kulluk								
Generation	19.0	23.9	1.4	1.7	5.3E-01	6.7E-01	3.0	3.7
MLC HPU'S	37.0	8.9	1.1	0.3	1.1E-01	2.6E-02	1.5	0.4
Air compressors	29.6	7.1	0.3	0.1	1.1E-01	2.6E-02	0.6	0.1
Cranes	8.9	4.9	0.3	0.1	2.6E-02	1.5E-02	0.4	0.2
Heaters & Boilers	0.9	1.3	0.0	0.1	6.3E-02	9.1E-02	0.1	0.2
Seldom-used units	3.7E-01	5.4E-01	3.7E-02	5.3E-02	1.1E-03	1.6E-03	3.0E-02	4.3E-02
Emergency Generator	1.8E+01	7.3E-02	1.8E+00	7.3E-03	5.5E-02	2.2E-04	1.5E+00	5.9E-03
Incinerator	0.4	0.3	13.8	9.9	3.5E-01	2.5E-01	2.3	1.6
Primary Ice Management								
Propulsion & Generation	84.7	46.3	6.1	3.3	2.4E+00	1.3E+00	13.2	7.2
Heaters & Boilers	1.5	0.8	0.1	0.0	1.1E-01	5.7E-02	0.2	0.1
Seldom-used units	2.8E-01	1.5E-01	2.8E-02	1.5E-02	8.4E-04	4.6E-04	2.3E-02	1.2E-02
Incinerator	0.2	0.1	7.7	4.2	1.9E-01	1.1E-01	1.3	0.7
Secondary Ice Management / Anchor Handler								
Propulsion & Generation	84.7	46.3	6.1	3.3	2.4E+00	1.3E+00	13.2	7.2
Heaters & Boilers	1.5	0.8	0.1	0.0	1.1E-01	5.7E-02	0.2	0.1
Seldom-used units	2.8E-01	1.5E-01	2.8E-02	1.5E-02	8.4E-04	4.6E-04	2.3E-02	1.2E-02
Incinerator	0.2	0.1	7.7	4.2	1.9E-01	1.1E-01	1.3	0.7
Resupply Ship - transport mode								
Propulsion & Generation	0.0	11.0	0.0	0.3	0.0E+00	4.1E-02	0.0	0.5
Seldom-used units	0.0E+00	8.2E-02	0.0E+00	8.1E-03	0.0E+00	2.4E-04	0.0E+00	6.5E-03
Resupply Ship - DP mode								
Propulsion & Generation	236.7	21.9	7.6	0.7	8.8E-01	8.2E-02	9.9	0.9
Seldom-used units	5.7E-02	8.2E-02	5.6E-03	8.1E-03	1.7E-04	2.4E-04	4.5E-03	6.5E-03
OSR vessel								
Propulsion & Generation	44.4	38.4	1.4	1.2	1.7E-01	1.4E-01	1.8	1.6
Seldom-used units	2.8E-01	4.1E-01	2.8E-02	4.1E-02	8.4E-04	1.2E-03	2.3E-02	3.3E-02
Incinerator	0.2	0.3	6.3	9.0	1.6E-01	2.3E-01	1.0	1.5
Quartering vessel								
Propulsion & Generation	57.1	49.3	0.2	0.2	2.8E-01	2.5E-01	0.5	0.4
Seldom-used units	2.8E-01	4.1E-01	2.8E-02	4.1E-02	8.4E-04	1.2E-03	2.3E-02	3.3E-02
Incinerator	0.2	0.3	6.3	9.0	1.6E-01	2.3E-01	1.0	1.5
OSR work boats								
Work boats	10.7	15.4	1.1	1.5	3.2E-02	4.6E-02	0.9	1.2
Total - without NOx Limit	**638**	**279**	**69**	**50**	**8**	**5**	**54**	**30**
Total - PTE	**638**	**<250**	**69**	**50**	**8**	**5**	**54**	**30**

Conical Drilling Unit Kulluk OCS Source - Hourly and Annual Emissions

EMISS TABLE 2

Source Group by Vessel	CO lb/hr	CO tons/year	Lead lb/hr	Lead tons/year	HAP lb/hr	HAP tons/year	CH_2O lb/hr	CH_2O tons/year
Kulluk								
Generation	8.6	10.8	1.5E-03	1.8E-03	6.2E-02	7.7E-02	1.8E-02	2.2E-02
MLC HPU'S	2.0	0.5	3.0E-04	7.3E-05	1.3E-02	3.1E-03	3.7E-03	8.9E-04
Air compressors	1.8	0.4	3.0E-04	7.3E-05	1.3E-02	3.1E-03	3.7E-03	8.9E-04
Cranes	0.5	0.3	7.3E-05	4.1E-05	3.1E-03	1.7E-03	8.9E-04	5.0E-04
Heaters & Boilers	0.2	0.3	5.4E-05	7.8E-05	2.0E-03	2.8E-03	1.5E-03	2.1E-03
Seldom-used units	1.0E-01	1.5E-01	3.1E-06	4.4E-06	4.2E-04	6.0E-04	1.3E-04	1.8E-04
Emergency Generator	4.9E+00	2.0E-02	1.5E-04	6.0E-07	2.0E-02	8.2E-05	6.1E-03	2.5E-05
Incinerator	41.4	29.8	2.9E-02	2.1E-02	3.5E-02	2.5E-02	0.0E+00	0.0E+00
Primary Ice Management								
Propulsion & Generation	38.3	21.0	6.5E-03	3.6E-03	2.7E-01	1.5E-01	8.0E-02	4.4E-02
Heaters & Boilers	0.4	0.2	9.0E-05	4.9E-05	3.3E-03	1.8E-03	2.4E-03	1.3E-03
Seldom-used units	7.6E-02	4.2E-02	2.3E-06	1.3E-06	3.2E-04	1.7E-04	9.5E-05	5.2E-05
Incinerator	23.1	12.6	1.6E-02	9.0E-03	1.9E-02	1.1E-02	0.0E+00	0.0E+00
Secondary Ice Management / Anchor Handler								
Propulsion & Generation	38.3	21.0	6.5E-03	3.6E-03	2.7E-01	1.5E-01	8.0E-02	4.4E-02
Heaters & Boilers	0.4	0.2	9.0E-05	4.9E-05	3.3E-03	1.8E-03	2.4E-03	1.3E-03
Seldom-used units	7.6E-02	4.2E-02	2.3E-06	1.3E-06	3.2E-04	1.7E-04	9.5E-05	5.2E-05
Incinerator	23.1	12.6	1.6E-02	9.0E-03	1.9E-02	1.1E-02	0.0E+00	0.0E+00
Resupply Ship - transport mode								
Propulsion & Generation	0.0	3.3	0.0E+00	1.1E-04	0.0E+00	1.5E-02	0.0E+00	4.6E-03
Seldom-used units	0.0E+00	2.2E-02	0.0E+00	6.7E-07	0.0E+00	9.1E-05	0.0E+00	2.7E-05
Resupply Ship - DP mode								
Propulsion & Generation	71.4	6.6	2.4E-03	2.3E-04	3.3E-01	3.1E-02	9.9E-02	9.2E-03
Seldom-used units	1.5E-02	2.2E-02	4.7E-07	6.7E-07	6.3E-05	9.1E-05	1.9E-05	2.7E-05
OSR vessel								
Propulsion & Generation	13.4	11.6	4.6E-04	3.9E-04	6.2E-02	5.3E-02	1.9E-02	1.6E-02
Seldom-used units	7.6E-02	1.1E-01	2.3E-06	3.4E-06	3.2E-04	4.5E-04	9.5E-05	1.4E-04
Incinerator	18.8	27.0	1.3E-02	1.9E-02	1.6E-02	2.3E-02	0.0E+00	0.0E+00
Quartering vessel								
Propulsion & Generation	2.3	2.0	7.8E-04	6.8E-04	1.1E-01	9.2E-02	3.2E-02	2.8E-02
Seldom-used units	7.6E-02	1.1E-01	2.3E-06	3.4E-06	3.2E-04	4.5E-04	9.5E-05	1.4E-04
Incinerator	18.8	27.0	1.3E-02	1.9E-02	1.6E-02	2.3E-02	0.0E+00	0.0E+00
OSR work boats								
Work boats	2.9	4.2	8.8E-05	1.3E-04	1.2E-02	1.7E-02	3.6E-03	5.2E-03
Total - without NOx Limit	**311**	**192**	**0.11**	**0.09**	**1.29**	**0.69**	**0.35**	**0.18**
Total - PTE	**311**	**192**	**0.11**	**0.09**	**1.29**	**0.69**	**0.35**	**0.18**

FEDERAL OP-APPENDIX D

Updated Emission Inventory

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 1	OF: 1	SHEET: 1
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

SUMMARY - ANNUAL POTENTIAL EMISSIONS

	NO_X tons/year	$PM_{2.5}$ tons/year	PM_{10} tons/year	CO tons/year	SO_2 tons/year	VOC tons/year	Lead tons/year	GHG tons/year
Engines	-	24.2	24.2	82.8	4.1	13.2	1.1E-02	-
Incinerators	-	5.1	6.0	109.1	0.9	36.4	7.7E-02	-
Total	<250	29.3	30.1	191.9	5.0	49.6	0.1	66,263.4
PSD trigger	250	250	250	250	250	250	250	100,000
Compare	Below	Below	Below	Below	Below	Below	Below	Below

	HAP tons/year	CH_2O tons/year	H_2SO_4 tons/year	Fluorides [a] tons/year	H_2S [b] tons/year	TRS [b] tons/year	RSC [b] tons/year
Engines	6.0E-01	1.8E-01	0.3	-	2.3	2.3	2.3
Incinerators	9.1E-02	0.0E+00	0.4	-	0.5	0.5	0.5
Total	0.7	0.2	0.8	-	2.8	2.8	2.8
PSD trigger	25	10	250	250	250	250	250
Compare	Below	Below	Below	Below	Below	Below	Below

[a] Fluoride is not a listed and quantified trace pollutant from diesel combustion as provided by AP42, so it is assumed to be an extremely small constituent. Furthermore, fluoride is a reduced form of fluorine and diesel combustion is an oxidizing process. Therefore, it is unlikely that it would exist as a combustion bi-product and should be a negligible emission from the project.

[b] H_2S also represents upper limit of total reduced sulfur and reduced sulfur compound emissions

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 1	OF: 14	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

shading represents owner restriction (OR) to be demonstrated by documentation of each event
shading represents OR to be demonstrated by documentation of daily fuel consumption
shading represents OR to be demonstrated by documentation of weekly fuel consumption

Anticipated Kulluk Operating Maximums

Kulluk & Associated Fleet

Expected Operating Maximums	Limit		How Defined	How documented
MLC Drilling Activity	480	hrs/activity	20 days/activity	
Well Drilling Activity	1,152	hrs/activity	48 days/activity	
Cementing/Logging Activity	1,248	hrs/activity	52 days/activity	
Season maximum drilling duration as an OCS source (secure and stable for commencement of exploratory activity):	2,880	hrs/season	120 days/season	
Ice mgmt vessel use within 25 miles	38%			
OSR vessel annual fuel limit	60%	of daily maximum - annualized		
Quartering vessel annual fuel limit	60%	of daily maximum - annualized		
MLC Activity				
Generators (three units combined) combined	85%	capacity	System Limitation	
Crane (three units combined) maximum	40%	capacity	System Limitation	
Crane (three units combined) maximum	30%	of time (day)	Shell engineering estimate	
Well Drilling Activity				
Generators (three units combined) combined production maximum	85%	capacity	System Limitation	
Crane (three units combined) maximum	40%	capacity	System Limitation	
Crane (three units combined) maximum	30%	of time (day)	Shell engineering estimate	
Cementing/Logging Activity				
Generators (three units combined) combined	60%	capacity	Shell OR	
Crane (three units combined) maximum	40%	capacity	System Limitation	
Crane (three units combined) maximum	50%	of time (day)	Shell engineering estimate	
All Activities - OR				
Kulluk Incinerator limited to	12	hr/day	Shell OR	manual - recording of start and stop time
Kulluk emergency generator limited to	2	hr/30-days & hr/day		
Sulfur content of all stationary source engines on Kulluk	0.0100%	by wt.	Shell OR	Kulluk fuel testing
Sulfur content of associated fleet	0.0100%	by wt.	Shell OR	Fleet fuel testing
Annual NOx emissions recalculated as weekly rolling avg	250	ton/yr.	Shell OR	
Annual Kulluk and fleet fuel restriction	6,000,000	gallons/year		Fuel consumption measurement
Ice Management Fleet Propulsion & Generation	100%	capacity	System Limitation	
Resupply ship in transport limited to	1,200	gal/1-way	Shell OR	Fuel consumption measurement
Resupply ship in DP mode limited to	4,800	gal/event	Shell OR	Fuel consumption measurement
Resupply ship resupply events limited to	24	rnd trip/season	Shell OR	Manual tracking
Resupply ship DP events limited to	24	hr/day=hr/event	Shell OR	Manual tracking
OSR Vessel p & g aggregate power:	2,600	kW		Manufacturer specifications
OSR Vessel p & g aggregate consumption:	2,800	gal/day	Shell OR	Fuel consumption measurement
Quartering vessel p & g aggregate power:	7,502	kW	Shell OR	Manufacturer specifications
Quartering vessel p & g aggregate consumption:	4,800	gal/day	Shell OR	Fuel consumption measurement
OSR work boats	3,789	gallons/wk.	Shell OR	Fuel consumption measurement

OSR Boat Options

OSR vessel	Pt. Oliktuk/Arctic Endeavor
Quartering vessel	Nanuq

Work Boats

#1 OSR 34-foot	32	gal/hr
#2 OSR 34-foot	32	gal/hr
#1 OSR 47-foot	63	gal/hr
ALL	6	hr/day
ALL	5	day/week
ALL	100%	hourly fuel consumption

Diesel Engine Thermal Efficiency Assumptions

		Reference
7.1	lb/gal	AP42 Table 3.4-1; footnote a
7,000	Btu/hp-hr	<600 hp; AP42 Table 3.3-1 Footnote (a) ver. 10/96.
		>600 hp, AP42 Table 3.4-1 ver. 10/96

Conversions

0.1350	MMBtu/gallon
0.7457	kW / hp
1,000,000	Btu/MMBtu
453.6	g/lb
2,000	lb/ton
24	hr/day
168	hr/wk
2	one-way trips/ round trip
32.07	wt S
64.06	wt. SO2
2.00	wt. conversion of S to SO2

** seldom-used engines are those running < 4 hr/wk.
blue values are input, black values are calculated or linked

Anticipated Kulluk Operating Maximums

Kulluk & Associated Fleet (continued)

Expected Operating Maximums	Controls				EF Reference			
	NOx	PM	CO	VOC	NOx	PM	CO	VOC
Kulluk								
Generation	Kulluk-SCR	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	4	7	7	7
MLC HPU'S	None-Sm	OxyCat-Sm	OxyCat-Sm	OxyCat-Sm	2	8	8	8
Air compressors	None-Lg	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	1	7	7	7
Cranes	None-Sm	OxyCat-Sm	OxyCat-Sm	OxyCat-Sm	2	8	8	8
Heaters & Boilers	heat&boil	heat&boil	heat&boil	heat&boil	3	3	3	3
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Emergency Generator	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Primary Ice Management								
Propulsion & Generation	SCR	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	5	7	7	7
Heaters & Boilers	heat&boil	heat&boil	heat&boil	heat&boil	3	3	3	3
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Secondary Ice Management / Anchor Handler								
Propulsion & Generation	SCR	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	5	7	7	7
Heaters & Boilers	heat&boil	heat&boil	heat&boil	heat&boil	3	3	3	3
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Resupply Ship - transport mode								
Propulsion & Generation	None-Lg	None-Lg	None-Lg	None-Lg	1	1	1	1
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Resupply Ship - DP mode								
Propulsion & Generation	None-Lg	None-Lg	None-Lg	None-Lg	1	1	1	1
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
OSR vessel								
Propulsion & Generation	None-Lg	None-Lg	None-Lg	None-Lg	1	1	1	1
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Quartering vessel								
Propulsion & Generation	Nanuq	CDPF-Lg	CDPF-Lg	CDPF-Lg	9	10	10	10
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
OSR work boats								
Work boats	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2

Assumed Control Device Effectiveness	Restriction	Comment	Reference
Oxidation Catalyst CO reduction efficiency	80%	50-100% of capacity	D.E.C. Marine AB letter, October 9, 2008, and initial stack test
Oxidation Catalyst VOC, HAPs (except metals), Formaldehyde reduction efficiency	70%	50-100% of capacity	D.E.C. Marine AB letter, October 9, 2008
Oxidation Catalyst PM reduction efficiency	50%		D.E.C. Marine AB email, February 9, 2009
CDPF reduction efficiency CO, VOC, HAPs	90%		CleanAIR CDPF guarantee
CDPF reduction efficiency PM	85%		CARB Currently verified, Jan. 2009, CleanAIR Systems PERMIT
Kulluk Generator SCR NOx control	1.6 g/kW-hr	50-100% of capacity	June 2010 Discoverer Stack Testing

Engine	NOx		CO		VOC		PM*		
Emission Factors / Controls	g/kW-hr	lb/gal	lb/MMBtu	lb/gal	lb/MMBtu	lb/gal	g/kWhr	lb/gal	Reference
None-Lg	12.00	0.380	0.85	0.115	0.09	0.012	0.50	0.016	1
None-Sm	15.00	0.476	0.95	0.128	0.35	0.047	1.20	0.038	2
heat&boil	20 lb/kgal	0.020	5 lb/kgal	0.005	1 lb/kgal	0.001	3 lb/kgal	0.003	3
Kulluk-SCR	1.60	0.051	-	-	-	-	-	-	4
SCR	1.60	0.051	-	-	-	-	-	-	5
Kulluk-OxyCat	-	-	-	-	-	-	0.200	0.006	6
OxyCat-Lg	-	-	0.170	0.023	0.027	0.004	0.250	0.008	7
OxyCat-Sm	-	-	0.190	0.026	0.105	0.014	0.600	0.019	8
Nanuq	9	0.285	-	-	-	-	-	-	9
CDPF-Lg	-	-	0.085	0.011	0.009	0.001	0.075	0.002	10
Electric	0	0	0	0	0	0	0	0	NA

*PM2.5

References

None-Lg	1	NOx & PM: Recent stack test data, CO & VOC:AP-42 Table 3.4-1 Internal Combustion, Large Stationary Engines (fuel Input)-uncontrolled; ver. 10/1996
None-Sm	2	NOx & PM: Recent stack test data, CO & VOC: AP-42.Table 3.3-1 Internal Combustion, Diesel (fuel input)-uncontrolled; ver. 10/1996
heat&boil	3	NOx & PM: Recent Stack test data, CO & VOC: AP-42. Table 1.11-2 External Combustion, Small Boilers-waste oil; ver 10/1996
Kulluk-SCR	4	Emission factors based on stack tests from the Frontier Discoverer
SCR	5	Selective Catalytic Reduction NOx emission factor based on stack tests
Kulluk-OxyCat	6	PM: Tier 2 engines
OxyCat-Lg	7	Oxidation Catalyst controls applied to reference (1) emission factors
OxyCat-Sm	8	Oxidation Catalyst controls applied to reference (2) emission factors
Nanuq	9	CAT3806 Diesel Engine Technical data sheet
CDPF-Lg	10	Catalytic Diesel Particulate Filters controls applied to reference (1) emission factors

FUEL USE - MAX DAILY

Emission Units to permit:	Capacity Values	Capacity fuel - hourly		Max fuel - daily					
				MLC Case		Drilling Case		Cementing/Logging Case	
		MMBtu/hr	gal/hr	MMBtu	gal	MMBtu	gal	MMBtu	gal
Kulluk									
Generation	8,500 hp	50.58	375	1,214	8,991	1,214	8,991	857	6,347
MLC HPU'S	1,500 hp	10.50	78	252	1,867	0	0	0	0
Air compressors	1,500 hp	10.50	78	252	1,867	0	0	0	0
Cranes	900 hp	2.52	19	18	134	18	134	30	224
Heaters & Boilers	6 MMBtu/hr	6.00	44	144	1,067	144	1,067	144	1,067
Seldom-used units	566 gal/30-days	0.11	0.79 group limit	3	19	3	19	3	19
Emergency Generator	77 gal/30-days	5.198	38.50 group limit	10	77	10	77	10	77
			KULLUK - SUBTOTAL		*14,021*		*10,288*		*7,733*
Primary Ice Management									
Propulsion & Generation	32,200 hp	225	1,670	5,410	40,071	5,410	40,071	5,410	40,071
Heaters & Boilers	10 MMBtu/hr	10	74	240	1,778	240	1,778	240	1,778
Seldom-used units	100 gal/wk	0.080	0.60 group limit	2	14	2	14	2	14
			ICE MANAGEMENT - SUBTOTAL		*41,863*		*41,863*		*41,863*
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	32,200 hp	225	1,670	5,410	40,071	5,410	40,071	5,410	40,071
Heaters & Boilers	10 MMBtu/hr	10	74	240	1,778	240	1,778	240	1,778
Seldom-used units	100 gal/wk	0.080	0.60 group limit	2	14	2	14	2	14
			ANCHOR HANDLER - SUBTOTAL		*41,863*		*41,863*		*41,863*
Resupply Ship - transport mode									
Propulsion & Generation	12,000 hp	84	622	162	1,200	162	1,200	162	1,200
Seldom-used units	20 gal/wk	0.016	0.12 group limit	0.4	2.9	0.4	2.9	0.4	2.9
Resupply Ship - DP mode									
Propulsion & Generation	12,000 hp	84	622	648	4,800	648	4,800	648	4,800
Seldom-used units	20 gal/wk	0.016	0.12 group limit	0.4	2.9	0.4	2.9	0.4	2.9
			RESUPPLY SHIPS - SUBTOTAL		*6,006*		*6,006*		*6,006*
OSR vessel									
Propulsion & Generation	3,487 hp	16	117	378	2,800	378	2,800	378	2,800
Seldom-used units	100 gal/wk	0.080	0.60 group limit	2	14	2	14	2	14
Quartering vessel									
Propulsion & Generation	10,061 hp	27	200	648	4,800	648	4,800	648	4,800
Seldom-used units	100 gal/wk	0.080	0.60 group limit	2	14	2	14	2	14
OSR work boats									
Work boats	3,789 gal/wk	3.05	23	73	541	73	541	73	541
			OSR SHIPS - SUBTOTAL		*8,170*		*8,170*		*8,170*
			Total daily use		**111,923**		**108,190**		**105,635**

TOTAL WASTE INCINERATED

	Capacity Values	MLC Case	Drilling Case	Cementing/Logging case
Incinerators		lbs/day	lbs/day	lbs/day
Kulluk	276 lb/hr	3,312	3,312	3,312
Ice Management	154 lb/hr	3,696	3,696	3,696
Anchor Handler	154 lb/hr	3,696	3,696	3,696
OSR vessel	125 lb/hr	3,000	3,000	3,000
Quartering vessel	125 lb/hr	3,000	3,000	3,000
	total lbs/day	**16,704**	**16,704**	**16,704**

FUEL USE - MAX ANNUAL

Emission Units to permit:	Capacity Values	Capacity fuel - hourly		Max fuel - Annual (Modeling only)						
				MLC Case		Drilling Case		Cementing/Logging Case		Total
		MMBtu/hr	gal/hr	MMBtu	gal	MMBtu	gal	MMBtu	gal	gal
Kulluk										
Generation	8,500 hp	50.58	375	24,276	179,822	58,262	431,573	44,554	330,027	941,422
MLC HPU'S	1,500 hp	10.50	78	5,040	37,333	0	0	0	0	37,333
Air compressors	1,500 hp	10.50	78	5,040	37,333	0	0	0	0	37,333
Cranes	900 hp	2.52	19	363	2,688	871	6,451	1,572	11,648	20,787
Heaters & Boilers	6 MMBtu/hr	6.00	44	2,880	21,333	6,912	51,200	7,488	55,467	128,000
Seldom-used units	566 gal/30-days	0.11	0.79 group limit	51	377	122	906	132	981	2,264
Emergency Generator	77 gal/30-days	5.198	38.50 group limit	7	51	17	123	18	133	308
			KULLUK - SUBTOTAL		*278,939*		*490,253*		*398,256*	*1,167,448*
Primary Ice Management										
Propulsion & Generation	32,200 hp	225	1670	41,113	304,540	98,671	730,897	106,894	791,805	1,827,243
Heaters & Boilers	10 MMBtu/hr	10	74	1,824	13,511	4,378	32,427	4,742	35,129	81,067
Seldom-used units	100 gal/wk	0.080	0.60 group limit	15	109	35	261	38	282	651
		ICE MANAGEMENT - SUBTOTAL			*318,160*		*763,584*		*827,216*	*1,908,961*
Secondary Ice Management / Anchor Handler										
Propulsion & Generation	32,200 hp	225	1670	41,113	304,540	98,671	730,897	106,894	791,805	1,827,243
Heaters & Boilers	10 MMBtu/hr	10	74	1,824	13,511	4,378	32,427	4,742	35,129	81,067
Seldom-used units	100 gal/wk	0.080	0.595 group limit	15	109	35	261	38	282	651
		ANCHOR HANDLER - SUBTOTAL			*318,160*		*763,584*		*827,216*	*1,908,961*
Resupply Ship - transport mode										
Propulsion & Generation	12,000 hp	84	622	1,296	9,600	3,110	23,040	3,370	24,960	57,600
Seldom-used units	20 gal/wk	0.016	0.12 group limit	8	57	19	137	20	149	343
Resupply Ship - DP mode										
Propulsion & Generation	12,000 hp	84	622	2,592	19,200	6,221	46,080	6,739	49,920	115,200
Seldom-used units	20 gal/wk	0.016	0.12 group limit	8	57	19	137	20	149	343
		RESUPPLY SHIPS - SUBTOTAL			*28,914*		*69,394*		*75,177*	*173,486*
OSR vessel										
Propulsion & Generation	3,487 hp	16	117	4,536	33,600	10,886	80,640	11,794	87,360	201,600
Seldom-used units	100 gal/wk	0.080	0.6 group limit	39	286	93	686	100	743	1,714
Quartering vessel										
Propulsion & Generation	10,061 hp	27	200	7,776	57,600	18,662	138,240	20,218	149,760	345,600
Seldom-used units	100 gal/wk	0.080	0.6 group limit	39	286	93	686	100	743	1,714
OSR work boats										
Work boats	3,789 gal/wk	3.05	23	1,462	10,827	3,508	25,984	3,800	28,149	64,960
			OSR SHIPS - SUBTOTAL		*102,598*		*246,235*		*266,755*	*615,589*
			Total Annual Use		**1,046,772**		**2,333,052**		**2,394,621**	**5,774,444**
				TOTAL ANNUAL GALLONS		**5,774,444**				

TOTAL WASTE INCINERATED

	Capacity Values	MLC Case	Drilling Case	Cementing/Logging case	Total
Incinerators		lbs/year	lbs/year	lbs/year	tons /year
Kulluk	276 lb/hr	66,240	158,976	172,224	199
Ice Management	154 lb/hr	28,090	67,415	73,033	84
Anchor Handler	154 lb/hr	28,090	67,415	73,033	84
OSR vessel	125 lb/hr	60,000	144,000	156,000	180
Quartering vessel	125 lb/hr	60,000	144,000	156,000	180
	total lbs/yr	**242,419**	**581,806**	**630,290**	**727**

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 5	OF: 14	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

NOx EMISSIONS - FOR IMPACT MODELING

shading represents OR to be demonstrated by documentation of daily fuel consumption

shading represents OR to be demonstrated by documentation of weekly fuel consumption

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	0.051	lb/gal		19.00	456	456	456	322	24
MLC HPU'S	0.476	lb/gal		36.99	888	888	0	0	9
Air compressors	0.380	lb/gal		29.59	710	710	0	0	7
Cranes	0.476	lb/gal		8.88	107	64	64	107	5
Heaters & Boilers	0.020	lb/gal		0.89	21	21	21	21	1
Seldom-used units	0.476	lb/gal		0.37	8.97	8.97	8.97	8.97	0.54
Emergency Generator	0.476	lb/gal		18.31	36.62	36.62	36.62	36.62	0.07
Primary Ice Management									
Propulsion & Generation	0.051	lb/gal		85	2,033	2,033	2,033	2,033	46
Heaters & Boilers	0.020	lb/gal		1.48	36	36	36	36	0.81
Seldom-used units	0.476	lb/gal		0.28	6.79	6.79	6.79	6.79	0.15
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	0.051	lb/gal		85	2,033	2,033	2,033	2,033	46
Heaters & Boilers	0.020	lb/gal		1.48	36	36	36	36	0.81
Seldom-used units	0.476	lb/gal		0.28	6.79	6.79	6.79	6.79	0.15
Resupply Ship - transport mode									
Propulsion & Generation	0.380	lb/gal	*237*	(0*)	457	(0*)	(0*)	(0*)	11
Seldom-used units	0.476	lb/gal	*0.057*	(0*)	1.36	(0*)	(0*)	(0*)	0.08
Resupply Ship - DP mode									
Propulsion & Generation	0.380	lb/gal		237	1,826	1,826	1,826	1,826	22
Seldom-used units	0.476	lb/gal		0.06	1.36	1.36	1.36	1.36	0.08
OSR vessel									
Propulsion & Generation	0.380	lb/gal		44	1,065	1,065	1,065	1,065	38
Seldom-used units	0.476	lb/gal		0.28	6.79	6.79	6.79	6.79	0.41
Quartering vessel									
Propulsion & Generation	0.285	lb/gal		57	1,370	1,370	1,370	1,370	49
Seldom-used units	0.476	lb/gal		0.28	6.79	6.79	6.79	6.79	0.41
OSR work boats									
Work boats	0.476	lb/gal		11	257	257	257	257	15
TOTAL				**637**	**11,369**	**10,869**	**9,271**	**9,179**	**278**

NOx EMISSIONS

Source	Emission Factor	unit	NO_X lb/hr	NO_X lb/day	NO_X ton/year
Incinerators					
Kulluk	3	lb/ton	0.41	4.97	0.30
Ice Management	3	lb/ton	0.23	5.54	0.13
Anchor Handler	3	lb/ton	0.23	5.54	0.13
OSR vessel	3	lb/ton	0.19	4.50	0.27
Quartering vessel	3	lb/ton	0.19	4.50	0.27
			1.25	**25.06**	**1.09**

Source	pollutant	EF	unit	reference
Incinerators	NO_X	3	lb/ton	AP42 Table 2.1-12, 10/96

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 6	OF: 14	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

$PM_{2.5}$ EMISSIONS - FOR IMPACT MODELING

shading represents OR to be demonstrated by documentation of daily fuel consumption

shading represents OR to be demonstrated by documentation of weekly fuel consumption

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	0.008	lb/gal		2.97	71	71	71	50	3.73
MLC HPU'S	0.019	lb/gal		1.48	36	36	0	0	0.36
Air compressors	0.008	lb/gal		0.62	15	15	0	0	0.15
Cranes	0.019	lb/gal		0.36	4	3	3	4	0.20
Heaters & Boilers	0.003	lb/gal		0.15	4	4	4	4	0.21
Seldom-used units	0.038	lb/gal		0.03	0.72	0.72	0.72	0.72	0.04
Emergency Generator	0.038	lb/gal		1.46	2.93	2.93	2.93	2.93	0.01
Primary Ice Management									
Propulsion & Generation	0.008	lb/gal		13	318	318	318	318	7
Heaters & Boilers	0.003	lb/gal		0.24	6	6	6	6	0.13
Seldom-used units	0.038	lb/gal		0.02	0.54	0.54	0.54	0.54	0.01
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	0.008	lb/gal		13	318	318	318	318	7
Heaters & Boilers	0.003	lb/gal		0.24	6	6	6	6	0.13
Seldom-used units	0.038	lb/gal		0.02	0.54	0.54	0.54	0.54	0.01
Resupply Ship - transport mode									
Propulsion & Generation	0.016	lb/gal	*10*	(0*)	19	(0*)	(0*)	(0*)	0.46
Seldom-used units	0.038	lb/gal	*0.005*	(0*)	0.11	(0*)	(0*)	(0*)	0.01
Resupply Ship - DP mode									
Propulsion & Generation	0.016	lb/gal		10	76	76	76	76	1
Seldom-used units	0.038	lb/gal		0.00	0.11	0.11	0.11	0.11	0.01
OSR vessel									
Propulsion & Generation	0.016	lb/gal		2	44	44	44	44	2
Seldom-used units	0.038	lb/gal		0.02	0.54	0.54	0.54	0.54	0.03
Quartering vessel									
Propulsion & Generation	0.002	lb/gal		0	11	11	11	11	0
Seldom-used units	0.038	lb/gal		0.02	0.54	0.54	0.54	0.54	0.03
OSR work boats									
Work boats	0.038	lb/gal		0.86	21	21	21	21	1
TOTAL				**47**	**954**	**933**	**883**	**863**	**24**

PM_{10} & $PM_{2.5}$ EMISSIONS

Source	Emission Factor PM_{10}	Emission Factor $PM_{2.5}$	unit	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	PM_{10} lb/day	$PM_{2.5}$ lb/day	PM_{10} ton/year	$PM_{2.5}$ ton/year
Incinerators									
Kulluk	16.4	14	lb/ton	2.26	1.93	27.16	23.18	1.63	1.39
Ice Management	16.4	14	lb/ton	1.26	1.08	30.31	25.87	0.69	0.59
Anchor Handler	16.4	14	lb/ton	1.26	1.08	30.31	25.87	0.69	0.59
OSR vessel	16.4	14	lb/ton	1.03	0.88	24.60	21.00	1.48	1.26
Quartering vessel	16.4	14	lb/ton	1.03	0.88	24.60	21.00	1.48	1.26
				6.84	**5.84**	**136.97**	**116.93**	**5.96**	**5.09**

Source	pollutant	EF	unit	reference
Incinerators	PM_{10}	16.4	lb/ton	Disco Stack Test June 2010 (multiplied by a safety factor of 2)
	$PM_{2.5}$	14	lb/ton	Disco Stack Test June 2010 (multiplied by a safety factor of 2)

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

CO EMISSIONS - FOR IMPACT MODELING

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	0.023	lb/gal		8.60	206	206	206	146	10.80
MLC HPU'S	0.026	lb/gal		2.00	48	48	0	0	0.48
Air compressors	0.023	lb/gal		1.79	43	43	0	0	0.43
Cranes	0.026	lb/gal		0.48	6	3	3	6	0.27
Heaters & Boilers	0.005	lb/gal		0.22	5	5	5	5	0.32
Seldom-used units	0.128	lb/gal		0.10	2.42	2.42	2.42	2.42	0.15
Emergency Generator	0.128	lb/gal		4.94	9.88	9.88	9.88	9.88	0.02
Primary Ice Management									
Propulsion & Generation	0.023	lb/gal		38.32	920	920	920	920	21
Heaters & Boilers	0.005	lb/gal		0.37	9	9	9	9	0.20
Seldom-used units	0.128	lb/gal		0.08	1.83	1.83	1.83	1.83	0.04
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	0.023	lb/gal		38.32	920	920	920	920	21
Heaters & Boilers	0.005	lb/gal		0.37	9	9	9	9	0.20
Seldom-used units	0.128	lb/gal		0.08	1.83	1.83	1.83	1.83	0.04
Resupply Ship - transport mode									
Propulsion & Generation	0.115	lb/gal	*71*	(0*)	138	(0*)	(0*)	(0*)	3.30
Seldom-used units	0.128	lb/gal	*0.015*	(0*)	0.37	(0*)	(0*)	(0*)	0.02
Resupply Ship - DP mode									
Propulsion & Generation	0.115	lb/gal		71	551	551	551	551	7
Seldom-used units	0.128	lb/gal		0.02	0.37	0.37	0.37	0.37	0.02
OSR vessel									
Propulsion & Generation	0.115	lb/gal		13	321	321	321	321	12
Seldom-used units	0.128	lb/gal		0.08	1.83	1.83	1.83	1.83	0.11
Quartering vessel									
Propulsion & Generation	0.011	lb/gal		2	55	55	55	55	2
Seldom-used units	0.128	lb/gal		0.08	1.83	1.83	1.83	1.83	0.11
OSR work boats									
Work boats	0.128	lb/gal		3	69	69	69	69	4
TOTAL				**186**	**3,320**	**3,179**	**3,089**	**3,030**	**83**

CO EMISSIONS

Source	Emission Factor	unit	CO lb/hr	CO lb/day	CO ton/year
Incinerators					
Kulluk	300	lb/ton	41.40	496.80	29.81
Ice Management	300	lb/ton	23.10	554.40	12.64
Anchor Handler	300	lb/ton	23.10	554.40	12.64
OSR vessel	300	lb/ton	18.75	450.00	27.00
Quartering vessel	300	lb/ton	18.75	450.00	27.00
			125.10	**2,505.60**	**109.09**

Source	pollutant	EF	unit	reference
Incinerators	CO	300	lb/ton	AP42 Table 2.1-12, 10/96

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 8	OF: 14	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

SO_2 EMISSIONS - FOR IMPACT MODELING

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	0.001419	lb/gal		0.53	12.75	12.75	12.75	9.00	0.67
MLC HPU'S	0.001419	lb/gal		0.11	2.65	2.65	0	0	0.03
Air compressors	0.001419	lb/gal		0.11	2.65	2.65	0	0	0.03
Cranes	0.001419	lb/gal		0.03	0.32	0.19	0.19	0.32	0.01
Heaters & Boilers	0.001419	lb/gal		0.06	1.51	1.51	1.51	1.51	0.09
Seldom-used units	0.001419	lb/gal		0.0011	0.0268	0.0268	0.0268	0.0268	0.0016
Emergency Generator	0.001419	lb/gal		0.0546	0.1092	0.1092	0.1092	0.1092	0.0002
Primary Ice Management									
Propulsion & Generation	0.001419	lb/gal		2.37	56.84	56.84	56.84	56.84	1.30
Heaters & Boilers	0.001419	lb/gal		0.11	2.52	2.52	2.52	2.52	0.06
Seldom-used units	0.001419	lb/gal		0.0008	0.0203	0.0203	0.0203	0.0203	0.0005
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	0.001419	lb/gal		2.37	56.84	56.84	56.84	56.84	1.30
Heaters & Boilers	0.001419	lb/gal		0.11	2.52	2.52	2.52	2.52	0.06
Seldom-used units	0.001419	lb/gal		0.0008	0.0203	0.0203	0.0203	0.0203	0.0005
Resupply Ship - transport mode									
Propulsion & Generation	0.001419	lb/gal	*0.88*	(0*)	1.70	(0*)	(0*)	(0*)	0.04
Seldom-used units	0.001419	lb/gal	*0.000*	(0*)	0.00	(0*)	(0*)	(0*)	0.00
Resupply Ship - DP mode									
Propulsion & Generation	0.001419	lb/gal		0.88	6.81	6.81	6.81	6.81	0.08
Seldom-used units	0.001419	lb/gal		0.0002	0.0041	0.0041	0.0041	0.0041	0.0002
OSR vessel									
Propulsion & Generation	0.001419	lb/gal		0.17	3.97	3.97	3.97	3.97	0.14
Seldom-used units	0.001419	lb/gal		0.0008	0.0203	0.0203	0.0203	0.0203	0.0012
Quartering vessel									
Propulsion & Generation	0.001419	lb/gal		0.28	6.81	6.81	6.81	6.81	0.25
Seldom-used units	0.001419	lb/gal		0.0008	0.0203	0.0203	0.0203	0.0203	0.0012
OSR work boats									
Work boats	0.001419	lb/gal		0.03	0.77	0.77	0.77	0.77	0.05
TOTAL				**7**	**159**	**157**	**152**	**148**	**4**

SO2 EMISSIONS

Source	Emission Factor	unit	SO_2 lb/hr	SO_2 lb/day	SO_2 ton/year
Incinerators					
Kulluk	2.5	lb/ton	0.35	4.14	0.25
Ice Management	2.5	lb/ton	0.19	4.62	0.11
Anchor Handler	2.5	lb/ton	0.19	4.62	0.11
OSR vessel	2.5	lb/ton	0.16	3.75	0.23
Quartering vessel	2.5	lb/ton	0.16	3.75	0.23
			1.04	**20.88**	**0.91**

Source	pollutant	EF	unit	reference
Incinerators	SO_2	2.5	lb/ton	AP42 Table 2.1-12, 10/96

S = the weight % Sulfur in the Fuel: 0.0100% — 0.0105 lb/MMBtu

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

VOC EMISSIONS

	Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
					VOC_pph	Max_VOC_ppd	MLC_VOC_ppd	Drill_VOC_ppd	C/L_VOC_ppd	VOC_tpy
Kulluk										
	Generation	0.004	lb/gal		1.37	32.77	32.77	32.77	23.13	1.72
	MLC HPU'S	0.014	lb/gal		1.10	26.46	26.46	0	0	0.26
	Air compressors	0.004	lb/gal		0.28	6.80	6.80	0	0	0.07
	Cranes	0.014	lb/gal		0.26	3.18	1.91	1.91	3.18	0.15
	Heaters & Boilers	0.001	lb/gal		0.04	1.07	1.07	1.07	1.07	0.06
	Seldom-used units	0.047	lb/gal		0.04	0.89	0.89	0.89	0.89	0.05
	Emergency Generator	0.047	lb/gal		1.82	3.64	3.64	3.64	3.64	0.01
Primary Ice Management										
	Propulsion & Generation	0.004	lb/gal		6.09	146.06	146.06	146.06	146.06	3.33
	Heaters & Boilers	0.001	lb/gal		0.07	1.78	1.78	1.78	1.78	0.04
	Seldom-used units	0.047	lb/gal		0.03	0.68	0.68	0.68	0.68	0.02
Secondary Ice Management / Anchor Handler										
	Propulsion & Generation	0.004	lb/gal		6.09	146.06	146.06	146.06	146.06	3.33
	Heaters & Boilers	0.001	lb/gal		0.07	1.78	1.78	1.78	1.78	0.04
	Seldom-used units	0.047	lb/gal		0.03	0.68	0.68	0.68	0.68	0.02
Resupply Ship - transport mode										
	Propulsion & Generation	0.012	lb/gal	*7.56*	(0*)	14.58	(0*)	(0*)	(0*)	0.35
	Seldom-used units	0.047	lb/gal	*0.006*	(0*)	0.14	(0*)	(0*)	(0*)	0.01
Resupply Ship - DP mode										
	Propulsion & Generation	0.012	lb/gal		7.56	58.32	58.32	58.32	58.32	0.70
	Seldom-used units	0.047	lb/gal		0.0056	0.1350	0.1350	0.1350	0.1350	0.0081
OSR vessel										
	Propulsion & Generation	0.012	lb/gal		1.42	34.02	34.02	34.02	34.02	1.22
	Seldom-used units	0.047	lb/gal		0.03	0.68	0.68	0.68	0.68	0.04
Quartering vessel										
	Propulsion & Generation	0.001	lb/gal		0.24	5.83	5.83	5.83	5.83	0.21
	Seldom-used units	0.047	lb/gal		0.03	0.68	0.68	0.68	0.68	0.04
OSR work boats										
	Work boats	0.047	lb/gal		1.07	25.58	25.58	25.58	25.58	1.53
TOTAL					**28**	**512**	**496**	**463**	**454**	**13**

VOC EMISSIONS

Source	Emission Factor	unit	VOC lb/hr	VOC lb/day	VOC ton/year
			I_VOC_pph	I_VOC_ppd	I_VOC_tpy
Incinerators					
Kulluk	100	lb/ton	13.80	165.60	9.94
Ice Management	100	lb/ton	7.70	184.80	4.21
Anchor Handler	100	lb/ton	7.70	184.80	4.21
OSR vessel	100	lb/ton	6.25	150.00	9.00
Quartering vessel	100	lb/ton	6.25	150.00	9.00
			41.70	**835.20**	**36.36**

Source	pollutant	EF	unit	reference
Incinerators	VOC	100	lb/ton	AP42 Table 2.1-12, 10/96

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor	
ENGINEERING CALCULATIONS	PROJECT NO: 180-20-6	PAGE: 10	OF: 14 / SHEET: 2
	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011	

LEAD EMISSIONS

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	3.92E-06	lb/gal		1.47E-03	3.52E-02	3.52E-02	3.52E-02	2.48E-02	1.84E-03
MLC HPU'S	3.92E-06	lb/gal		3.05E-04	7.31E-03	7.31E-03	0.00E+00	0.00E+00	7.31E-05
Air compressors	3.92E-06	lb/gal		3.05E-04	7.31E-03	7.31E-03	0.00E+00	0.00E+00	7.31E-05
Cranes	3.92E-06	lb/gal		7.31E-05	8.77E-04	5.26E-04	5.26E-04	8.77E-04	4.07E-05
Heaters & Boilers	1.22E-06	lb/gal		5.40E-05	1.30E-03	1.30E-03	1.30E-03	1.30E-03	7.78E-05
Seldom-used units	3.92E-06	lb/gal		3.08E-06	7.39E-05	7.39E-05	7.39E-05	7.39E-05	4.43E-06
Emergency Generator	3.92E-06	lb/gal		1.51E-04	3.01E-04	3.01E-04	3.01E-04	3.01E-04	6.03E-07
Primary Ice Management									
Propulsion & Generation	3.92E-06	lb/gal		6.54E-03	1.57E-01	1.57E-01	1.57E-01	1.57E-01	3.58E-03
Heaters & Boilers	1.22E-06	lb/gal		9.00E-05	2.16E-03	2.16E-03	2.16E-03	2.16E-03	4.92E-05
Seldom-used units	3.92E-06	lb/gal		2.33E-06	5.59E-05	5.59E-05	5.59E-05	5.59E-05	1.28E-06
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	3.92E-06	lb/gal		6.54E-03	1.57E-01	1.57E-01	1.57E-01	1.57E-01	3.58E-03
Heaters & Boilers	1.22E-06	lb/gal		9.00E-05	2.16E-03	2.16E-03	2.16E-03	2.16E-03	4.92E-05
Seldom-used units	3.92E-06	lb/gal		2.33E-06	5.59E-05	5.59E-05	5.59E-05	5.59E-05	1.28E-06
Resupply Ship - transport mode									
Propulsion & Generation	3.92E-06	lb/gal	*2.44E-03*	(0*)	4.70E-03	(0*)	(0*)	(0*)	1.13E-04
Seldom-used units	3.92E-06	lb/gal	*4.66E-07*	(0*)	1.12E-05	(0*)	(0*)	(0*)	6.71E-07
Resupply Ship - DP mode									
Propulsion & Generation	3.92E-06	lb/gal		2.44E-03	1.88E-02	1.88E-02	1.88E-02	1.88E-02	2.26E-04
Seldom-used units	3.92E-06	lb/gal		4.66E-07	1.12E-05	1.12E-05	1.12E-05	1.12E-05	6.71E-07
OSR vessel									
Propulsion & Generation	3.92E-06	lb/gal		4.57E-04	1.10E-02	1.10E-02	1.10E-02	1.10E-02	3.95E-04
Seldom-used units	3.92E-06	lb/gal		2.33E-06	5.59E-05	5.59E-05	5.59E-05	5.59E-05	3.36E-06
Quartering vessel									
Propulsion & Generation	3.92E-06	lb/gal		7.83E-04	1.88E-02	1.88E-02	1.88E-02	1.88E-02	6.77E-04
Seldom-used units	3.92E-06	lb/gal		2.33E-06	5.59E-05	5.59E-05	5.59E-05	5.59E-05	3.36E-06
OSR work boats									
Work boats	3.92E-06	lb/gal		8.83E-05	2.12E-03	2.12E-03	2.12E-03	2.12E-03	1.27E-04
TOTAL				**1.94E-02**	**4.26E-01**	**4.21E-01**	**4.06E-01**	**3.96E-01**	**1.09E-02**

LEAD EMISSIONS

Source	Emission Factor	unit	Lead lb/hr	Lead lb/day	Lead ton/year
Incinerators					
Kulluk	0.213	lb/ton	0.03	0.35	0.02
Ice Management	0.213	lb/ton	0.02	0.39	0.01
Anchor Handler	0.213	lb/ton	0.02	0.39	0.01
OSR vessel	0.213	lb/ton	0.01	0.32	0.02
Quartering vessel	0.213	lb/ton	0.01	0.32	0.02
			0.09	**1.78**	**0.08**

Source	pollutant	EF	unit	EF	unit
IC Engines	Lead	2.90E-05	lb/MMBtu	3.92E-06	lb/gal
Boilers	Lead	9	lb/10^{12} Btu	1.22E-06	lb/gal
Incinerators	Lead			0.213	lb/ton

Reference	
IC Engines	L & E Air Emissions from Sources of Lead and Lead Compounds, EPA 454/R-98-006, May 1998, Section 5.2.2, Distillate oil-fired gas turbines
Boilers	AP42, Table 1.3-10. Emission Factors For Trace Elements From Distillate Fuel Oil Combustion Sources
Incinerators	AP42, Table 2.2-2 - Metals Emission Factors for Mass Burn and Modular Excess Air Combustors

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

HAP EMISSIONS

Source	Emission Factor	unit	Control	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk										
Generation	1.65E-04	lb/gal	SCR, OxyCat		6.16E-02	1.48E+00	1.48E+00	1.48E+00	1.04E+00	7.75E-02
MLC HPU'S	1.65E-04	lb/gal	OxyCat		1.28E-02	3.07E-01	3.07E-01	0.00E+00	0.00E+00	3.07E-03
Air compressors	1.65E-04	lb/gal	OxyCat		1.28E-02	3.07E-01	3.07E-01	0.00E+00	0.00E+00	3.07E-03
Cranes	1.65E-04	lb/gal	OxyCat		3.07E-03	3.69E-02	2.21E-02	2.21E-02	3.69E-02	1.71E-03
Heaters & Boilers	4.42E-05	lb/gal			1.96E-03	4.71E-02	4.71E-02	4.71E-02	4.71E-02	2.83E-03
Seldom-used units	5.31E-04	lb/gal			4.17E-04	1.00E-02	1.00E-02	1.00E-02	1.00E-02	6.01E-04
Emergency Generator	5.31E-04	lb/gal			2.04E-02	4.09E-02	4.09E-02	4.09E-02	4.09E-02	8.17E-05
Primary Ice Management										
Propulsion & Generation	1.65E-04	lb/gal	SCR, OxyCat		2.75E-01	6.59E+00	6.59E+00	6.59E+00	6.59E+00	1.50E-01
Heaters & Boilers	4.42E-05	lb/gal			3.27E-03	7.85E-02	7.85E-02	7.85E-02	7.85E-02	1.79E-03
Seldom-used units	5.31E-04	lb/gal			3.16E-04	7.58E-03	7.58E-03	7.58E-03	7.58E-03	1.73E-04
Secondary Ice Management / Anchor Handler										
Propulsion & Generation	1.65E-04	lb/gal	SCR, OxyCat		2.75E-01	6.59E+00	6.59E+00	6.59E+00	6.59E+00	1.50E-01
Heaters & Boilers	4.42E-05	lb/gal			3.27E-03	7.85E-02	7.85E-02	7.85E-02	7.85E-02	1.79E-03
Seldom-used units	5.31E-04	lb/gal			3.16E-04	7.58E-03	7.58E-03	7.58E-03	7.58E-03	1.73E-04
Resupply Ship - transport mode										
Propulsion & Generation	5.31E-04	lb/gal		*3.30E-01*	(0*)	6.37E-01	(0*)	(0*)	(0*)	1.53E-02
Seldom-used units	5.31E-04	lb/gal		*6.32E-05*	(0*)	1.52E-03	(0*)	(0*)	(0*)	9.10E-05
Resupply Ship - DP mode										
Propulsion & Generation	5.31E-04	lb/gal			3.30E-01	2.55E+00	2.55E+00	2.55E+00	2.55E+00	3.06E-02
Seldom-used units	5.31E-04	lb/gal			6.32E-05	1.52E-03	1.52E-03	1.52E-03	1.52E-03	9.10E-05
OSR vessel										
Propulsion & Generation	5.31E-04	lb/gal			6.19E-02	1.49E+00	1.49E+00	1.49E+00	1.49E+00	5.35E-02
Seldom-used units	5.31E-04	lb/gal			3.16E-04	7.58E-03	7.58E-03	7.58E-03	7.58E-03	4.55E-04
Quartering vessel										
Propulsion & Generation	5.31E-04	lb/gal	CDPF		1.06E-01	2.55E+00	2.55E+00	2.55E+00	2.55E+00	9.17E-02
Seldom-used units	5.31E-04	lb/gal			3.16E-04	7.58E-03	7.58E-03	7.58E-03	7.58E-03	4.55E-04
OSR work boats										
Work boats	5.31E-04	lb/gal			1.20E-02	2.87E-01	2.87E-01	2.87E-01	2.87E-01	1.72E-02
TOTAL					**1.18**	**23.11**	**22.46**	**21.84**	**21.42**	**0.60**

HAP EMISSIONS

Source	Emission Factor	unit	HAP lb/hr	HAP lb/day	HAP ton/year
Incinerators					
Kulluk	2.51E-01	lb/ton	0.03	0.42	0.02
Ice Management	2.51E-01	lb/ton	0.02	0.46	0.01
Anchor Handler	2.51E-01	lb/ton	0.02	0.46	0.01
OSR vessel	2.51E-01	lb/ton	0.02	0.38	0.02
Quartering vessel	2.51E-01	lb/ton	0.02	0.38	0.02
			0.10	**2.09**	**0.09**

Source	pollutant	EF	unit
IC Engines-uncontrolled	HAP	5.31E-04	lb/gal
IC Engines-OxyCat controlled	HAP	1.65E-04	lb/gal
Boilers	HAP	4.42E-05	lb/gal
Incinerators	HAP	2.51E-01	lb/ton

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor	
ENGINEERING CALCULATIONS	PROJECT NO: 180-20-6	PAGE: 12	OF: 14 / SHEET: 2
	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011	

FORMALDEHYDE EMISSIONS

	Source	Emission Factor	unit	Control	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk											
	Generation	4.78E-05	lb/gal	SCR, OxyCat		1.79E-02	4.30E-01	4.30E-01	4.30E-01	3.03E-01	2.25E-02
	MLC HPU'S	4.78E-05	lb/gal	OxyCat		3.72E-03	8.92E-02	8.92E-02	0.00E+00	0.00E+00	8.92E-04
	Air compressors	4.78E-05	lb/gal	OxyCat		3.72E-03	8.92E-02	8.92E-02	0.00E+00	0.00E+00	8.92E-04
	Cranes	4.78E-05	lb/gal	OxyCat		8.92E-04	1.07E-02	6.42E-03	6.42E-03	1.07E-02	4.97E-04
	Heaters & Boilers	3.30E-05	lb/gal			1.47E-03	3.52E-02	3.52E-02	3.52E-02	3.52E-02	2.11E-03
	Seldom-used units	1.59E-04	lb/gal			1.25E-04	3.01E-03	3.01E-03	3.01E-03	3.01E-03	1.80E-04
	Emergency Generator	1.59E-04	lb/gal			6.13E-03	1.23E-02	1.23E-02	1.23E-02	1.23E-02	2.45E-05
Primary Ice Management											
	Propulsion & Generation	4.78E-05	lb/gal	SCR, OxyCat		7.98E-02	1.91E+00	1.91E+00	1.91E+00	1.91E+00	4.37E-02
	Heaters & Boilers	3.30E-05	lb/gal			2.44E-03	5.87E-02	5.87E-02	5.87E-02	5.87E-02	1.34E-03
	Seldom-used units	1.59E-04	lb/gal			9.48E-05	2.28E-03	2.28E-03	2.28E-03	2.28E-03	5.19E-05
Secondary Ice Management / Anchor Handler											
	Propulsion & Generation	4.78E-05	lb/gal	SCR, OxyCat		7.98E-02	1.91E+00	1.91E+00	1.91E+00	1.91E+00	4.37E-02
	Heaters & Boilers	3.30E-05	lb/gal			2.44E-03	5.87E-02	5.87E-02	5.87E-02	5.87E-02	1.34E-03
	Seldom-used units	1.59E-04	lb/gal			9.48E-05	2.28E-03	2.28E-03	2.28E-03	2.28E-03	5.19E-05
Resupply Ship - transport mode											
	Propulsion & Generation	1.59E-04	lb/gal		*9.91E-02*	(0*)	1.91E-01	(0*)	(0*)	(0*)	4.59E-03
	Seldom-used units	1.59E-04	lb/gal		*1.90E-05*	(0*)	4.55E-04	(0*)	(0*)	(0*)	2.73E-05
Resupply Ship - DP mode											
	Propulsion & Generation	1.59E-04	lb/gal			9.91E-02	7.65E-01	7.65E-01	7.65E-01	7.65E-01	9.18E-03
	Seldom-used units	1.59E-04	lb/gal			1.90E-05	4.55E-04	4.55E-04	4.55E-04	4.55E-04	2.73E-05
OSR vessel											
	Propulsion & Generation	1.59E-04	lb/gal			1.86E-02	4.46E-01	4.46E-01	4.46E-01	4.46E-01	1.61E-02
	Seldom-used units	1.59E-04	lb/gal			9.48E-05	2.28E-03	2.28E-03	2.28E-03	2.28E-03	1.37E-04
Quartering vessel											
	Propulsion & Generation	1.59E-04	lb/gal	CDPF		3.19E-02	7.65E-01	7.65E-01	7.65E-01	7.65E-01	2.75E-02
	Seldom-used units	1.59E-04	lb/gal			9.48E-05	2.28E-03	2.28E-03	2.28E-03	2.28E-03	1.37E-04
OSR work boats											
	Work boats	1.59E-04	lb/gal			3.59E-03	8.62E-02	8.62E-02	8.62E-02	8.62E-02	5.17E-03
TOTAL						**0.35**	**6.88**	**6.68**	**6.51**	**6.38**	**0.18**

FORMALDEHYDE EMISSIONS

	Source	Emission Factor	unit	CH_2O lb/hr	CH_2O lb/day	CH_2O ton/year
Incinerators						
	Kulluk	0.00E+00	lb/ton	0.00	0.00	0.00
	Ice Management	0.00E+00	lb/ton	0.00	0.00	0.00
	Anchor Handler	0.00E+00	lb/ton	0.00	0.00	0.00
	OSR vessel	0.00E+00	lb/ton	0.00	0.00	0.00
	Quartering vessel	0.00E+00	lb/ton	0.00	0.00	0.00
				0.00	**0.00**	**0.00**

Source	pollutant	EF	unit
IC Engines-uncontrolled	CH_2O	1.59E-04	lb/gal
IC Engines-OxyCat controlled	CH_2O	4.78E-05	lb/gal
Boilers	CH_2O	3.30E-05	lb/gal
Incinerators	CH_2O	0.00E+00	lb/ton

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

HAPs Emission Factors -(from AP42)

ICE Engines Emission Factors

AP42 Table 3.3-2, Speciated Organic Compound Emission Factors For Uncontrolled Diesel Engines

Pollutant	EF lb/MMBtu	EF lb/gal
Acaldehyde	7.67E-04	1.04E-04
Acenaphthene	1.42E-06	1.92E-07
Acenaphthylene	5.06E-06	6.83E-07
Acrolein	9.25E-05	1.25E-05
Anthracene	1.87E-06	2.52E-07
Benzene	9.33E-04	1.26E-04
Benzo(a)anthracene	1.68E-06	2.27E-07
Benzo(a)pyrene	1.88E-07	2.54E-08
Benzo(b)fluoranthene	9.91E-08	1.34E-08
Benzo(g,h,l)perylene	4.89E-07	6.60E-08
Benzo(k)fluoranthene	1.55E-07	2.09E-08
1,3-Butadiene	3.91E-05	5.28E-06
Chrysene	3.53E-07	4.77E-08
Dibenz(a,h)anthracene	5.83E-07	7.87E-08
Fluoranthene	7.61E-06	1.03E-06
Fluorene	2.92E-05	3.94E-06
Formaldehyde	1.18E-03	1.59E-04
Indeno(1,2,3-cd)pyrene	3.75E-07	5.06E-08
Naphthalene	8.48E-05	1.14E-05
Phenanthrene	2.94E-05	3.97E-06
Pyrene	4.78E-06	6.45E-07
Toluene	4.09E-04	5.52E-05
Xylenes	2.85E-04	3.85E-05
		5.23E-04

Boiler Emission Factors

AP42 Table 1.3-9, Emission Factors For Speciated Organic Compounds From Fuel Oil Combustion

Pollutant	EF lb/10^3 gal	EF lb/gal
Acenaphthene	2.11E-05	2.11E-08
Acenaphthylene	2.53E-07	2.53E-10
Anthracene	1.22E-06	1.22E-09
Benzene	2.14E-04	2.14E-07
Benz(a)anthracene	4.01E-06	4.01E-09
Benzo(b,k)fluoranthene	1.48E-06	1.48E-09
Benzo(g,h,i)perylene	2.26E-06	2.26E-09
Chrysene	2.38E-06	2.38E-09
Dibenzo(a,h)anthracene	1.67E-06	1.67E-09
Ethylbenzene	6.36E-05	6.36E-08
Fluoranthene	4.84E-06	4.84E-09
Fluorene	4.47E-06	4.47E-09
Formaldehyde	3.30E-02	3.30E-05
Indo(1,2,3-cd)pyrene	2.14E-06	2.14E-09
Naphthalene	1.13E-03	1.13E-06
Phenanthrene	1.05E-05	1.05E-08
Pyrene	4.25E-06	4.25E-09
Toluene	6.20E-03	6.20E-06
o-Xylene	1.09E-04	1.09E-07
		4.08E-05

Incinerator Emission Factors

Table 1.3-10. Emission Factors For Trace Elements From Distillate Fuel Oil Combustion Sources

Metal			EF lb/MMBtu	EF lb/gal
Arsenic	As		4.90E-06	6.62E-07
Cadmium	Cd	11 lb/10^{12} Btu	1.10E-05	1.49E-06
Chromium	Cr	0.35 lb/10^{9} gal	2.59E-06	3.50E-07
Lead	Pb		2.9E-05	3.92E-06
Mercury	Hg	6.2 lb/10^{12} Btu	6.20E-06	8.37E-07
Nickel	Ni	0.41 lb/10^{6} gal	3.04E-06	4.10E-07
	Total Metals			7.66E-06
	Total HAPs			5.31E-04

Metal		EF lb/10^{12} Btu	EF lb/gal
Arsenic	As	4	5.40E-07
Cadmium	Cd	3	4.05E-07
Chromium	Cr	3	4.05E-07
Lead	Pb	9	1.22E-06
Mercury	Hg	3	4.05E-07
Nickel	Ni	3	4.05E-07
Total Metals			3.38E-06
Total HAPs			4.42E-05

Table 2.2-2 - Metals Emission Factors for Mass Burn and Modular Excess Air Combustors

Metal		lb/ton
Arsenic	As	4.37E-03
Cadmium	Cd	1.09E-02
Chromium	Cr	8.97E-03
Lead	Pb	2.13E-01
Mercury	Hg	5.60E-03
Nickel	Ni	7.85E-03
Total Metals		2.51E-01
Total HAPs		2.51E-01

Greatest Emited HAP

Formaldehyde	1.59E-04	3.30E-05	

ICE Metal References

Arsenic	L & E Air Emissions from Sources of Arsenic and Arsenic Compounds, EPA-454/R-98-013, June 1998, Table 4-20, Distillate Oil Fired Turbine
Cadmium	L & E Air Emissions from Sources of Cadmium and Cadmium Compounds, EPA-454/R-93-040, Sept. 1993, Table 6-12, No. 2 Distillate Oil
Chromium	L & E Air Emissions from Sources of Chromium, EPA-450/4-84-007g, July 1984, Table 36, Distillate #2
Lead	L & E Air Emissions from Sources of Lead and Lead Compounds, EPA 454/R-98-006, May 1998, Section 5.2.2, Distillate oil-fired gas turbines
Mercury	L & E Air Emissions from Sources of Mercury and Mercury Compounds, EPA-454/R-97-012, Dec. 1997, Table 6-12, Distillate No. 2
Nickel	L & E Air Emissions from Sources of Nickel, EPA-450/4-84-007f, March 1984, Table 26, Distillate #2

Maximum Annual Fuel

Total Annual Fuel	MMBtu/year	gallons/year
Kulluk & Associated Fleet	810,000	6,000,000

Waste	ton/yr
All Incinerators	727

Greenhouse Gas Emissions

$CO_2 + CH_4*21 + N_2O*310 \rightarrow CO_2e$

Pollutant	Type	Multiplier	Reference	EF	unit	ton/year	Reference
CO_2	comb	1	40 CFR 98, Table A-1	73.96	kg/MMBtu	66,037	40 CFR Part 98, Subpart C, Table C-1 (Distillate Fuel Oil No. 2)
CH_4	comb	21	40 CFR 98, Table A-1	3.00E-03	kg/MMBtu	56	40 CFR Part 98, Subpart C, Table C-2 (Fuel Type: Petroleum)
N_2O	comb	310	40 CFR 98, Table A-1	6.00E-04	kg/MMBtu	166	40 CFR Part 98, Subpart C, Table C-2 (Fuel Type: Petroleum)
CH_4	offgas	21	40 CFR 98, Table A-1	399	lb	4	Methane Mass Caculation.xls October 22,2010
Annual CO_2e						66,263	

Sulfuric Acid

$S + O_2 \rightarrow SO_2$

$2SO_2 + O_2 \rightarrow 2SO_3$

$SO_3 + H_2O \rightarrow H_2SO_4$

Pollutant	Formula	MW
Sulfuric Acid	H_2SO_4	98.079 g/g-mol
Sulfur	S	32.066 g/g-mol

3.06 weight conversion of S to H_2SO_4

Source	S content	H_2SO_4 EF		Reference	H_2SO_4 [b] ton/year
Kulluk & Associated Fleet	0.0100%	0.0161	lb/MMBtu	Calculation	0.33
All Incinerators		1.2	lb/ton	AP42 Table 2.2-2, 1/95 [a]	0.44
					0.76

[a] Acid Gas Emission Factors for Multiple Hearth Sewage Sludge Incinerators, Uncontrolled

[b] Conversion assumed of 5.0% Ref: AP42, Section 1.3.3.2 Sulfur Oxides Emissions. Maximum conversion of SO2 to SO3 from fuel oil combustion in boilers

Fluorides

Fluoride is not a listed and quantified trace pollutant from diesel combustion as provided by AP42, so it is assumed to be an extremely small constituent. Furthermore, fluoride is a reduced form of fluorine and diesel combustion is an oxidizing process. Therefore, it is unlikely that it would exist as a combustion bi-product and should be a negligible emission from the project.

Hydrogen Sulfide, Total Reduced Sulfur, Reduced Sulfur Compounds

TRS	Formula
Dimethyl disulfide (DMDS)	$(CH_3)_2S_2$
Dimethyl sulfide (DMS)	$(CH_3)_2S$
Hydrogen sulfide	H_2S
Methyl mercaptan (MeSH)	CH_4S

RSC	Formula
Carbon disulfide	CS_2
Carbonyl sulfide	COS
Hydrogen sulfide	H_2S

Pollutant	MW
SO_2	64 g/g-mol
H_2S	34.081 g/g-mol

0.53 weight conversion of SO_2 to H_2S

Source	SO_2 EF		SO_2 ton/year	H_2S EF [a]		H_2S ton/year
Kulluk & Associated Fleet	0.0105	lb/MMBtu	4.26	5.60E-03	lb/MMBtu	2.27
All Incinerators	2.5	lb/ton	0.91	1.33E+00	lb/ton	0.48
			5.16			2.75

[a] It is assumed that all SO_2 is transformed to H_2S

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
ENGINEERING CALCULATIONS	PROJECT NO: 180-20-6	PAGE: 1	OF: 4	SHEET: 3
	SUBJECT: Model Emission Summary	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group
MLC Case

STACK	NO_X g/s	$PM_{2.5}$ g/s	PM_{10} g/s	CO g/s	SO_2 g/s	NH_3 g/s
Kulluk						
MAINENGS	2.395	0.374	0.374	1.08	6.70E-02	0.09
MLCHPU_A	2.330	0.093	0.093	0.13	6.95E-03	0.00
MLCHPU_B	2.330	0.093	0.093	0.13	6.95E-03	0.00
AIRCMP_A	1.864	0.039	0.039	0.11	6.95E-03	0.00
AIRCMP_B	1.864	0.039	0.039	0.11	6.95E-03	0.00
CRANE_A	0.112	0.004	0.004	0.01	3.34E-04	0.00
CRANE_B	0.112	0.004	0.004	0.01	3.34E-04	0.00
CRANE_C	0.112	0.004	0.004	0.01	3.34E-04	0.00
HEATBOIL	0.112	0.018	0.018	0.03	7.94E-03	0.00
INCIN_K	0.052	0.243	0.285	5.22	0.04	0.00
SELDOML (no egen.)	0.047	0.004	0.004	0.01	1.41E-04	0.00
SELDOMH (egen.)	2.307	0.185	0.185	0.62	6.88E-03	0.00
Primary Ice Management						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Secondary Ice Management / Anchor Handler						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Model ID: ICEMGMT; ICE MGMT/AH AREAPOLY [1, 2]	*2.51E-06*	*4.21E-07*	*4.27E-07*	*1.79E-06*	*7.71E-08*	*4.63E-08*
Resupply Ship - DP mode						
Propulsion & Generation	9.588	0.399	0.399	2.89	3.57E-02	0.00
Seldom-used units	0.007	0.001	0.001	0.00	2.13E-05	0.00
Model ID: RESUP_DP	*9.59*	*0.40*	*0.40*	*2.89*	*0.04*	*0.00*
Resupply Ship - transport mode						
Propulsion & Generation	0.000	0.000	0.000	0.00	0.00E+00	0.00
Seldom-used units	0.000	0.000	0.000	0.00	0.00E+00	0.00
OSR vessel						
Propulsion & Generation	5.593	0.233	0.233	1.69	2.09E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_MAIN; OSR Vessel AREAPOLY [1, 3]	*1.41E-06*	*8.66E-08*	*9.13E-08*	*1.02E-06*	*1.02E-08*	*0.00E+00*
Quartering vessel						
Propulsion & Generation	7.191	0.060	0.060	0.29	3.57E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_QTR; Quartering Vessel AREAPOLY [1,	*1.81E-06*	*4.33E-08*	*4.80E-08*	*6.66E-07*	*1.39E-08*	*0.00E+00*
OSR work boats						
Work boats	1.352	0.108	0.108	0.36	4.03E-03	0.00
Model ID: OSR_WORK; OSR Work Boats AREAPOLY [1]	*3.38E-07*	*2.70E-08*	*2.70E-08*	*9.12E-08*	*1.01E-09*	*0.00E+00*

[1] AREAPOLY units = $g/s/m^2$

[2] Ice Mngt/AH divide by area of the AREAPOLY = 8,718,385 sq. meters

[3] OSR divide by area of the AREAPOLY = 3,997,350 sq. meters

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 2	OF: 4	SHEET: 3
ENGINEERING CALCULATIONS	SUBJECT: Model Emission Summary	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group
Drill Case

STACK	NO_X g/s	$PM_{2.5}$ g/s	PM_{10} g/s	CO g/s	SO_2 g/s	NH_3 g/s
Kulluk						
MAINENGS	2.395	0.374	0.374	1.08	6.70E-02	0.09
MLCHPU_A	0.000	0.000	0.000	0.00	0.00E+00	0.00
MLCHPU_B	0.000	0.000	0.000	0.00	0.00E+00	0.00
AIRCMP_A	0.000	0.000	0.000	0.00	0.00E+00	0.00
AIRCMP_B	0.000	0.000	0.000	0.00	0.00E+00	0.00
CRANE_A	0.112	0.004	0.004	0.01	3.34E-04	0.00
CRANE_B	0.112	0.004	0.004	0.01	3.34E-04	0.00
CRANE_C	0.112	0.004	0.004	0.01	3.34E-04	0.00
HEATBOIL	0.112	0.018	0.018	0.03	7.94E-03	0.00
INCIN_K	0.052	0.243	0.285	5.22	0.04	0.00
SELDOML (no egen.)	0.047	0.004	0.004	0.01	1.41E-04	0.00
SELDOMH (egen.)	2.307	0.185	0.185	0.62	6.88E-03	0.00
Primary Ice Management						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Secondary Ice Management / Anchor Handler						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Model ID: ICEMGMT; ICE MGMT/AH AREAPOLY [1, 2]	*2.51E-06*	*4.21E-07*	*4.27E-07*	*1.79E-06*	*7.71E-08*	*4.63E-08*
Resupply Ship - DP mode						
Propulsion & Generation	9.588	0.399	0.399	2.89	3.57E-02	0.00
Seldom-used units	0.007	0.001	0.001	0.00	2.13E-05	0.00
Model ID: RESUP_DP	*9.59*	*0.40*	*0.40*	*2.89*	*0.04*	*0.00*
Resupply Ship - transport mode						
Propulsion & Generation	0.000	0.000	0.000	0.00	0.00E+00	0.00
Seldom-used units	0.000	0.000	0.000	0.00	0.00E+00	0.00
OSR vessel						
Propulsion & Generation	5.593	0.233	0.233	1.69	2.09E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_MAIN; OSR Vessel AREAPOLY [1, 3]	*1.41E-06*	*8.66E-08*	*9.13E-08*	*1.02E-06*	*1.02E-08*	*0.00E+00*
Quartering vessel						
Propulsion & Generation	7.191	0.060	0.060	0.29	3.57E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_QTR; Quartering Vessel AREAPOLY [1,	*1.81E-06*	*4.33E-08*	*4.80E-08*	*6.66E-07*	*1.39E-08*	*0.00E+00*
OSR work boats						
Work boats	1.352	0.108	0.108	0.36	4.03E-03	0.00
Model ID: OSR_WORK; OSR Work Boats AREAPOLY [1]	*3.38E-07*	*2.70E-08*	*2.70E-08*	*9.12E-08*	*1.01E-09*	*0.00E+00*

[1] AREAPOLY units = $g/s/m^2$

[2] Ice Mngt/AH divide by area of the AREAPOLY = 8,718,385 sq. meters

[3] OSR divide by area of the AREAPOLY = 3,997,350 sq. meters

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
ENGINEERING CALCULATIONS	PROJECT NO: 180-20-6	PAGE: 3	OF: 4	SHEET: 3
	SUBJECT: Model Emission Summary	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group
Cementing/Logging Case

STACK	NO_X g/s	$PM_{2.5}$ g/s	PM_{10} g/s	CO g/s	SO_2 g/s	NH_3 g/s
Kulluk						
MAINENGS	1.690	0.264	0.264	0.76	4.73E-02	0.09
MLCHPU_A	0.000	0.000	0.000	0.00	0.00E+00	0.00
MLCHPU_B	0.000	0.000	0.000	0.00	0.00E+00	0.00
AIRCMP_A	0.000	0.000	0.000	0.00	0.00E+00	0.00
AIRCMP_B	0.000	0.000	0.000	0.00	0.00E+00	0.00
CRANE_A	0.186	0.007	0.007	0.01	5.56E-04	0.00
CRANE_B	0.186	0.007	0.007	0.01	5.56E-04	0.00
CRANE_C	0.186	0.007	0.007	0.01	5.56E-04	0.00
HEATBOIL	0.112	0.018	0.018	0.03	7.94E-03	0.00
INCIN_K	0.052	0.243	0.285	5.22	0.04	0.00
SELDOML (no egen.)	0.047	0.004	0.004	0.01	1.41E-04	0.00
SELDOMH (egen.)	2.307	0.185	0.185	0.62	6.88E-03	0.00
Primary Ice Management						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Secondary Ice Management / Anchor Handler						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Model ID: ICEMGMT; ICE MGMT/AH AREAPOLY [1, 2]	*2.51E-06*	*4.21E-07*	*4.27E-07*	*1.79E-06*	*7.71E-08*	*4.63E-08*
Resupply Ship - DP mode						
Propulsion & Generation	9.588	0.399	0.399	2.89	3.57E-02	0.00
Seldom-used units	0.007	0.001	0.001	0.00	2.13E-05	0.00
Model ID: RESUP_DP	*9.59*	*0.40*	*0.40*	*2.89*	*0.04*	*0.00*
Resupply Ship - transport mode						
Propulsion & Generation	0.000	0.000	0.000	0.00	0.00E+00	0.00
Seldom-used units	0.000	0.000	0.000	0.00	0.00E+00	0.00
OSR vessel						
Propulsion & Generation	5.593	0.233	0.233	1.69	2.09E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_MAIN; OSR Vessel AREAPOLY [1, 3]	*1.41E-06*	*8.66E-08*	*9.13E-08*	*1.02E-06*	*1.02E-08*	*0.00E+00*
Quartering vessel						
Propulsion & Generation	7.191	0.060	0.060	0.29	3.57E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_QTR; Quartering Vessel AREAPOLY [1,	*1.81E-06*	*4.33E-08*	*4.80E-08*	*6.66E-07*	*1.39E-08*	*0.00E+00*
OSR work boats						
Work boats	1.352	0.108	0.108	0.36	4.03E-03	0.00
Model ID: OSR_WORK; OSR Work Boats AREAPOLY [1]	*3.38E-07*	*2.70E-08*	*2.70E-08*	*9.12E-08*	*1.01E-09*	*0.00E+00*

[1] AREAPOLY units = $g/s/m^2$

[2] Ice Mngt/AH divide by area of the AREAPOLY = 8,718,385 sq. meters

[3] OSR divide by area of the AREAPOLY = 3,997,350 sq. meters

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 4	OF: 4	SHEET: 3
ENGINEERING CALCULATIONS	SUBJECT: Model Emission Summary	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group
Maximum

STACK	CO g/s	SO_2 g/s	NH_3 g/s
Kulluk			
MAINENGS	1.08	6.70E-02	0.09
MLCHPU_A	0.13	6.95E-03	0.00
MLCHPU_B	0.13	6.95E-03	0.00
AIRCMP_A	0.11	6.95E-03	0.00
AIRCMP_B	0.11	6.95E-03	0.00
CRANE_A	0.01	5.56E-04	0.00
CRANE_B	0.01	5.56E-04	0.00
CRANE_C	0.01	5.56E-04	0.00
HEATBOIL	0.03	7.94E-03	0.00
INCIN_K	5.22	0.04	0.00
SELDOML (no egen.)	0.0127	1.41E-04	0.00
SELDOMH (egen.)	0.6221	6.88E-03	0.00
Primary Ice Management			
Propulsion & Generation	4.83	2.98E-01	0.20
Heaters & Boilers	0.05	1.32E-02	0.00
Seldom-used units	0.01	1.06E-04	0.00
Incinerator	2.91	0.02	0.00
Secondary Ice Management / Anchor Handler			
Propulsion & Generation	4.83	2.98E-01	0.20
Heaters & Boilers	0.05	1.32E-02	0.00
Seldom-used units	0.01	1.06E-04	0.00
Incinerator	2.91	0.02	0.00
Model ID: ICEMGMT; ICE MGMT/AH AREAPOLY [1, 2]	*1.79E-06*	*7.71E-08*	*4.63E-08*
Resupply Ship - DP mode			
Propulsion & Generation	2.89	3.57E-02	0.00
Seldom-used units	0.00	2.13E-05	0.00
Model ID: RESUP_DP	*2.89*	*0.04*	*0.00*
Resupply Ship - transport mode			
Propulsion & Generation	0.00	0.00	0.00
Seldom-used units	0.00	0.00	0.00
OSR vessel			
Propulsion & Generation	1.69	2.09E-02	0.00
Seldom-used units	0.01	1.06E-04	0.00
Incinerator	2.36	0.02	0.00
Model ID: OSR_MAIN; OSR Vessel AREAPOLY [1, 3]	*1.02E-06*	*1.02E-08*	*0.00E+00*
Quartering vessel			
Propulsion & Generation	0.29	3.57E-02	0.00
Seldom-used units	0.01	1.06E-04	0.00
Incinerator	2.36	0.02	0.00
Model ID: OSR_QTR; Quartering Vessel AREAPOLY [1,	*6.66E-07*	*1.39E-08*	*0.00E+00*
OSR work boats			
Work boats	0.36	4.03E-03	0.00
Model ID: OSR_WORK; OSR Work Boats AREAPOLY [1]	*9.12E-08*	*1.01E-09*	*0.00E+00*

[1] AREAPOLY units = $g/s/m^2$

[2] Ice Mngt/AH divide by area of the AREAPOLY = 8,718,385 sq. meters

[3] OSR divide by area of the AREAPOLY = 3,997,350 sq. meters

CONICAL DRILLING UNIT KULLUK IN THE BEAUFORT SEA
ALASKA MINOR SOURCE PERMIT APPLICATION
(18 AAC PART 50.502 (C))
FOR CONSTRUCTION ON THE INNER OCS

CONTENTS

Page

STATIONARY SOURCE IDENTIFICATION FORM 1
EMISSIONS SUMMARY FORM NEW STATIONARY SOURCE 6
MINOR PERMIT APPLICATION - EMISSION UNIT INFORMATION 9
FORM H – OWNER REQUESTED LIMITS TO AVOID CLASSIFICATION 25

Appendices

Alaska Minor-Appendix A: Beaufort Sea Lease Block Map and List
Alaska Minor-Appendix B: Updated Emission Inventory
Alaska Minor-Appendix C: Potential to Emit Emissions – for ORL Purposes Only

SECTION 1

STATIONARY SOURCE IDENTIFICATION FORM

Alaska Department of Environmental Conservation Air Quality Minor Permit Application	**ADEC USE ONLY** Receiving Date: ADEC Control Number AQ MSS :

STATIONARY SOURCE IDENTIFICATION FORM

Section 1 Stationary Source Information

Stationary Source Name:Shell Offshore Inc. – Conical Drilling Unit Kulluk			SIC:1311
Project Name (if different):	Stationary Source Contact:Susan Childs		
Source Physical Address:all OCS leases currently issued in the Beaufort Sea and within 25 miles of the Alaska Seaward boundary (See Appendix A: Beaufort Sea Lease Block Map and List)	City:Anchorage	State:AK	Zip:99503
	Telephone:907-646-7112		
	E-Mail Address:Susan.Childs@shell.com		
UTM Coordinates (m) or Latitude/Longitude:	Northing:	Easting:	Zone:
	Latitude:	Longitude:	

Section 2 Legal Owner

Name:Shell Offshore Inc.		
Mailing Address:3601 C Street, Suite 1334		
City:Anchorage	State:AK	Zip:99503
Telephone #:907-646-7112		
E-Mail Address:		

Section 3 Operator *(if different from owner)*

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

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

Name:Susan Childs		
Mailing Address:3601 C Street, Suite 1334		
City Anchorage	State:AK	Zip:99503
Physical Address:(same)		
City:	State:	Zip:
Telephone #:		
E-Mail Address:		

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

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

Section 6 Application Contact

Name:Pauline Ruddy			
Mailing Address:3601 C Street, Suite 1334	City:Anchorage	State:AK	Zip:99503
	Telephone:907-771-7243		
	E-Mail Address:Pauline.Ruddy@shell.com		

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

☐ Fast Track [18 AAC 50.542(b)] ☒ Public Comment [18 AAC 50.542(d)]

Section 8 Project Description

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

If this application includes an Owner Requested Limit or a request to revise an existing permit term or condition, describe the intent of the limit, and provide sample language for the limit, and for monitoring, record keeping, and reporting for showing compliance with the limit.

Add additional pages if necessary.

The Concial Drilling Unit Kulluk (Kulluk) is an exploratory drill ship for gathering information on the sub-surface resource of the Beaufort Sea Outer Continental Shelf (OCS) leases. The intent is to drill during the open-water season with the support of ice management vessels in case of ice floes in the area of drilling. The drill ship emission units consist of generators, hydraulic pump units, air compressors, cementing and logging equipment, all diesel fueled. There will also be heaters and an incinerator. The associated support fleet will consist of two ice management vessels, an oil-spill response (OSR) vessel, possible quartering vessel, and resupply ships. A thorough explanation of this source is provided in the report: Supplement to the EPA Outer Cnotinental Shelf (OCS) Operating Permint Application, February 28, 2011, Prepared by Air Sciences Inc.

The Kulluk is scheduled to begin drilling in July 2012 and continue over the July through November season until the lease resources are defined.

Shell is seeking four ORLs which demonstrate that it will remain below the PSD thresholds while drilling. These ORLs do not limit the operation, but recognize the environmental commitments that Shell is making. These five are listed on Form H and are:
1) Restrict the fuel source to ULSD
2) Restrict the operation as an OCS source to 120 days per year
3) Restrict annual NOx emissions (from the Kulluk and its associated fleet) to less than 250 tons per year.
4) Restrict annual fuel consumption to 6,000,000 gallons per year

Sample language, monitoring, record keeping and reporting are listed on Form H.

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

[18 AAC 50.502(b)]

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

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

[18 AAC 50.502(c)(1)]

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

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

[18 AAC 50.502(c)(2)]

Construction or relocation* of a:

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

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

Section 10 Modification Classification(s) (*Check all that apply)*

[18 AAC 50.502(c)(3)]

- ☐ NO_x Increase > 10 TPY [and existing PTE > 40 tons per year]
- ☐ SO_2 Increase > 10 TPY [and existing PTE > 40 tons per year]
- ☐ PM-10 Increase > 10 TPY [and existing PTE > 15 tons per year]
- ☐ CO Increase > 100 TPY [and existing PTE > 100 tons per year in a nonattainment area]

Basis for calculating modification:

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

Section 11 Permit Action Request (*Check all that apply)*

[18 AAC 50.508]

- ☐ ~~Clean Unit designation~~ *(vacated by Court)*
- ☐ ~~Pollution Control Project designation~~ *(vacated by Court)*
- ☐ Establish Plantwide Applicability Limitation
- ☐ Establish emission reductions to offset nonattainment pollutant
- ☒ Owner Requested Limit*
- ☐ Revise or Rescind Title I Permit Conditions*

Permit Number: Date: Condition #:

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

Section 12 Existing Permits and Limits

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

- ☐ Air quality permit Number(s)*:
- ☐ Owner Requested Limit Number(s):
- ☐ Pre Approved (Emission) Limit Number(s)**:

** All valid construction, Title V, and minor permit numbers.*
***Optional. Please provide this number if possible.*
See http://www.state.ak.us/dec/air/ap/pals.htm

Section 13 Other Application Material

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

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

☒ Attached are maps, plans, and/or aerial photographs as necessary to show the locations and distances of

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

(Indicate compass direction and scale on each.)

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

☒ Attached is an electronic copy of all modeling files.

If located within an approved coastal district:

☐ Attached is a completed Coastal Project Questionnaire (CPQ) for the stationary source

Section 14 Certification

This certification applies to the Air Quality Control Minor Permit Application for the Conical Drilling Unit Kulluk (Stationary Source Name) submitted to the department on: March 29, 2011.

Type of Application

☒ Initial Application
☐ Change to Initial Application

The application is **NOT** complete unless the certification of truth, accuracy, and completeness on this form bears the **signature of a responsible official** of the firm making the application. (18 AAC 50.205)

CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS

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

Signature: Susan Childs	Date: March 29, 2011
Printed Name: Susan Childs	Title: Alaska Venture Support Integrator Manager

Section 15 Attachments

☒ Attachments Included. List attachments:

- Appendix A: Beaufort Sea Lease Block Map and List
- Appendix B: Emissions Inventory
- Appendix C: PTE Emissions - For ORL Purposes Only

Section 16 Mailing Address

Submit the minor permit application to the Construction Permit Supervisor in the department's Juneau office. Submitting to a different office will delay processing. The mailing address and phone number for the Juneau office is:

ADEC, Air Permits Program
410 Willoughby Ave., Suite 303
P.O. Box 111800
Juneau, AK 99811-1800

(907) 465-5100

SECTION 2

EMISSIONS SUMMARY FORM NEW STATIONARY SOURCE

Alaska Department of Environmental Conservation Air Quality Control Minor Permit Application	ADEC USE ONLY Receiving Date: ADEC Control #:

EMISSIONS SUMMARY FORM
NEW STATIONARY SOURCE

Section 1 Stationary Source Information

Stationary Source Name:	Stationary Source Physical Address:	City:
Shell Offshore, Inc. – Conical Drilling Unit Kulluk	all OCS leases currently issued in the Beaufort Sea (See Appendix A: Beaufort Sea Lease Block Map and List)	

Section 2 Potential to Emit – CO, NO_x, PM-10, SO_2, lead

Emission Unit No.	Capacity	Potential to Emit (TPY)				
		CO *(If within 10 km of nonattainment area)*	NO_X	PM-10	SO_2	lead
Kulluk						
Kulluk – Gens	85%	10.8	23.9	3.7	6.7E-01	1.8E-03
Kulluk – MLCHPUs	100%	0.5	8.9	0.4	2.6E-02	7.3E-05
Kulluk – Comps	100%	0.4	7.1	0.1	2.6E-02	7.3E-05
Kulluk – Cranes	40%	0.3	4.9	0.2	1.5E-02	4.1E-05
Kulluk – Heaters	100%	0.3	1.3	0.2	9.1E-02	7.8E-05
Kulluk – Seldom	100%	1.5E-01	5.4E-01	4.3E-02	1.6E-03	4.4E-06
Kulluk – Egen	100%	2.0E-02	7.3E-02	5.9E-03	2.2E-04	6.0E-07
Kulluk – Incin	100%	29.8	0.3	1.6	2.5E-01	2.1E-02
Ice Management						
Ice – P&G	100%	21.0	46.3	7.2	1.3E+00	3.6E-03
Ice – Heaters	100%	0.2	0.8	0.1	5.7E-02	4.9E-05
Ice – Seldom	100%	4.2E-02	1.5E-01	1.2E-02	4.6E-04	1.3E-06
Ice – Incin	100%	12.6	0.1	0.7	1.1E-01	9.0E-03

EMISSIONS SUMMARY FORM
NEW STATIONARY SOURCE (CONTINUED)

Emission Unit No.	Capacity	Potential to Emit (TPY)				
		CO	NO_X	PM-10	SO_2	lead
Anchor Handler						
AH – P&G	100%	21.0	46.3	7.2	1.3E+00	3.6E-03
AH – Heaters	100%	0.2	0.8	0.1	5.7E-02	4.9E-05
AH – Seldom	100%	4.2E-02	1.5E-01	1.2E-02	4.6E-04	1.3E-06
AH – Incin	100%	12.6	0.1	0.7	1.1E-01	9.0E-03
Resupply Ship - transport mode						
Resupply – P&G	100%	3.3	11.0	0.5	4.1E-02	1.1E-04
Resupply – Seldom	100%	2.2E-02	8.2E-02	6.5E-03	2.4E-04	6.7E-07
Resupply Ship - DP mode						
Resupply – P&G	100%	6.6	21.9	0.9	8.2E-02	2.3E-04
Resupply – Seldom	100%	2.2E-02	8.2E-02	6.5E-03	2.4E-04	6.7E-07
OSR vessel						
OSR – P&G	100%	11.6	38.4	1.6	1.4E-01	3.9E-04
OSR – Seldom	100%	1.1E-01	4.1E-01	3.3E-02	1.2E-03	3.4E-06
OSR – Incin	100%	27.0	0.3	1.5	2.3E-01	1.9E-02
Quartering vessel						
Quartering – P&G	100%	2.0	49.3	0.4	2.5E-01	6.8E-04
Quartering – Seldom	100%	1.1E-01	4.1E-01	3.3E-02	1.2E-03	3.4E-06
Quartering – Incin	100%	27.0	0.3	1.5	2.3E-01	1.9E-02
OSR Work Boats						
OSR Work Boats	100%	4.2	15.4	1.2	4.6E-02	1.3E-04
TOTAL TONS PER YEAR:		**192**	**<250**	**30**	**5**	**0.09**

☒ Detailed emissions calculations are attached. *Note: For calculations other than (rated capacity) times (emission factor), these must be attached in order for your application to be complete. You may give an example calculation where the method of calculation is identical for multiple emission units..*

Include multiple copies of this page if more space is required.

SECTION 3

MINOR PERMIT APPLICATION - EMISSION UNIT INFORMATION

Alaska Department of Environmental Conservation Air Quality Control Minor Permit Application	**ADEC USE ONLY** Receiving Date: ADEC Control #:

MINOR PERMIT APPLICATION – EMISSION UNIT INFORMATION

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

FOR A MODIFICATION TO AN EXISTING STATIONARY SOURCE:

IF YOU HAVE A TITLE V PERMIT: Complete this form for each emissions unit that is new or that is affected by a physical change or change in the method of operation.

IF YOU DO NOT HAVE A TITLE V PERMIT: Complete this form for all emissions units.

Section 1 Stationary Source Information

Source Name: Shell Offshore, Inc. - Conical Drilling Unit Kulluk

Source Physical Address: All OCS leases currently issued in the Beaufort Sea (see Appendix A: Beaufort Sea Lease Block Map and List)

City:

Section 2 Emission Unit Identification and Description

Emission Unit No.	Equipment Type	Make	Model	Serial No.	Max. Rated Capacity or Max. Design Throughput
Kulluk – Gens	Diesel (RICE) engines	N/A	N/A	N/A	8,500 hp
Kulluk – MLCHPUs	Diesel (RICE) engines	N/A	N/A	N/A	1,500 hp
Kulluk – Comps	Diesel (RICE) engines	N/A	N/A	N/A	1,500 hp
Kulluk – Cranes	Diesel (RICE) engines	N/A	N/A	N/A	900 hp
Kulluk – Heaters	Heaters & Boilers	N/A	N/A	N/A	6 MMBtu/hour
Kulluk – Seldom	Diesel (RICE) engines	N/A	N/A	N/A	566 gallons/30-days
Kulluk – Egen	Diesel (RICE) engines	N/A	N/A	N/A	77 gallons/30-days
Kulluk – Incin	Incinerator	N/A	N/A	N/A	276 lb/hour
Ice – P&G	Diesel (RICE) engines	N/A	N/A	N/A	32,200 hp
Ice – Heaters	Heaters & Boilers	N/A	N/A	N/A	10 MMBtu/hour
Ice – Seldom	Diesel (RICE) engines	N/A	N/A	N/A	100 gallons/week
Ice – Incin	Incinerator	N/A	N/A	N/A	154 lb/hour

Section 2 Emission Unit Identification and Description (cont'd)

Emission Unit No.	Equipment Type	Make	Model	Serial No.	Max. Rated Capacity or Max. Design Throughput
AH – P&G	Diesel (RICE) engines	N/A	N/A	N/A	32,200 hp
AH – Heaters	Heaters & Boilers	N/A	N/A	N/A	10 MMBtu/hour
AH – Seldom	Diesel (RICE) engines	N/A	N/A	N/A	100 gallons/week
AH – Incin	Incinerator	N/A	N/A	N/A	154 lb/hr
Resupply – P&G	Diesel (RICE) engines	N/A	N/A	N/A	12,000 hp
Resupply – Seldom	Diesel (RICE) engines	N/A	N/A	N/A	20 gallons/week
OSR – P&G	Diesel (RICE) engines	N/A	N/A	N/A	3,487 hp
OSR – Seldom	Diesel (RICE) engines	N/A	N/A	N/A	100 gallons/week
OSR – Incin	Incinerator	N/A	N/A	N/A	125 lb/hour
Quartering – P&G	Diesel (RICE) engines	N/A	N/A	N/A	10,061 hp
Quartering – Seldom	Diesel (RICE) engines	N/A	N/A	N/A	100 gallons/week
Quartering – Incin	Incinerator	N/A	N/A	N/A	125 lb/hour
OSR Work Boats	Diesel (RICE) engines	N/A	N/A	N/A	3,789 gallons/week

Section 3 Emission Unit Use

Emission Unit No.	Is unit portable?		If portable, is unit:						Is this unit a:		If limited operation, is the unit:			
[List same emissions= units as in Section 2.]	Yes	No	- a non road engine? Yes	No	- classified as intermittently used oil field support equipment per Policy 04.02.105? Yes	No	- classified as an oil field construction unit per Policy 04.02.104? Yes	No	primary (base load) unit?	or limited operation unit?	peaking unit?	black start unit?	Emergency / back-up unit?	or other?
Kulluk – Gens	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
Kulluk – MLCHPUs	☒	☐	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
Kulluk – Comps	☒	☐	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
Kulluk – Cranes	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
Kulluk – Heaters	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
Kulluk – Seldom	☐	☒	☒	☐	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐
Kulluk – Egen	☐	☒	☒	☐	☐	☒	☐	☒	☐	☒	☐	☐	☒	☐
Kulluk – Incin	☐	☒	☒	☐	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐
Ice – P&G	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
Ice – Heaters	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
Ice – Seldom	☐	☒	☒	☐	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐
Ice – Incin	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
AH – P&G	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
AH – Heaters	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
AH – Seldom	☐	☒	☒	☐	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐
AH – Incin	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
Resupply – P&G	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
Resupply – Seldom	☐	☒	☒	☐	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐
OSR – P&G	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
OSR – Seldom	☐	☒	☒	☐	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐
OSR – Incin	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
Quartering – P&G	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
Quartering – Seldom	☐	☒	☒	☐	☐	☒	☐	☒	☐	☒	☐	☐	☐	☐
Quartering – Incin	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐
OSR Work Boats	☐	☒	☒	☐	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐

Section 4 Fuels

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

Section 4a Fuel Burning Equipment not including flares

Emission Unit Number	Fuel Type(s)	Maximum fuel sulfur content*	Fuel Density (if liquid fuel) lb/gal	Higher Heating Value**	Maximum design fuel consumption rate
Kulluk – Gens	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	375 gallons/hour
Kulluk – MLCHPUs	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	78 gallons/hour
Kulluk – Comps	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	78 gallons/hour
Kulluk – Cranes	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	19 gallons/hour
Kulluk – Heaters	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	44 gallons/hour
Kulluk – Seldom	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	0.79 gallons/hour
Kulluk – Egen	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	38.50 gallons/hour
Ice – P&G	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	1,670 gallons/hour
Ice – Heaters	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	74 gallons/hour
Ice – Seldom	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	0.60 gallons/hour
AH – P&G	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	1,670 gallons/hour
AH – Heaters	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	74 gallons/hour
AH – Seldom	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	0.60 gallons/hour
Resupply – P&G	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	622 gallons/hour
Resupply – Seldom	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	0.12 gallons/hour
OSR – P&G	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	117 gallons/hour
OSR – Seldom	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	0.60 gallons/hour
Quartering – P&G	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	200 gallons/hour
Quartering – Seldom	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	0.60 gallons/hour
OSR Work Boats	Diesel	0.0100 ☒ wt. % ☐ ppm	7.1	135,000 ☒ btu/gal ☐ Btu/dscf Other	23 gallons/hour

**Use Weight percent sulfur for liquid fuels. Use parts per million H_2S for gaseous fuels.*
***Use Btu per gallon for liquid fuels. Use Btu per dry standard cubic foot for gaseous fuels.*

Use more than one sheet if necessary.

Section 4b Flares

Complete this section if the stationary source contains a flare.

Emission Unit Number:	Heat release rate for pilot / purge operation (MMBtu/hr)	Maximum heat release rate (MMBtu/hr)	Flare gas heat content (Btu/scf)	Flare gas H_2S content (ppm)
☐ See attached for additional details				

Section 5 Materials Processed and Methods of Operation

Emission Unit Number	Materials Processed	Maximum Material Processing rate	Describe Method of Operation
☐ See attached for additional details.			

Use more than one sheet if necessary.

Section 6 Emission Control Information (if applicable)

Emission Unit Number:	Control equipment	Pollutant(s) Controlled:	Description of the Control equipment	Describe significant operating parameters and set points for the control equipment	The Control equipment is Necessary:		
					To comply with an emission standard?	To avoid a project classification	Other – give purpose of control equipment
Kulluk – Gens	SCR, OxyCat	NOx, PM, CO, VOC		NOx-1.6 g/kW-hr, PM-50%, CO-80%, VOC-70%	☐	☐	to comply with NAAQS
Kulluk – MLCHPUs	OxyCat	PM, CO, VOC		PM-50%, CO-80%, VOC-70%	☐	☐	to comply with NAAQS
Kulluk – Comps	OxyCat	PM, CO, VOC		PM-50%, CO-80%, VOC-70%	☐	☐	to comply with NAAQS
Kulluk – Cranes	OxyCat	PM, CO, VOC		PM-50%, CO-80%, VOC-70%	☐	☐	to comply with NAAQS
Ice – P&G	SCR, OxyCat	NOx, PM, CO, VOC		NOx-1.6 g/kW-hr, PM-50%, CO-80%, VOC-70%	☐	☐	to comply with NAAQS
AH – P&G	SCR, OxyCat	NOx, PM, CO, VOC		NOx-1.6 g/kW-hr, PM-50%, CO-80%, VOC-70%	☐	☐	to comply with NAAQS
OSR – P&G	CDPF	PM, CO, VOC		PM-85%, CO, VOC-90%	☐	☐	to comply with NAAQS
					☐	☐	
					☐	☐	
					☐	☐	
					☐	☐	

☐ See attached for additional details

Section 7 Emission Factors

Give exact citations of emission factor sources.

Emission Unit Number:	Emission factor for NOx:	Emission factor source*	Emission Factor for SO2	Emission factor source*	Emission factor for PM-10	Emission factor source*	Emission Factor for CO (if within 10 km of nonattainment area)	Emission factor source*	E mission factor for Lead (if new Stationary Source)	Emission factor source*
Kulluk – Gens	1.6 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	0.25 g/kW-hr	Source Test	0.170 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
Kulluk – MLCHPUs	15 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	0.60 g/kW-hr	Source Test	0.190 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
Kulluk – Comps	12 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	0.25 g/kW-hr	Source Test	0.170 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
Kulluk – Cranes	15 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	0.60 g/kW-hr	Source Test	0.190 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
Kulluk – Heaters	20 lb/kgal	Source Test	1.4e-3 lb/gal	Calculation	3 lb/kgal	Source Test	5 lb/kgal	AP-42	9 lb/10^{12} Btu	AP-42
Kulluk – Seldom	15 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	1.2 g/kW-hr	Source Test	0.95 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
Kulluk – Egen	15 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	1.2 g/kW-hr	Source Test	0.95 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
Kulluk – Incin	3 lb/ton	AP-42	2.5 lb/ton	AP-42	16.4 lb/ton	Source Test	300 lb/ton	AP-42	0.213 lb/ton	AP-42
Ice – P&G	1.6 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	0.25 g/kW-hr	Source Test	0.170 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
Ice – Heaters	20 lb/kgal	Source Test	1.4e-3 lb/gal	Calculation	3 lb/kgal	Source Test	5 lb/kgal	AP-42	9 lb/10^{12} Btu	AP-42
Ice – Seldom	15 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	1.2 g/kW-hr	Source Test	0.95 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
Ice – Incin	3 lb/ton	AP-42	2.5 lb/ton	AP-42	16.4 lb/ton	Source Test	300 lb/ton	AP-42	0.213 lb/ton	AP-42
AH – P&G	1.6 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	0.25 g/kW-hr	Source Test	0.170 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
AH – Heaters	20 lb/kgal	Source Test	1.4e-3 lb/gal	Calculation	3 lb/kgal	Source Test	5 lb/kgal	AP-42	9 lb/10^{12} Btu	AP-42
AH – Seldom	15 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	1.2 g/kW-hr	Source Test	0.95 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
AH – Incin	3 lb/ton	AP-42	2.5 lb/ton	AP-42	16.4 lb/ton	Source Test	300 lb/ton	AP-42	0.213 lb/ton	AP-42
Resupply – P&G	12 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	0.5 g/kW-hr	Source Test	0.85 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
Resupply – Seldom	15 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	1.2 g/kW-hr	Source Test	0.95 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
OSR – P&G	12 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	0.5 g/kW-hr	Source Test	0.85 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
OSR – Seldom	15 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	1.2 g/kW-hr	Source Test	0.95 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
OSR – Incin	3 lb/ton	AP-42	2.5 lb/ton	AP-42	16.4 lb/ton	Source Test	300 lb/ton	AP-42	0.213 lb/ton	AP-42
Quartering – P&G	12 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	0.075 g/kW-hr	Source Test	0.085 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
Quartering – Seldom	15 g/kW-hr	Source Test	1.4e-3 lb/gal	Calculation	1.2 g/kW-hr	Source Test	0.95 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42
Quartering – Incin	3 lb/ton	AP-42	2.5 lb/ton	AP-42	16.4 lb/ton	Source Test	300 lb/ton	AP-42	0.213 lb/ton	AP-42
OSR Work Boats	15 g/kW-hr	Source Test			1.2 g/kW-hr	Source Test	0.95 lb/MMBtu	AP-42	2.9e-5 lb/MMBtu	AP-42

☐ For Emission factors from sources other than published data (such as AP-42), documentation is attached.

*Emission factor source: e.g., AP-42, vendor, source test etc.

Section 8 Emission Unit Limits

Emission Unit Number:	Existing Operational Limit if any	Proposed Operational Limit if any	Is the emission unit designated a Clean Unit?	Are you applying for Clean Unit designation?	If emission unit is or would be a Clean Unit, for which pollutant(s)?	Is the emission unit designated as part of a Pollution Control Project?	Are you applying for designation as a Pollution Control Project?
			☐ Yes ☐ No	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No
			☐ Yes ☐ No	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No

☐ Further explanation is attached. *(Attach if necessary)*

Is your stationary source subject to a Plantwide Applicability Limitation? ☐ Yes ☐ No
If yes: Which pollutant(s)? _____
Describe the limitation.
Are you applying for a PAL? ☐ Yes ☐ No If yes, which pollutnat(s)?

Section 9 Applicable State Emission Limits (listed in 18 AAC 50.050 through 18 AAC 50.090)

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

Emission Unit Number:	**Emission Limit or Standard**	**Regulation Citation**

☐ A demonstration of compliance for each emission limit or standard must be attached in order for the application to be considered complete.

Use more than one sheet if necessary.

Section 10 Incinerators

In addition to Sections 1 – 9, complete this section if the stationary source contains an incinerator.

Emission Unit Number:	Rated capacity in lbs / hour	Type of waste burned
Kulluk – Incin	276 lbs/hour	Domestic Waste
Ice – Incin	154 lbs/hour	Domestic Waste
AH – Incin	154 lbs/hour	Domestic Waste
OSR – Incin	125 lbs/hour	Domestic Waste
Quartering – Incin	125 lbs/hour	Domestic Waste
☒		

See attached for additional details

Section 11 Asphalt Plant

If the stationary source is an asphalt plant, complete this section instead of Section 2.

	Make and Model	Primary burner size (Btu per hour)	Chamber Size (Cubic Feet)	Maximum Fuel Feed: ☐Gallon/hr ☐Scf/hr
☐ Dryer:				
☐ Afterburner :				
☐ Dryer:				
☐ Afterburner :				

If emission unit is an asphalt plant, identify each piece of installed equipment by placing an "x" in the box beside the piece of equipment. If the equipment listed has a place to provide the size and capacity, provide that additional information. List only diesel engines that are stationary.

Material handling devices:
- ☐ Conveyors,
- ☐ Loaders,
- ☐ Bins,
- ☐ Elevators,
- ☐ Screens, or
- ☐ Chutes

Dryer Control Devices:
- ☐
- ☐Baghouse
- ☐Cyclone
- ☐Scrubber

Knockout box

Distance from dryer exhaust outlet to:

Nearest residence _____

Other occupied structure _____

Any of the following:
- ☐ Asphalt cement heaters,
- ☐
- ☐Fuel Fired Silo Heaters
- ☐Mixers
- Pugmills
- ☐ Other Emission Control Equipment. List:

_____

_____

_____

☐Diesel Engines:

Make & model _____, Size _____hp, Max fuel rate_____gal/hr

Make & model _____, Size _____hp, Max fuel rate_____gal/hr

Make & model , Size hp, Max fuel rate gal/hr

Was the asphalt plant last constructed, modified or reconstructed before or after June 11, 1973?

Before?

After?

If requested by the department:

☐ Attached is a copy of the operation and maintenance plan for the unit.

☐ Attached is

☐ a copy of the most recent particulate matter source test if within the last five years; or

☐ a schedule for conducting the test.

☐ For an asphalt plant within one mile of the nearest residence or occupied structure, a fugitive dust control plan is attached.

Section 12 Soil Remediation Unit

If the stationary source is a soil remediation unit, complete this section instead of Section 2..

	Make and Model	Primary burner size (Btu per hour)	Chamber Size (Cubic Feet)	Maximum Fuel Feed: ☐Gallon/hr ☐Scf/hr
☐ Dryer, rotary kiln, combustion device in fluidized bed, etc.:				
☐ Afterburner :				
☐ Dryer, rotary kiln, combustion device in fluidized bed, etc.:				
☐ Afterburner :				

Identify each piece of installed equipment by placing an "x" in the box beside the piece of equipment. If the equipment listed has a place to provide the size and capacity, provide that additional information. List only diesel engines that are stationary.

Material handling devices:
- ☐ Conveyors,
- ☐ Loaders,
- ☐ Bins,
- ☐ Elevators,
- ☐ Screens, or
- ☐ Chutes

Dryer Control Devices:
- ☐
- ☐Baghouse
- ☐Cyclone
- ☐Scrubber
- Knockout box

☐ Other Emission Control Equipment. List:

_____
_____
_____

☐Diesel Engines:

Make & model _____, Size _____hp, Max fuel rate_____gal/hr
Make & model _____, Size _____hp, Max fuel rate_____gal/hr
Make & model , Size hp, Max fuel rate gal/hr

Storage areas for
- ☐Untreated soils (Describe)
  If storage bin provide the date installed:
- ☐Treated soils (Describe)
  If storage bin provide the date installed:
- ☐
- ☐Enclosed truck loading station Date Installed:
- Railcar loading station Date Installed:

Distance from emission unit outlet to:

Nearest residence _____
Other occupied structure _____

☐ Attached is a VOC and dust control plan. ☐ Attached is a carbon monoxide continuous emission monitor performance test report, or schedule for conducting the test. ☐ Attached is an approval from Spill Protection and Response (SPAR) of your facility Contaminated Sites Workplan.	If requested by the department: ☐ Attached is a copy of the operation and maintenance plan for the unit. ☐ Attached is ☐ a copy of the most recent particulate matter source test if within the last five years; or ☐ a schedule for conducting the test.

Section 13 Rock Crushers

If the stationary source is a rock crusher, complete this section instead of Section 2.

Initial Crushers			**Other Crushers**	
Equipment Id.	Rated capacity (Tons per hour)		Equipment Id.	Rated capacity (Tons per hour)
Other Grinding Mills			**Screening Operations**	
Equipment Id.	Rated capacity (Tons per hour)		Equipment Id.	Rated capacity (Tons per hour)
Belt Conveyors			**Belt Conveyors**	
Equipment Id.	Rated capacity (Tons per hour)		Equipment Id.	Rated capacity (Tons per hour)

Bucket Elevators			**Storage Bins**	
Equipment Id.	Rated capacity (Tons per hour)		Equipment Id.	Rated capacity (Tons per hour)
Bagging Operations			**Enclosed Truck or Railcar Loading Stations**	
Equipment Id.	Rated capacity (Tons per hour)		Equipment Id.	Rated capacity (Tons per hour)
Distance from equipment listed above to: Nearest residence _____ Other occupied structure _____			If requested by the department: ☐ For a rock crusher, a fugitive dust control plan is attached.	

NOTE: Rock Crushers and Asphalt Plants may be subject to federal New Source Performance Standards (40 C.F.R. 60, Subparts I and OOO.) The department no longer enforces these standards through minor permit. Address all correspondence about compliance with these standards to EPA.

SECTION 4

FORM H – OWNER REQUESTED LIMITS TO AVOID CLASSIFICATION

Alaska Department of Environmental Conservation Air Quality Control Construction Permit Application	ADEC USE ONLY Receiving Date: ADEC Control #:

FORM H – OWNER REQUESTED LIMITS TO AVOID CLASSIFICATION

Section 1 Stationary Source Information

Source Name: Conical Drilling Unit Kulluk - Beaufort Sea
Source Physical Address: all OCS leases currently issued in the Beaufort Sea and within 25 miles of the Alaska Seaward boundary (See Appendix A: Beaufort Sea Lease Block Map and List)
City:

Section 2 Stationary Source or Modification Classification to be Avoided *(Check all that apply)*

Stationary Source Classifications	Citation
☐ Ambient Air Quality Facility	18 AAC 50.300(b)
☒ Prevention of Significant Deterioration Major Source	18 AAC 50.300(c)
☐ Nonattainment Major Source	18 AAC 50.300(d)
☐ Major Stationary Source Near a Nonattainment Area	18 AAC 50.300(e)
☐ Hazardous Air Pollutant Major Source	18 AAC 50.300(f)
☐ Port of Anchorage Facility	18 AAC 50.300(g)
Modification Classifications	**Citation**
☐ **M1** A modification that would cause a source to be classified as an Ambient Air Quality Facility	18 AAC 50.300(h)(1)
☐ **M2** Increase in actual emissions beyond a source's allowable emissions	18 AAC 50.300(h)(2)
☐ **M3** An increase greater than the PSD Significance Thresholds at a PSD Major source	18 AAC 50.300(h)(3)
☐ **M4a** A 250 TPY increase that would classify a non-PSD Major Source as PSD Major Source	18 AAC 50.300(h)(4)(B)(i)
☐ **M4b** A 100 TPY increase that would classify a non-PSD Major Source as PSD Major Source	18 AAC 50.300(h)(4)(B)(ii)
☐ **M5** For Nonattainment Major Source, an increase of CO of 100 TPY	18 AAC 50.300(h)(5)
☐ **M6** For Nonattainment Major Sources, an increase of PM-10 of 15 TPY	18 AAC 50.300(h)(6)
☐ **M7** For stationary sources in CO Nonattainment Areas, an increase of CO of 100 TPY	18 AAC 50.300(h)(7)
☐ **M8** For stationary sources in PM-10 Nonattainment Areas, an increase of PM-10 of 100 TPY	18 AAC 50.300(h)(8)
☐ **M9** An increase of a nonattainment air pollutant of 100 TPY near a nonattainment area	18 AAC 50.300(h)(9)
☐ **M10a** A Hazardous Air Pollutant Major modification (10 TPY of a single HAP)	18 AAC 50.300(h)(10)
☐ **M10b** A Hazardous Air Pollutant Major modification. (25 TPY aggregate HAP)	18 AAC 50.300(h)(10)
☐ **M11** An increase of organic vapors in the Port of Anchorage	18 AAC 50.300(h)(11)

Section 3 Proposed Physical or Operational Restrictions

Describe the proposed physical or operational restrictions and how those restrictions affect emissions.

1) Restrict source fuel to ULSD. Without sulfur in the fuel, there will be limited SO2 emissions.

2) Restrict operation as an OCS source to 120 days per year. All emissions are limited by placing a limit on the duration of the operation

3) Restrict annual cumulative emissions of NOx from all emission units of the Kulluk and its associated fleet to less than 250 tons. Individual emission units will have flexibility to emit depending on the unique circumstances of the drilling activity, but the total will be limited on an annual running total, demonstrated on a weekly basis.

4) Restrict annual fuel consumption to 6,000,000 gallons for Kulluk and its associaed fleet.

☒ *Attach any calculations necessary to show that the proposed restrictions will avoid the classification.*

Section 4 List the proposed terms or conditions to limit operations or emissions:

Number	Proposed Terms or Conditions
1	All fuel purchased for use with the Kulluk and its associated fleet, while an OCS source will be ULSD
2	The duration as an OCS source will be limited to 2,880 hours (120 days) per year.
3	The annual cumulative NOx emissions from the Kulluk and its associated fleet, while an OCS source will be limited to less than 250 tons
4	The annual fuel consumption of the Kulluk and its associated fleet, while an OCS source will be limited to 6,000,000 gallons of diesel fuel.
5	
6	
7	
☐ *See attached for additional details.*	

Section 5 List proposed monitoring techniques for each of the proposed terms or conditions listed in Section 4 above:

Number	Proposed Monitoring Technique
1	Purchase of ULSD will be demonstrated with purchase records and an analysis of the sulfur content of the purchased fuel
2	Time and date of beginning and end of each period as an OCS source will be documented
3	On a weekly basis the total annual NOx emissions from all emission units of the Kulluk and its associated fleet, while an OCS source, will be summed and compared to 250 tons. Emission factors will be established either by stack test (for emission units over 600 hp), manufacturer information (for sources under 600 hp), and EPA generic factors for the incinerators. Process rates will be tracked by fuel consumption for the conbustion sources and by hours of operation for the incinerators. The NOx emissions from each emission unit will be tracked by multiplying the NOx emission factor by the process rate for each emission unit. For all of the emission units excepting the seldom-used sources, including emergency generators, the process rates will be tracked daily and daily NOx emission rates will be determined. These daily emissions will be added to form a weekly emission unit emission. For the seldom-used units only a weekly emission will be calculated from weekly tracked process rates.)
4	Annual fuel consumption will be monitored using fuel meters on all source groups (combined generators, combined HPUs, combined propulsion and generation for fleet, etc.), documented on a frequency of at least weekly
5	
6	
7	
☐ *See attached for additional details.*	

Section 6 List the proposed record keeping necessary for each of the proposed terms or conditions listed in Section 4 above:

Number	Proposed Record Keeping
1	Fuel purchase receipts will be archived
2	Times and dates of the beginning and end of each period as an OCS source will be recorded and archived.
3	The weekly NOx emission from each emission unit will be summed to obtain a total project weekly NOx emission rate. It will be summed with the previous 51 weeks of NOx emissions to demonstrate compliance. These weekly annual NOx emission sums will be archived.
4	The weekly or more frequent fuel consumption will be totaled per week and a rolling annual total will be recorded
5	
6	

7	
☐ *See attached for additional details.*	

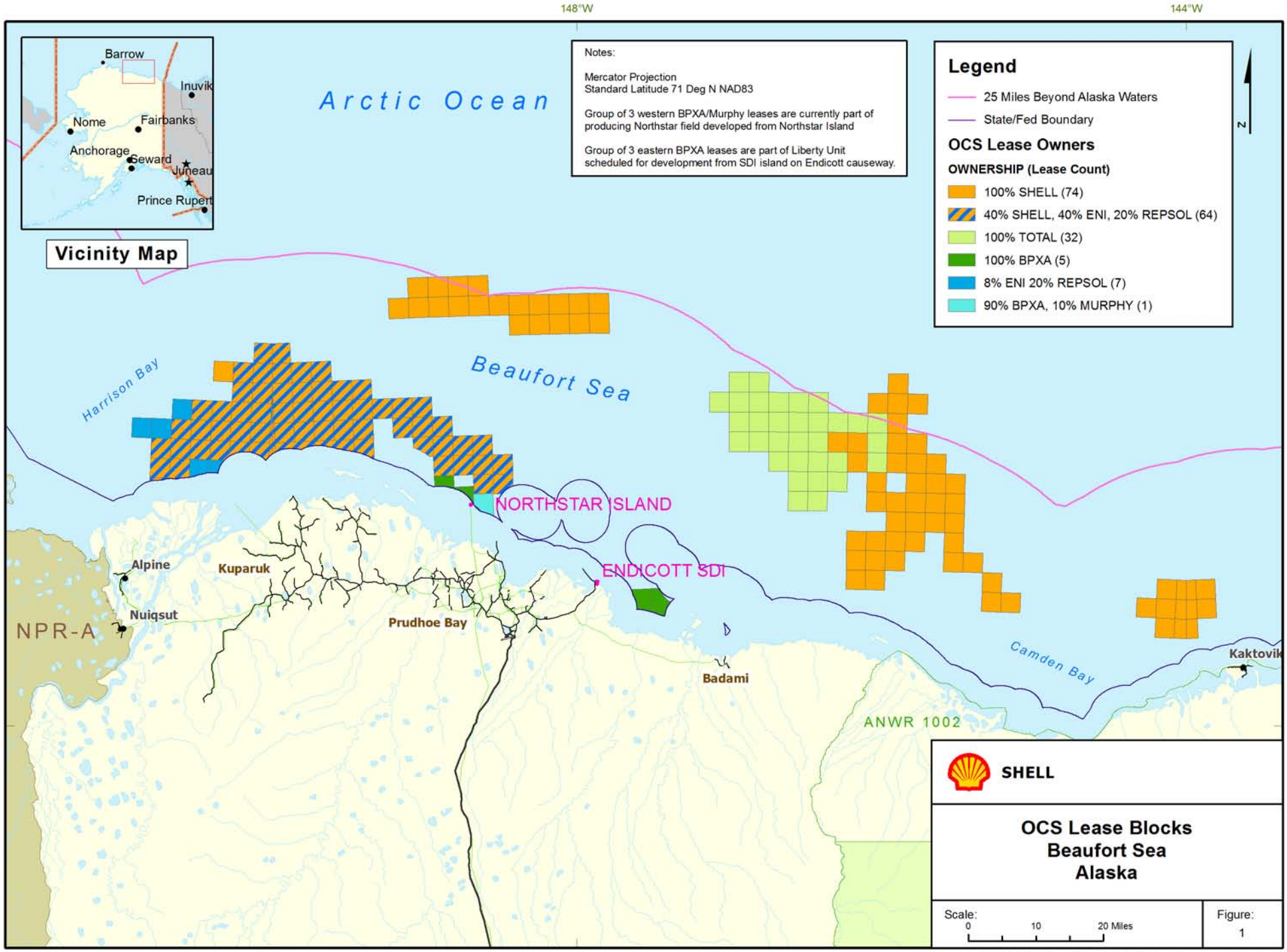
Section 7 Attachments

☒ Attachments Included. List attachments: Appendix C: PTE Emissions - for ORL Purposes Only
Emissions Inventory spreadsheet demonstrating PSD avoidance.

This spreadsheet provides a demonstration that emissions will be under the PSD emission thresholds based only on these 4 ORLs listed above. This emission spreadsheet is for no other purpose, and is higher in emissions than the emission inventory based on all of the owner restrictions proposed for the minor source permit, which is attached to the minor source application forms. The potential emissions in this inventory are based on Kulluk source groups operating at capacity and limited by the four ORLs, and the associated fleet emissions "…while at the source and when enroute to or from the source within 25 miles of the source…" (potential emissions defined in 40 CFR Part 52.2). The fleet emissions defined in this ORL-PTE are caclulated at maximum expected fleet operating rates while operating within 25 miles of the Kulluk.

ALASKA MINOR-APPENDIX A

Beaufort Sea Lease Block Map and List


148°W
144°W
Arctic Ocean
Notes:
Mercator Projection
Standard Latitude 71 Deg N NAD83
Group of 3 western BPXA/Murphy leases are currently part of producing Northstar field developed from Northstar Island
Group of 3 eastern BPXA leases are part of Liberty Unit scheduled for development from SDI island on Endicott causeway.
Legend
25 Miles Beyond Alaska Waters
State/Fed Boundary
OCS Lease Owners
OWNERSHIP (Lease Count)
100% SHELL (74)
40% SHELL, 40% ENI, 20% REPSOL (64)
100% TOTAL (32)
100% BPXA (5)
8% ENI 20% REPSOL (7)
90% BPXA, 10% MURPHY (1)
N
Barrow
Inuvik
Nome
Fairbanks
Anchorage
Seward
Juneau
Prince Rupert
Vicinity Map
Harrison Bay
Beaufort Sea
NORTHSTAR ISLAND
ENDICOTT SDI
Alpine
Kuparuk
Nuiqsut
NPR-A
Prudhoe Bay
Badami
Camden Bay
Kaktovik
ANWR 1002
70°N
SHELL
OCS Lease Blocks
Beaufort Sea
Alaska
Scale:
0
10
20 Miles
Figure:
1
Shell AV GIS/3-23-2011/OCS_Blocks_By_Operator_Fig1_v1.mxd

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y0179	Inside	08/01/1980	BF	470(1) 470(2) 471 515	NR06-0327		12/19/1979	NORTHSTAR	BPXA	BPXA	100
Y0181	Inside	08/01/1980	BF	516 560	NR06-0327		12/19/1979	NORTHSTAR	BPXA	BPXA	90
										MURPHY AK	10
Y1585	Inside	08/01/1991	124	745 746 789	NR06-0327		6/1/1991	LIBERTY	BPXA	BPXA	100
Y1645	Inside	12/01/1996	144	6510C	NR06-03	Beechey Point	9/1/1996	NORTHSTAR	BPXA	BPXA	100
Y1650	Inside	06/27/2003	144	6819B 6820B 6870B 6871G	NR06-03	Beechey Point	9/1/1996	LIBERTY	BPXA	BPXA	100
Y1699	Inside	07/01/2007	186	6369	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1700	Inside	07/01/2007	186	6370	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1701	Inside	07/01/2007	186	6419	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1702	Inside	07/01/2007	186	6420	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1703	Inside	07/01/2007	186	6421BC	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1704	Inside	07/01/2007	186	6352	NR06-03	Beechey Point	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1705	Inside	07/01/2007	186	6402A 6403B	NR06-03	Beechey Point	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1742	Inside	07/01/2007	195	6173	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1743	Inside	07/01/2007	195	6222	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1744	Inside	07/01/2007	195	6223	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1745	Inside	07/01/2007	195	6272	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1746	Inside	07/01/2007	195	6273	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1747	Inside	07/01/2007	195	6320	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1748	Inside	07/01/2007	195	6321	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1749	Inside	07/01/2007	195	6322	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1750	Inside	07/01/2007	195	6323	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1751	Inside	07/01/2007	195	6371	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1752	Inside	07/01/2007	195	6372	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1753	Inside	07/01/2007	195	6373	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1754	Inside	07/01/2007	195	6374BC 6424C	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1755	Inside	07/01/2007	195	6418	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1756	Inside	07/01/2007	195	6422B	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1757	Inside	07/01/2007	195	6423B	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1758	Inside	07/01/2007	195	6468	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1759	Inside	07/01/2007	195	6469B	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1760	Inside	07/01/2007	195	6518B 6519A	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1761	Inside	07/01/2007	195	6152	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1762	Inside	07/01/2007	195	6202	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1763	Inside	07/01/2007	195	6203	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1764	Inside	07/01/2007	195	6204	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1765	Inside	07/01/2007	195	6251A 6301B	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1766	Inside	07/01/2007	195	6252	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1767	Inside	07/01/2007	195	6253	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1768	Inside	07/01/2007	195	6254	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1769	Inside	07/01/2007	195	6255	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1770	Inside	07/01/2007	195	6256	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1771	Inside	07/01/2007	195	6302	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1772	Inside	07/01/2007	195	6303	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1773	Inside	07/01/2007	195	6304	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1774	Inside	07/01/2007	195	6305	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1775	Inside	07/01/2007	195	6306	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1776	Inside	07/01/2007	195	6307	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1777	Inside	07/01/2007	195	6308	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1778	Inside	07/01/2007	195	6309	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1779	Inside	07/01/2007	195	6351AB 6401C	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1780	Inside	07/01/2007	195	6353	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1781	Inside	07/01/2007	195	6354	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1782	Inside	07/01/2007	195	6355	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1783	Inside	07/01/2007	195	6356	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1784	Inside	07/01/2007	195	6358	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1785	Inside	07/01/2007	195	6359	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1786	Inside	07/01/2007	195	6360	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1787	Inside	07/01/2007	195	6404A 6405B	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1788	Inside	07/01/2007	195	6406B	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1789	Inside	07/01/2007	195	6409B	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1790	Inside	07/01/2007	195	6410	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1791	Inside	07/01/2007	195	6411	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1792	Inside	07/01/2007	195	6412	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1793	Inside	07/01/2007	195	6460	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1794	Inside	07/01/2007	195	6461	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1795	Inside	07/01/2007	195	6462	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1796	Inside	07/01/2007	195	6463	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1799	Inside	07/01/2007	195	6512ABC	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1800	Inside	07/01/2007	195	6513BCE	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1804	Inside	08/01/2005	195	6657	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1805	Inside	08/01/2005	195	6658	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1806	Inside	08/01/2005	195	6659	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1807	Inside	08/01/2005	195	6707	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1808	Inside	08/01/2005	195	6708	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1809	Inside	08/01/2005	195	6709	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1810	Inside	08/01/2005	195	6712	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1811	Inside	08/01/2005	195	6713	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1812	Inside	08/01/2005	195	6757	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1813	Inside	08/01/2005	195	6758	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1816	Inside	08/01/2005	195	6764	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1820	Inside	08/01/2005	195	6773	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1821	Inside	08/01/2005	195	6774	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1822	Inside	08/01/2005	195	6814	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1823	Inside	08/01/2005	195	6815	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1826	Inside	08/01/2005	195	6822	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1827	Inside	08/01/2005	195	6823	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1828	Inside	08/01/2005	195	6824	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1833	Inside	08/01/2005	195	6873	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1834	Inside	08/01/2005	195	6874	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1839	Inside	08/01/2005	195	6751	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1840	Inside	08/01/2005	195	6752	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1841	Inside	08/01/2005	195	6801	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1842	Inside	08/01/2005	195	6802	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1843	Inside	08/01/2005	195	6851	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1857	Inside	07/01/2007	202	6221	NR05-04	Harrison Bay	4/18/2007		SHELL	SHELL	100
Y1858	Inside	07/01/2007	202	6274	NR05-04	Harrison Bay	4/18/2007		ENI US	SHELL	40
										ENI US	40
										REPSOL	20
Y1859	Inside	12/15/2008	202	6319	NR05-04	Harrison Bay	4/18/2007		ENI US	ENI US	80
										REPSOL	20
Y1860	Inside	07/01/2007	202	6324	NR05-04	Harrison Bay	4/18/2007		ENI US	SHELL	40
										ENI US	40
										REPSOL	20
Y1861	Inside	07/01/2007	202	6367	NR05-04	Harrison Bay	4/18/2007		ENI US	ENI US	80
										REPSOL	20
Y1862	Inside	07/01/2007	202	6368	NR05-04	Harrison Bay	4/18/2007		ENI US	ENI US	80
										REPSOL	20
Y1863	Inside	07/01/2007	202	6470	NR05-04	Harrison Bay	4/18/2007		ENI US	SHELL	40
										ENI US	40
										REPSOL	20
Y1864	Inside	07/01/2007	202	6471	NR05-04	Harrison Bay	4/18/2007		ENI US	SHELL	40
										ENI US	40
										REPSOL	20
Y1865	Inside	08/01/2007	202	6009	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1866	Crossing	08/01/2007	202	6010	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1867	Crossing	08/01/2007	202	6011	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1868	Crossing	08/01/2007	202	6012	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1869	Inside	08/01/2007	202	6058	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1870	Inside	08/01/2007	202	6059	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1871	Inside	08/01/2007	202	6060	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1872	Inside	08/01/2007	202	6061	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1873	Crossing	08/01/2007	202	6062	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1874	Inside	08/01/2007	202	6063	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1875	Inside	08/01/2007	202	6064	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1876	Inside	08/01/2007	202	6065	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1877	Inside	08/01/2007	202	6066	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1878	Inside	08/01/2007	202	6067	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1879	Inside	08/01/2007	202	6068	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1880	Inside	08/01/2007	202	6114	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1881	Inside	08/01/2007	202	6115	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1882	Inside	08/01/2007	202	6116	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1883	Inside	08/01/2007	202	6117	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1884	Inside	08/01/2007	202	6118	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1885	Inside	08/01/2007	202	6324	NR06-03	Beechey Point	4/18/2007		TOTAL	TOTAL	100
Y1886	Inside	07/01/2007	202	6871	NR06-03	Beechey Point	4/18/2007		BPXA	BPXA	100
Y1887	Inside	08/01/2007	202	6251	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1888	Inside	08/01/2007	202	6252	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1889	Outside	08/01/2007	202	6259	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1890	Inside	08/01/2007	202	6301	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1891	Inside	08/01/2007	202	6302	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1892	Inside	08/01/2007	202	6303	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1893	Crossing	08/01/2007	202	6304	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1894	Crossing	08/01/2007	202	6305	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1895	Outside	08/01/2007	202	6308	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1896	Outside	08/01/2007	202	6309	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1897	Outside	08/01/2007	202	6310	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1898	Inside	08/01/2007	202	6351	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1899	Inside	08/01/2007	202	6352	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1900	Inside	08/01/2007	202	6353	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1901	Inside	08/01/2007	202	6354	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1902	Inside	08/01/2007	202	6355	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1903	Inside	08/01/2007	202	6356	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1904	Crossing	08/01/2007	202	6357	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1905	Crossing	08/01/2007	202	6358	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1906	Crossing	08/01/2007	202	6359	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1907	Inside	08/01/2007	202	6401	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1908	Inside	08/01/2007	202	6402	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1909	Inside	08/01/2007	202	6403	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1910	Inside	08/01/2007	202	6404	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1911	Inside	08/01/2007	202	6405	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1912	Inside	07/01/2007	202	6406	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1913	Inside	07/01/2007	202	6407	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1914	Inside	08/01/2007	202	6408	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1915	Inside	08/01/2007	202	6409	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1916	Inside	08/01/2007	202	6410	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1917	Inside	08/01/2007	202	6453	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1918	Inside	08/01/2007	202	6454	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1919	Inside	08/01/2007	202	6455	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1920	Inside	08/01/2007	202	6456	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1921	Inside	07/01/2007	202	6457	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1922	Inside	08/01/2007	202	6458	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1923	Inside	08/01/2007	202	6459	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1924	Inside	08/01/2007	202	6460	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1925	Inside	08/01/2007	202	6461	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1926	Inside	08/01/2007	202	6504	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1927	Inside	08/01/2007	202	6505	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1928	Inside	08/01/2007	202	6506	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1929	Inside	08/01/2007	202	6508	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1930	Inside	08/01/2007	202	6510	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1931	Inside	08/01/2007	202	6511	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1932	Inside	08/01/2007	202	6512	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1933	Inside	08/01/2007	202	6554	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1934	Inside	08/01/2007	202	6555	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1935	Inside	08/01/2007	202	6558	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1936	Inside	07/01/2007	202	6559	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1937	Inside	07/01/2007	202	6560	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1938	Inside	08/01/2007	202	6561	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1939	Inside	08/01/2007	202	6562	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1940	Inside	07/01/2007	202	6609	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1941	Inside	07/01/2007	202	6610	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1942	Inside	07/01/2007	202	6611	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1943	Inside	08/01/2007	202	6612	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1944	Inside	07/01/2007	202	6660	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1945	Inside	08/01/2007	202	6662	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

ALASKA MINOR-APPENDIX B

Updated Emission Inventory

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 1	OF: 1	SHEET: 1
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

SUMMARY - ANNUAL POTENTIAL EMISSIONS

	NO_X tons/year	$PM_{2.5}$ tons/year	PM_{10} tons/year	CO tons/year	SO_2 tons/year	VOC tons/year	Lead tons/year	GHG tons/year
Engines	-	24.2	24.2	82.8	4.1	13.2	1.1E-02	-
Incinerators	-	5.1	6.0	109.1	0.9	36.4	7.7E-02	-
Total	<250	29.3	30.1	191.9	5.0	49.6	0.1	66,263.4
PSD trigger	250	250	250	250	250	250	250	100,000
Compare	Below	Below	Below	Below	Below	Below	Below	Below

	HAP tons/year	CH_2O tons/year	H_2SO_4 tons/year	Fluorides [a] tons/year	H_2S [b] tons/year	TRS [b] tons/year	RSC [b] tons/year
Engines	6.0E-01	1.8E-01	0.3	-	2.3	2.3	2.3
Incinerators	9.1E-02	0.0E+00	0.4	-	0.5	0.5	0.5
Total	0.7	0.2	0.8	-	2.8	2.8	2.8
PSD trigger	25	10	250	250	250	250	250
Compare	Below	Below	Below	Below	Below	Below	Below

[a] Fluoride is not a listed and quantified trace pollutant from diesel combustion as provided by AP42, so it is assumed to be an extremely small constituent. Furthermore, fluoride is a reduced form of fluorine and diesel combustion is an oxidizing process. Therefore, it is unlikely that it would exist as a combustion bi-product and should be a negligible emission from the project.

[b] H_2S also represents upper limit of total reduced sulfur and reduced sulfur compound emissions

shading represents owner restriction (OR) to be demonstrated by documentation of each event

shading represents OR to be demonstrated by documentation of daily fuel consumption

shading represents OR to be demonstrated by documentation of weekly fuel consumption

Anticipated Kulluk Operating Maximums

Kulluk & Associated Fleet

Expected Operating Maximums	Limit		How Defined	How documented
MLC Drilling Activity	480	hrs/activity	20 days/activity	
Well Drilling Activity	1,152	hrs/activity	48 days/activity	
Cementing/Logging Activity	1,248	hrs/activity	52 days/activity	
Season maximum drilling duration as an OCS source (secure and stable for commencement of exploratory activity):	2,880	hrs/season	120 days/season	
Ice mgmt vessel use within 25 miles	38%			
OSR vessel annual fuel limit	60%	of daily maximum - annualized		
Quartering vessel annual fuel limit	60%	of daily maximum - annualized		
MLC Activity				
Generators (three units combined) combined	85%	capacity	System Limitation	
Crane (three units combined) maximum	40%	capacity	System Limitation	
Crane (three units combined) maximum	30%	of time (day)	Shell engineering estimate	
Well Drilling Activity				
Generators (three units combined) combined production maximum	85%	capacity	System Limitation	
Crane (three units combined) maximum	40%	capacity	System Limitation	
Crane (three units combined) maximum	30%	of time (day)	Shell engineering estimate	
Cementing/Logging Activity				
Generators (three units combined) combined	60%	capacity	Shell OR	
Crane (three units combined) maximum	40%	capacity	System Limitation	
Crane (three units combined) maximum	50%	of time (day)	Shell engineering estimate	
All Activities - OR				
Kulluk Incinerator limited to	12	hr/day	Shell OR	manual - recording of start and stop time
Kulluk emergency generator limited to	2	hr/30-days & hr/day		
Sulfur content of all stationary source engines on Kulluk	0.0100%	by wt.	Shell OR	Kulluk fuel testing
Sulfur content of associated fleet	0.0100%	by wt.	Shell OR	Fleet fuel testing
Annual NOx emissions recalculated as weekly rolling avg	250	ton/yr.	Shell OR	
Annual Kulluk and fleet fuel restriction	6,000,000	gallons/year		Fuel consumption measurement
Ice Management Fleet Propulsion & Generation	100%	capacity	System Limitation	
Resupply ship in transport limited to	1,200	gal/1-way	Shell OR	Fuel consumption measurement
Resupply ship in DP mode limited to	4,800	gal/event	Shell OR	Fuel consumption measurement
Resupply ship resupply events limited to	24	rnd trip/season	Shell OR	Manual tracking
Resupply ship DP events limited to	24	hr/day=hr/event	Shell OR	Manual tracking
OSR Vessel p & g aggregate power:	2,600	kW		Manufacturer specifications
OSR Vessel p & g aggregate consumption:	2,800	gal/day	Shell OR	Fuel consumption measurement
Quartering vessel p & g aggregate power:	7,502	kW	Shell OR	Manufacturer specifications
Quartering vessel p & g aggregate consumption:	4,800	gal/day	Shell OR	Fuel consumption measurement
OSR work boats	3,789	gallons/wk.	Shell OR	Fuel consumption measurement

OSR Boat Options

OSR vessel	Pt. Oliktuk/Arctic Endeavor
Quartering vessel	Nanuq

Work Boats

#1 OSR 34-foot	32	gal/hr
#2 OSR 34-foot	32	gal/hr
#1 OSR 47-foot	63	gal/hr
ALL	6	hr/day
ALL	5	day/week
ALL	100%	hourly fuel consumption

Diesel Engine Thermal Efficiency Assumptions

		Reference
7.1	lb/gal	AP42 Table 3.4-1; footnote a
7,000	Btu/hp-hr	<600 hp; AP42 Table 3.3-1 Footnote (a) ver. 10/96.
		>600 hp, AP42 Table 3.4-1 ver. 10/96

Conversions

0.1350	MMBtu/gallon
0.7457	kW / hp
1,000,000	Btu/MMBtu
453.6	g/lb
2,000	lb/ton
24	hr/day
168	hr/wk
2	one-way trips/ round trip
32.07	wt S
64.06	wt. SO2
2.00	wt. conversion of S to SO2

** seldom-used engines are those running < 4 hr/wk.

blue values are input, black values are calculated or linked

Anticipated Kulluk Operating Maximums

Kulluk & Associated Fleet (continued)

Expected Operating Maximums	Controls				EF Reference			
	NOx	PM	CO	VOC	NOx	PM	CO	VOC
Kulluk								
Generation	Kulluk-SCR	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	4	7	7	7
MLC HPU'S	None-Sm	OxyCat-Sm	OxyCat-Sm	OxyCat-Sm	2	8	8	8
Air compressors	None-Lg	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	1	7	7	7
Cranes	None-Sm	OxyCat-Sm	OxyCat-Sm	OxyCat-Sm	2	8	8	8
Heaters & Boilers	heat&boil	heat&boil	heat&boil	heat&boil	3	3	3	3
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Emergency Generator	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Primary Ice Management								
Propulsion & Generation	SCR	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	5	7	7	7
Heaters & Boilers	heat&boil	heat&boil	heat&boil	heat&boil	3	3	3	3
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Secondary Ice Management / Anchor Handler								
Propulsion & Generation	SCR	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	5	7	7	7
Heaters & Boilers	heat&boil	heat&boil	heat&boil	heat&boil	3	3	3	3
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Resupply Ship - transport mode								
Propulsion & Generation	None-Lg	None-Lg	None-Lg	None-Lg	1	1	1	1
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Resupply Ship - DP mode								
Propulsion & Generation	None-Lg	None-Lg	None-Lg	None-Lg	1	1	1	1
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
OSR vessel								
Propulsion & Generation	None-Lg	None-Lg	None-Lg	None-Lg	1	1	1	1
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Quartering vessel								
Propulsion & Generation	Nanuq	CDPF-Lg	CDPF-Lg	CDPF-Lg	9	10	10	10
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
OSR work boats								
Work boats	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2

Assumed Control Device Effectiveness	Restriction	Comment	Reference
Oxidation Catalyst CO reduction efficiency	80%	50-100% of capacity	D.E.C. Marine AB letter, October 9, 2008, and initial stack test
Oxidation Catalyst VOC, HAPs (except metals), Formaldehyde reduction efficiency	70%	50-100% of capacity	D.E.C. Marine AB letter, October 9, 2008
Oxidation Catalyst PM reduction efficiency	50%		D.E.C. Marine AB email, February 9, 2009
CDPF reduction efficiency CO, VOC, HAPs	90%		CleanAIR CDPF guarantee
CDPF reduction efficiency PM	85%		CARB Currently verified, Jan. 2009, CleanAIR Systems PERMIT
Kulluk Generator SCR NOx control	1.6 g/kW-hr	50-100% of capacity	June 2010 Discoverer Stack Testing

Engine	NOx		CO		VOC		PM*		
Emission Factors / Controls	g/kW-hr	lb/gal	lb/MMBtu	lb/gal	lb/MMBtu	lb/gal	g/kWhr	lb/gal	Reference
None-Lg	12.00	0.380	0.85	0.115	0.09	0.012	0.50	0.016	1
None-Sm	15.00	0.476	0.95	0.128	0.35	0.047	1.20	0.038	2
heat&boil	20 lb/kgal	0.020	5 lb/kgal	0.005	1 lb/kgal	0.001	3 lb/kgal	0.003	3
Kulluk-SCR	1.60	0.051	-	-	-	-	-	-	4
SCR	1.60	0.051	-	-	-	-	-	-	5
Kulluk-OxyCat	-	-	-	-	-	-	0.200	0.006	6
OxyCat-Lg	-	-	0.170	0.023	0.027	0.004	0.250	0.008	7
OxyCat-Sm	-	-	0.190	0.026	0.105	0.014	0.600	0.019	8
Nanuq	9	0.285	-	-	-	-	-	-	9
CDPF-Lg	-	-	0.085	0.011	0.009	0.001	0.075	0.002	10
Electric	0	0	0	0	0	0	0	0	NA

*PM2.5

References

None-Lg	1	NOx & PM: Recent stack test data, CO & VOC:AP-42 Table 3.4-1 Internal Combustion, Large Stationary Engines (fuel Input)-uncontrolled; ver. 10/1996
None-Sm	2	NOx & PM: Recent stack test data, CO & VOC: AP-42.Table 3.3-1 Internal Combustion, Diesel (fuel input)-uncontrolled; ver. 10/1996
heat&boil	3	NOx & PM: Recent Stack test data, CO & VOC: AP-42. Table 1.11-2 External Combustion, Small Boilers-waste oil; ver 10/1996
Kulluk-SCR	4	Emission factors based on stack tests from the Frontier Discoverer
SCR	5	Selective Catalytic Reduction NOx emission factor based on stack tests
Kulluk-OxyCat	6	PM: Tier 2 engines
OxyCat-Lg	7	Oxidation Catalyst controls applied to reference (1) emission factors
OxyCat-Sm	8	Oxidation Catalyst controls applied to reference (2) emission factors
Nanuq	9	CAT3806 Diesel Engine Technical data sheet
CDPF-Lg	10	Catalytic Diesel Particulate Filters controls applied to reference (1) emission factors

FUEL USE - MAX DAILY

Emission Units to permit:	Capacity Values	Capacity fuel - hourly		Max fuel - daily					
				MLC Case		Drilling Case		Cementing/Logging Case	
		MMBtu/hr	gal/hr	MMBtu	gal	MMBtu	gal	MMBtu	gal
Kulluk									
Generation	8,500 hp	50.58	375	1,214	8,991	1,214	8,991	857	6,347
MLC HPU'S	1,500 hp	10.50	78	252	1,867	0	0	0	0
Air compressors	1,500 hp	10.50	78	252	1,867	0	0	0	0
Cranes	900 hp	2.52	19	18	134	18	134	30	224
Heaters & Boilers	6 MMBtu/hr	6.00	44	144	1,067	144	1,067	144	1,067
Seldom-used units	566 gal/30-days	0.11	0.79 group limit	3	19	3	19	3	19
Emergency Generator	77 gal/30-days	5.198	38.50 group limit	10	77	10	77	10	77
			KULLUK - SUBTOTAL		*14,021*		*10,288*		*7,733*
Primary Ice Management									
Propulsion & Generation	32,200 hp	225	1,670	5,410	40,071	5,410	40,071	5,410	40,071
Heaters & Boilers	10 MMBtu/hr	10	74	240	1,778	240	1,778	240	1,778
Seldom-used units	100 gal/wk	0.080	0.60 group limit	2	14	2	14	2	14
			ICE MANAGEMENT - SUBTOTAL		*41,863*		*41,863*		*41,863*
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	32,200 hp	225	1,670	5,410	40,071	5,410	40,071	5,410	40,071
Heaters & Boilers	10 MMBtu/hr	10	74	240	1,778	240	1,778	240	1,778
Seldom-used units	100 gal/wk	0.080	0.60 group limit	2	14	2	14	2	14
			ANCHOR HANDLER - SUBTOTAL		*41,863*		*41,863*		*41,863*
Resupply Ship - transport mode									
Propulsion & Generation	12,000 hp	84	622	162	1,200	162	1,200	162	1,200
Seldom-used units	20 gal/wk	0.016	0.12 group limit	0.4	2.9	0.4	2.9	0.4	2.9
Resupply Ship - DP mode									
Propulsion & Generation	12,000 hp	84	622	648	4,800	648	4,800	648	4,800
Seldom-used units	20 gal/wk	0.016	0.12 group limit	0.4	2.9	0.4	2.9	0.4	2.9
			RESUPPLY SHIPS - SUBTOTAL		*6,006*		*6,006*		*6,006*
OSR vessel									
Propulsion & Generation	3,487 hp	16	117	378	2,800	378	2,800	378	2,800
Seldom-used units	100 gal/wk	0.080	0.60 group limit	2	14	2	14	2	14
Quartering vessel									
Propulsion & Generation	10,061 hp	27	200	648	4,800	648	4,800	648	4,800
Seldom-used units	100 gal/wk	0.080	0.60 group limit	2	14	2	14	2	14
OSR work boats									
Work boats	3,789 gal/wk	3.05	23	73	541	73	541	73	541
			OSR SHIPS - SUBTOTAL		*8,170*		*8,170*		*8,170*
			Total daily use		**111,923**		**108,190**		**105,635**

TOTAL WASTE INCINERATED

	Capacity Values	MLC Case	Drilling Case	Cementing/Logging case
Incinerators		lbs/day	lbs/day	lbs/day
Kulluk	276 lb/hr	3,312	3,312	3,312
Ice Management	154 lb/hr	3,696	3,696	3,696
Anchor Handler	154 lb/hr	3,696	3,696	3,696
OSR vessel	125 lb/hr	3,000	3,000	3,000
Quartering vessel	125 lb/hr	3,000	3,000	3,000
	total lbs/day	**16,704**	**16,704**	**16,704**

FUEL USE - MAX ANNUAL

Emission Units to permit:	Capacity Values	Capacity fuel - hourly		Max fuel - Annual (Modeling only)						
				MLC Case		Drilling Case		Cementing/Logging Case		Total
		MMBtu/hr	gal/hr	MMBtu	gal	MMBtu	gal	MMBtu	gal	gal
Kulluk										
Generation	8,500 hp	50.58	375	24,276	179,822	58,262	431,573	44,554	330,027	941,422
MLC HPU'S	1,500 hp	10.50	78	5,040	37,333	0	0	0	0	37,333
Air compressors	1,500 hp	10.50	78	5,040	37,333	0	0	0	0	37,333
Cranes	900 hp	2.52	19	363	2,688	871	6,451	1,572	11,648	20,787
Heaters & Boilers	6 MMBtu/hr	6.00	44	2,880	21,333	6,912	51,200	7,488	55,467	128,000
Seldom-used units	566 gal/30-days	0.11	0.79 group limit	51	377	122	906	132	981	2,264
Emergency Generator	77 gal/30-days	5.198	38.50 group limit	7	51	17	123	18	133	308
			KULLUK - SUBTOTAL		*278,939*		*490,253*		*398,256*	*1,167,448*
Primary Ice Management										
Propulsion & Generation	32,200 hp	225	1670	41,113	304,540	98,671	730,897	106,894	791,805	1,827,243
Heaters & Boilers	10 MMBtu/hr	10	74	1,824	13,511	4,378	32,427	4,742	35,129	81,067
Seldom-used units	100 gal/wk	0.080	0.60 group limit	15	109	35	261	38	282	651
		ICE MANAGEMENT - SUBTOTAL			*318,160*		*763,584*		*827,216*	*1,908,961*
Secondary Ice Management / Anchor Handler										
Propulsion & Generation	32,200 hp	225	1670	41,113	304,540	98,671	730,897	106,894	791,805	1,827,243
Heaters & Boilers	10 MMBtu/hr	10	74	1,824	13,511	4,378	32,427	4,742	35,129	81,067
Seldom-used units	100 gal/wk	0.080	0.595 group limit	15	109	35	261	38	282	651
		ANCHOR HANDLER - SUBTOTAL			*318,160*		*763,584*		*827,216*	*1,908,961*
Resupply Ship - transport mode										
Propulsion & Generation	12,000 hp	84	622	1,296	9,600	3,110	23,040	3,370	24,960	57,600
Seldom-used units	20 gal/wk	0.016	0.12 group limit	8	57	19	137	20	149	343
Resupply Ship - DP mode										
Propulsion & Generation	12,000 hp	84	622	2,592	19,200	6,221	46,080	6,739	49,920	115,200
Seldom-used units	20 gal/wk	0.016	0.12 group limit	8	57	19	137	20	149	343
		RESUPPLY SHIPS - SUBTOTAL			*28,914*		*69,394*		*75,177*	*173,486*
OSR vessel										
Propulsion & Generation	3,487 hp	16	117	4,536	33,600	10,886	80,640	11,794	87,360	201,600
Seldom-used units	100 gal/wk	0.080	0.6 group limit	39	286	93	686	100	743	1,714
Quartering vessel										
Propulsion & Generation	10,061 hp	27	200	7,776	57,600	18,662	138,240	20,218	149,760	345,600
Seldom-used units	100 gal/wk	0.080	0.6 group limit	39	286	93	686	100	743	1,714
OSR work boats										
Work boats	3,789 gal/wk	3.05	23	1,462	10,827	3,508	25,984	3,800	28,149	64,960
			OSR SHIPS - SUBTOTAL		*102,598*		*246,235*		*266,755*	*615,589*
			Total Annual Use		**1,046,772**		**2,333,052**		**2,394,621**	**5,774,444**
				TOTAL ANNUAL GALLONS		**5,774,444**				

TOTAL WASTE INCINERATED

	Capacity Values	MLC Case	Drilling Case	Cementing/Logging case	Total
Incinerators		lbs/year	lbs/year	lbs/year	tons /year
Kulluk	276 lb/hr	66,240	158,976	172,224	199
Ice Management	154 lb/hr	28,090	67,415	73,033	84
Anchor Handler	154 lb/hr	28,090	67,415	73,033	84
OSR vessel	125 lb/hr	60,000	144,000	156,000	180
Quartering vessel	125 lb/hr	60,000	144,000	156,000	180
	total lbs/yr	**242,419**	**581,806**	**630,290**	**727**

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 5	OF: 14	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

NOx EMISSIONS - FOR IMPACT MODELING

shading represents OR to be demonstrated by documentation of daily fuel consumption

shading represents OR to be demonstrated by documentation of weekly fuel consumption

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	0.051	lb/gal		19.00	456	456	456	322	24
MLC HPU'S	0.476	lb/gal		36.99	888	888	0	0	9
Air compressors	0.380	lb/gal		29.59	710	710	0	0	7
Cranes	0.476	lb/gal		8.88	107	64	64	107	5
Heaters & Boilers	0.020	lb/gal		0.89	21	21	21	21	1
Seldom-used units	0.476	lb/gal		0.37	8.97	8.97	8.97	8.97	0.54
Emergency Generator	0.476	lb/gal		18.31	36.62	36.62	36.62	36.62	0.07
Primary Ice Management									
Propulsion & Generation	0.051	lb/gal		85	2,033	2,033	2,033	2,033	46
Heaters & Boilers	0.020	lb/gal		1.48	36	36	36	36	0.81
Seldom-used units	0.476	lb/gal		0.28	6.79	6.79	6.79	6.79	0.15
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	0.051	lb/gal		85	2,033	2,033	2,033	2,033	46
Heaters & Boilers	0.020	lb/gal		1.48	36	36	36	36	0.81
Seldom-used units	0.476	lb/gal		0.28	6.79	6.79	6.79	6.79	0.15
Resupply Ship - transport mode									
Propulsion & Generation	0.380	lb/gal	*237*	(0*)	457	(0*)	(0*)	(0*)	11
Seldom-used units	0.476	lb/gal	*0.057*	(0*)	1.36	(0*)	(0*)	(0*)	0.08
Resupply Ship - DP mode									
Propulsion & Generation	0.380	lb/gal		237	1,826	1,826	1,826	1,826	22
Seldom-used units	0.476	lb/gal		0.06	1.36	1.36	1.36	1.36	0.08
OSR vessel									
Propulsion & Generation	0.380	lb/gal		44	1,065	1,065	1,065	1,065	38
Seldom-used units	0.476	lb/gal		0.28	6.79	6.79	6.79	6.79	0.41
Quartering vessel									
Propulsion & Generation	0.285	lb/gal		57	1,370	1,370	1,370	1,370	49
Seldom-used units	0.476	lb/gal		0.28	6.79	6.79	6.79	6.79	0.41
OSR work boats									
Work boats	0.476	lb/gal		11	257	257	257	257	15
TOTAL				**637**	**11,369**	**10,869**	**9,271**	**9,179**	**278**

NOx EMISSIONS

Source	Emission Factor	unit	NO_X lb/hr	NO_X lb/day	NO_X ton/year
Incinerators					
Kulluk	3	lb/ton	0.41	4.97	0.30
Ice Management	3	lb/ton	0.23	5.54	0.13
Anchor Handler	3	lb/ton	0.23	5.54	0.13
OSR vessel	3	lb/ton	0.19	4.50	0.27
Quartering vessel	3	lb/ton	0.19	4.50	0.27
			1.25	**25.06**	**1.09**

Source	pollutant	EF	unit	reference
Incinerators	NO_X	3	lb/ton	AP42 Table 2.1-12, 10/96

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 6	OF: 14	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

$PM_{2.5}$ EMISSIONS - FOR IMPACT MODELING

shading represents OR to be demonstrated by documentation of daily fuel consumption

shading represents OR to be demonstrated by documentation of weekly fuel consumption

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	0.008	lb/gal		2.97	71	71	71	50	3.73
MLC HPU'S	0.019	lb/gal		1.48	36	36	0	0	0.36
Air compressors	0.008	lb/gal		0.62	15	15	0	0	0.15
Cranes	0.019	lb/gal		0.36	4	3	3	4	0.20
Heaters & Boilers	0.003	lb/gal		0.15	4	4	4	4	0.21
Seldom-used units	0.038	lb/gal		0.03	0.72	0.72	0.72	0.72	0.04
Emergency Generator	0.038	lb/gal		1.46	2.93	2.93	2.93	2.93	0.01
Primary Ice Management									
Propulsion & Generation	0.008	lb/gal		13	318	318	318	318	7
Heaters & Boilers	0.003	lb/gal		0.24	6	6	6	6	0.13
Seldom-used units	0.038	lb/gal		0.02	0.54	0.54	0.54	0.54	0.01
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	0.008	lb/gal		13	318	318	318	318	7
Heaters & Boilers	0.003	lb/gal		0.24	6	6	6	6	0.13
Seldom-used units	0.038	lb/gal		0.02	0.54	0.54	0.54	0.54	0.01
Resupply Ship - transport mode									
Propulsion & Generation	0.016	lb/gal	*10*	(0*)	19	(0*)	(0*)	(0*)	0.46
Seldom-used units	0.038	lb/gal	*0.005*	(0*)	0.11	(0*)	(0*)	(0*)	0.01
Resupply Ship - DP mode									
Propulsion & Generation	0.016	lb/gal		10	76	76	76	76	1
Seldom-used units	0.038	lb/gal		0.00	0.11	0.11	0.11	0.11	0.01
OSR vessel									
Propulsion & Generation	0.016	lb/gal		2	44	44	44	44	2
Seldom-used units	0.038	lb/gal		0.02	0.54	0.54	0.54	0.54	0.03
Quartering vessel									
Propulsion & Generation	0.002	lb/gal		0	11	11	11	11	0
Seldom-used units	0.038	lb/gal		0.02	0.54	0.54	0.54	0.54	0.03
OSR work boats									
Work boats	0.038	lb/gal		0.86	21	21	21	21	1
TOTAL				**47**	**954**	**933**	**883**	**863**	**24**

PM_{10} & $PM_{2.5}$ EMISSIONS

Source	Emission Factor PM_{10}	Emission Factor $PM_{2.5}$	unit	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	PM_{10} lb/day	$PM_{2.5}$ lb/day	PM_{10} ton/year	$PM_{2.5}$ ton/year
Incinerators									
Kulluk	16.4	14	lb/ton	2.26	1.93	27.16	23.18	1.63	1.39
Ice Management	16.4	14	lb/ton	1.26	1.08	30.31	25.87	0.69	0.59
Anchor Handler	16.4	14	lb/ton	1.26	1.08	30.31	25.87	0.69	0.59
OSR vessel	16.4	14	lb/ton	1.03	0.88	24.60	21.00	1.48	1.26
Quartering vessel	16.4	14	lb/ton	1.03	0.88	24.60	21.00	1.48	1.26
				6.84	**5.84**	**136.97**	**116.93**	**5.96**	**5.09**

Source	pollutant	EF	unit	reference
Incinerators	PM_{10}	16.4	lb/ton	Disco Stack Test June 2010 (multiplied by a safety factor of 2)
	$PM_{2.5}$	14	lb/ton	Disco Stack Test June 2010 (multiplied by a safety factor of 2)

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

CO EMISSIONS - FOR IMPACT MODELING

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	0.023	lb/gal		8.60	206	206	206	146	10.80
MLC HPU'S	0.026	lb/gal		2.00	48	48	0	0	0.48
Air compressors	0.023	lb/gal		1.79	43	43	0	0	0.43
Cranes	0.026	lb/gal		0.48	6	3	3	6	0.27
Heaters & Boilers	0.005	lb/gal		0.22	5	5	5	5	0.32
Seldom-used units	0.128	lb/gal		0.10	2.42	2.42	2.42	2.42	0.15
Emergency Generator	0.128	lb/gal		4.94	9.88	9.88	9.88	9.88	0.02
Primary Ice Management									
Propulsion & Generation	0.023	lb/gal		38.32	920	920	920	920	21
Heaters & Boilers	0.005	lb/gal		0.37	9	9	9	9	0.20
Seldom-used units	0.128	lb/gal		0.08	1.83	1.83	1.83	1.83	0.04
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	0.023	lb/gal		38.32	920	920	920	920	21
Heaters & Boilers	0.005	lb/gal		0.37	9	9	9	9	0.20
Seldom-used units	0.128	lb/gal		0.08	1.83	1.83	1.83	1.83	0.04
Resupply Ship - transport mode									
Propulsion & Generation	0.115	lb/gal	*71*	(0*)	138	(0*)	(0*)	(0*)	3.30
Seldom-used units	0.128	lb/gal	*0.015*	(0*)	0.37	(0*)	(0*)	(0*)	0.02
Resupply Ship - DP mode									
Propulsion & Generation	0.115	lb/gal		71	551	551	551	551	7
Seldom-used units	0.128	lb/gal		0.02	0.37	0.37	0.37	0.37	0.02
OSR vessel									
Propulsion & Generation	0.115	lb/gal		13	321	321	321	321	12
Seldom-used units	0.128	lb/gal		0.08	1.83	1.83	1.83	1.83	0.11
Quartering vessel									
Propulsion & Generation	0.011	lb/gal		2	55	55	55	55	2
Seldom-used units	0.128	lb/gal		0.08	1.83	1.83	1.83	1.83	0.11
OSR work boats									
Work boats	0.128	lb/gal		3	69	69	69	69	4
TOTAL				**186**	**3,320**	**3,179**	**3,089**	**3,030**	**83**

CO EMISSIONS

Source	Emission Factor	unit	CO lb/hr	CO lb/day	CO ton/year
Incinerators					
Kulluk	300	lb/ton	41.40	496.80	29.81
Ice Management	300	lb/ton	23.10	554.40	12.64
Anchor Handler	300	lb/ton	23.10	554.40	12.64
OSR vessel	300	lb/ton	18.75	450.00	27.00
Quartering vessel	300	lb/ton	18.75	450.00	27.00
			125.10	**2,505.60**	**109.09**

Source	pollutant	EF	unit	reference
Incinerators	CO	300	lb/ton	AP42 Table 2.1-12, 10/96

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

SO_2 EMISSIONS - FOR IMPACT MODELING

	Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk										
	Generation	0.001419	lb/gal		0.53	12.75	12.75	12.75	9.00	0.67
	MLC HPU'S	0.001419	lb/gal		0.11	2.65	2.65	0	0	0.03
	Air compressors	0.001419	lb/gal		0.11	2.65	2.65	0	0	0.03
	Cranes	0.001419	lb/gal		0.03	0.32	0.19	0.19	0.32	0.01
	Heaters & Boilers	0.001419	lb/gal		0.06	1.51	1.51	1.51	1.51	0.09
	Seldom-used units	0.001419	lb/gal		0.0011	0.0268	0.0268	0.0268	0.0268	0.0016
	Emergency Generator	0.001419	lb/gal		0.0546	0.1092	0.1092	0.1092	0.1092	0.0002
Primary Ice Management										
	Propulsion & Generation	0.001419	lb/gal		2.37	56.84	56.84	56.84	56.84	1.30
	Heaters & Boilers	0.001419	lb/gal		0.11	2.52	2.52	2.52	2.52	0.06
	Seldom-used units	0.001419	lb/gal		0.0008	0.0203	0.0203	0.0203	0.0203	0.0005
Secondary Ice Management / Anchor Handler										
	Propulsion & Generation	0.001419	lb/gal		2.37	56.84	56.84	56.84	56.84	1.30
	Heaters & Boilers	0.001419	lb/gal		0.11	2.52	2.52	2.52	2.52	0.06
	Seldom-used units	0.001419	lb/gal		0.0008	0.0203	0.0203	0.0203	0.0203	0.0005
Resupply Ship - transport mode										
	Propulsion & Generation	0.001419	lb/gal	*0.88*	(0*)	1.70	(0*)	(0*)	(0*)	0.04
	Seldom-used units	0.001419	lb/gal	*0.000*	(0*)	0.00	(0*)	(0*)	(0*)	0.00
Resupply Ship - DP mode										
	Propulsion & Generation	0.001419	lb/gal		0.88	6.81	6.81	6.81	6.81	0.08
	Seldom-used units	0.001419	lb/gal		0.0002	0.0041	0.0041	0.0041	0.0041	0.0002
OSR vessel										
	Propulsion & Generation	0.001419	lb/gal		0.17	3.97	3.97	3.97	3.97	0.14
	Seldom-used units	0.001419	lb/gal		0.0008	0.0203	0.0203	0.0203	0.0203	0.0012
Quartering vessel										
	Propulsion & Generation	0.001419	lb/gal		0.28	6.81	6.81	6.81	6.81	0.25
	Seldom-used units	0.001419	lb/gal		0.0008	0.0203	0.0203	0.0203	0.0203	0.0012
OSR work boats										
	Work boats	0.001419	lb/gal		0.03	0.77	0.77	0.77	0.77	0.05
TOTAL					**7**	**159**	**157**	**152**	**148**	**4**

SO2 EMISSIONS

Source	Emission Factor	unit	SO_2 lb/hr	SO_2 lb/day	SO_2 ton/year
Incinerators					
Kulluk	2.5	lb/ton	0.35	4.14	0.25
Ice Management	2.5	lb/ton	0.19	4.62	0.11
Anchor Handler	2.5	lb/ton	0.19	4.62	0.11
OSR vessel	2.5	lb/ton	0.16	3.75	0.23
Quartering vessel	2.5	lb/ton	0.16	3.75	0.23
			1.04	**20.88**	**0.91**

Source	pollutant	EF	unit	reference
Incinerators	SO_2	2.5	lb/ton	AP42 Table 2.1-12, 10/96

S = the weight % Sulfur in the Fuel: 0.0100% — 0.0105 lb/MMBtu

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 9	OF: 14	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

VOC EMISSIONS

	Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
					VOC_pph	Max_VOC_ppd	MLC_VOC_ppd	Drill_VOC_ppd	C/L_VOC_ppd	VOC_tpy
Kulluk										
	Generation	0.004	lb/gal		1.37	32.77	32.77	32.77	23.13	1.72
	MLC HPU'S	0.014	lb/gal		1.10	26.46	26.46	0	0	0.26
	Air compressors	0.004	lb/gal		0.28	6.80	6.80	0	0	0.07
	Cranes	0.014	lb/gal		0.26	3.18	1.91	1.91	3.18	0.15
	Heaters & Boilers	0.001	lb/gal		0.04	1.07	1.07	1.07	1.07	0.06
	Seldom-used units	0.047	lb/gal		0.04	0.89	0.89	0.89	0.89	0.05
	Emergency Generator	0.047	lb/gal		1.82	3.64	3.64	3.64	3.64	0.01
Primary Ice Management										
	Propulsion & Generation	0.004	lb/gal		6.09	146.06	146.06	146.06	146.06	3.33
	Heaters & Boilers	0.001	lb/gal		0.07	1.78	1.78	1.78	1.78	0.04
	Seldom-used units	0.047	lb/gal		0.03	0.68	0.68	0.68	0.68	0.02
Secondary Ice Management / Anchor Handler										
	Propulsion & Generation	0.004	lb/gal		6.09	146.06	146.06	146.06	146.06	3.33
	Heaters & Boilers	0.001	lb/gal		0.07	1.78	1.78	1.78	1.78	0.04
	Seldom-used units	0.047	lb/gal		0.03	0.68	0.68	0.68	0.68	0.02
Resupply Ship - transport mode										
	Propulsion & Generation	0.012	lb/gal	*7.56*	(0*)	14.58	(0*)	(0*)	(0*)	0.35
	Seldom-used units	0.047	lb/gal	*0.006*	(0*)	0.14	(0*)	(0*)	(0*)	0.01
Resupply Ship - DP mode										
	Propulsion & Generation	0.012	lb/gal		7.56	58.32	58.32	58.32	58.32	0.70
	Seldom-used units	0.047	lb/gal		0.0056	0.1350	0.1350	0.1350	0.1350	0.0081
OSR vessel										
	Propulsion & Generation	0.012	lb/gal		1.42	34.02	34.02	34.02	34.02	1.22
	Seldom-used units	0.047	lb/gal		0.03	0.68	0.68	0.68	0.68	0.04
Quartering vessel										
	Propulsion & Generation	0.001	lb/gal		0.24	5.83	5.83	5.83	5.83	0.21
	Seldom-used units	0.047	lb/gal		0.03	0.68	0.68	0.68	0.68	0.04
OSR work boats										
	Work boats	0.047	lb/gal		1.07	25.58	25.58	25.58	25.58	1.53
TOTAL					**28**	**512**	**496**	**463**	**454**	**13**

VOC EMISSIONS

Source	Emission Factor	unit	VOC lb/hr	VOC lb/day	VOC ton/year
			I_VOC_pph	I_VOC_ppd	I_VOC_tpy
Incinerators					
Kulluk	100	lb/ton	13.80	165.60	9.94
Ice Management	100	lb/ton	7.70	184.80	4.21
Anchor Handler	100	lb/ton	7.70	184.80	4.21
OSR vessel	100	lb/ton	6.25	150.00	9.00
Quartering vessel	100	lb/ton	6.25	150.00	9.00
			41.70	**835.20**	**36.36**

Source	pollutant	EF	unit	reference
Incinerators	VOC	100	lb/ton	AP42 Table 2.1-12, 10/96

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

LEAD EMISSIONS

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	3.92E-06	lb/gal		1.47E-03	3.52E-02	3.52E-02	3.52E-02	2.48E-02	1.84E-03
MLC HPU'S	3.92E-06	lb/gal		3.05E-04	7.31E-03	7.31E-03	0.00E+00	0.00E+00	7.31E-05
Air compressors	3.92E-06	lb/gal		3.05E-04	7.31E-03	7.31E-03	0.00E+00	0.00E+00	7.31E-05
Cranes	3.92E-06	lb/gal		7.31E-05	8.77E-04	5.26E-04	5.26E-04	8.77E-04	4.07E-05
Heaters & Boilers	1.22E-06	lb/gal		5.40E-05	1.30E-03	1.30E-03	1.30E-03	1.30E-03	7.78E-05
Seldom-used units	3.92E-06	lb/gal		3.08E-06	7.39E-05	7.39E-05	7.39E-05	7.39E-05	4.43E-06
Emergency Generator	3.92E-06	lb/gal		1.51E-04	3.01E-04	3.01E-04	3.01E-04	3.01E-04	6.03E-07
Primary Ice Management									
Propulsion & Generation	3.92E-06	lb/gal		6.54E-03	1.57E-01	1.57E-01	1.57E-01	1.57E-01	3.58E-03
Heaters & Boilers	1.22E-06	lb/gal		9.00E-05	2.16E-03	2.16E-03	2.16E-03	2.16E-03	4.92E-05
Seldom-used units	3.92E-06	lb/gal		2.33E-06	5.59E-05	5.59E-05	5.59E-05	5.59E-05	1.28E-06
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	3.92E-06	lb/gal		6.54E-03	1.57E-01	1.57E-01	1.57E-01	1.57E-01	3.58E-03
Heaters & Boilers	1.22E-06	lb/gal		9.00E-05	2.16E-03	2.16E-03	2.16E-03	2.16E-03	4.92E-05
Seldom-used units	3.92E-06	lb/gal		2.33E-06	5.59E-05	5.59E-05	5.59E-05	5.59E-05	1.28E-06
Resupply Ship - transport mode									
Propulsion & Generation	3.92E-06	lb/gal	*2.44E-03*	(0*)	4.70E-03	(0*)	(0*)	(0*)	1.13E-04
Seldom-used units	3.92E-06	lb/gal	*4.66E-07*	(0*)	1.12E-05	(0*)	(0*)	(0*)	6.71E-07
Resupply Ship - DP mode									
Propulsion & Generation	3.92E-06	lb/gal		2.44E-03	1.88E-02	1.88E-02	1.88E-02	1.88E-02	2.26E-04
Seldom-used units	3.92E-06	lb/gal		4.66E-07	1.12E-05	1.12E-05	1.12E-05	1.12E-05	6.71E-07
OSR vessel									
Propulsion & Generation	3.92E-06	lb/gal		4.57E-04	1.10E-02	1.10E-02	1.10E-02	1.10E-02	3.95E-04
Seldom-used units	3.92E-06	lb/gal		2.33E-06	5.59E-05	5.59E-05	5.59E-05	5.59E-05	3.36E-06
Quartering vessel									
Propulsion & Generation	3.92E-06	lb/gal		7.83E-04	1.88E-02	1.88E-02	1.88E-02	1.88E-02	6.77E-04
Seldom-used units	3.92E-06	lb/gal		2.33E-06	5.59E-05	5.59E-05	5.59E-05	5.59E-05	3.36E-06
OSR work boats									
Work boats	3.92E-06	lb/gal		8.83E-05	2.12E-03	2.12E-03	2.12E-03	2.12E-03	1.27E-04
TOTAL				**1.94E-02**	**4.26E-01**	**4.21E-01**	**4.06E-01**	**3.96E-01**	**1.09E-02**

LEAD EMISSIONS

Source	Emission Factor	unit	Lead lb/hr	Lead lb/day	Lead ton/year
Incinerators					
Kulluk	0.213	lb/ton	0.03	0.35	0.02
Ice Management	0.213	lb/ton	0.02	0.39	0.01
Anchor Handler	0.213	lb/ton	0.02	0.39	0.01
OSR vessel	0.213	lb/ton	0.01	0.32	0.02
Quartering vessel	0.213	lb/ton	0.01	0.32	0.02
			0.09	**1.78**	**0.08**

Source	pollutant	EF	unit	EF	unit
IC Engines	Lead	2.90E-05	lb/MMBtu	3.92E-06	lb/gal
Boilers	Lead	9	lb/10^{12} Btu	1.22E-06	lb/gal
Incinerators	Lead			0.213	lb/ton

Reference	
IC Engines	L & E Air Emissions from Sources of Lead and Lead Compounds, EPA 454/R-98-006, May 1998, Section 5.2.2, Distillate oil-fired gas turbines
Boilers	AP42, Table 1.3-10. Emission Factors For Trace Elements From Distillate Fuel Oil Combustion Sources
Incinerators	AP42, Table 2.2-2 - Metals Emission Factors for Mass Burn and Modular Excess Air Combustors

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor	
	PROJECT NO: 180-20-6	PAGE: 11	OF: 14 / SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011	

HAP EMISSIONS

Source	Emission Factor	unit	Control	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk										
Generation	1.65E-04	lb/gal	SCR, OxyCat		6.16E-02	1.48E+00	1.48E+00	1.48E+00	1.04E+00	7.75E-02
MLC HPU'S	1.65E-04	lb/gal	OxyCat		1.28E-02	3.07E-01	3.07E-01	0.00E+00	0.00E+00	3.07E-03
Air compressors	1.65E-04	lb/gal	OxyCat		1.28E-02	3.07E-01	3.07E-01	0.00E+00	0.00E+00	3.07E-03
Cranes	1.65E-04	lb/gal	OxyCat		3.07E-03	3.69E-02	2.21E-02	2.21E-02	3.69E-02	1.71E-03
Heaters & Boilers	4.42E-05	lb/gal			1.96E-03	4.71E-02	4.71E-02	4.71E-02	4.71E-02	2.83E-03
Seldom-used units	5.31E-04	lb/gal			4.17E-04	1.00E-02	1.00E-02	1.00E-02	1.00E-02	6.01E-04
Emergency Generator	5.31E-04	lb/gal			2.04E-02	4.09E-02	4.09E-02	4.09E-02	4.09E-02	8.17E-05
Primary Ice Management										
Propulsion & Generation	1.65E-04	lb/gal	SCR, OxyCat		2.75E-01	6.59E+00	6.59E+00	6.59E+00	6.59E+00	1.50E-01
Heaters & Boilers	4.42E-05	lb/gal			3.27E-03	7.85E-02	7.85E-02	7.85E-02	7.85E-02	1.79E-03
Seldom-used units	5.31E-04	lb/gal			3.16E-04	7.58E-03	7.58E-03	7.58E-03	7.58E-03	1.73E-04
Secondary Ice Management / Anchor Handler										
Propulsion & Generation	1.65E-04	lb/gal	SCR, OxyCat		2.75E-01	6.59E+00	6.59E+00	6.59E+00	6.59E+00	1.50E-01
Heaters & Boilers	4.42E-05	lb/gal			3.27E-03	7.85E-02	7.85E-02	7.85E-02	7.85E-02	1.79E-03
Seldom-used units	5.31E-04	lb/gal			3.16E-04	7.58E-03	7.58E-03	7.58E-03	7.58E-03	1.73E-04
Resupply Ship - transport mode										
Propulsion & Generation	5.31E-04	lb/gal		*3.30E-01*	(0*)	6.37E-01	(0*)	(0*)	(0*)	1.53E-02
Seldom-used units	5.31E-04	lb/gal		*6.32E-05*	(0*)	1.52E-03	(0*)	(0*)	(0*)	9.10E-05
Resupply Ship - DP mode										
Propulsion & Generation	5.31E-04	lb/gal			3.30E-01	2.55E+00	2.55E+00	2.55E+00	2.55E+00	3.06E-02
Seldom-used units	5.31E-04	lb/gal			6.32E-05	1.52E-03	1.52E-03	1.52E-03	1.52E-03	9.10E-05
OSR vessel										
Propulsion & Generation	5.31E-04	lb/gal			6.19E-02	1.49E+00	1.49E+00	1.49E+00	1.49E+00	5.35E-02
Seldom-used units	5.31E-04	lb/gal			3.16E-04	7.58E-03	7.58E-03	7.58E-03	7.58E-03	4.55E-04
Quartering vessel										
Propulsion & Generation	5.31E-04	lb/gal	CDPF		1.06E-01	2.55E+00	2.55E+00	2.55E+00	2.55E+00	9.17E-02
Seldom-used units	5.31E-04	lb/gal			3.16E-04	7.58E-03	7.58E-03	7.58E-03	7.58E-03	4.55E-04
OSR work boats										
Work boats	5.31E-04	lb/gal			1.20E-02	2.87E-01	2.87E-01	2.87E-01	2.87E-01	1.72E-02
TOTAL					**1.18**	**23.11**	**22.46**	**21.84**	**21.42**	**0.60**

HAP EMISSIONS

Source	Emission Factor	unit	HAP lb/hr	HAP lb/day	HAP ton/year
Incinerators					
Kulluk	2.51E-01	lb/ton	0.03	0.42	0.02
Ice Management	2.51E-01	lb/ton	0.02	0.46	0.01
Anchor Handler	2.51E-01	lb/ton	0.02	0.46	0.01
OSR vessel	2.51E-01	lb/ton	0.02	0.38	0.02
Quartering vessel	2.51E-01	lb/ton	0.02	0.38	0.02
			0.10	**2.09**	**0.09**

Source	pollutant	EF	unit
IC Engines-uncontrolled	HAP	5.31E-04	lb/gal
IC Engines-OxyCat controlled	HAP	1.65E-04	lb/gal
Boilers	HAP	4.42E-05	lb/gal
Incinerators	HAP	2.51E-01	lb/ton

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

FORMALDEHYDE EMISSIONS

	Source	Emission Factor	unit	Control	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
						CH2O_pph	Max_CH2O_ppd	MLC_CH2O_ppd	Drill_CH2O_ppd	C/L_CH2O_ppd	CH2O_tpy
Kulluk											
	Generation	4.78E-05	lb/gal	SCR, OxyCat		1.79E-02	4.30E-01	4.30E-01	4.30E-01	3.03E-01	2.25E-02
	MLC HPU'S	4.78E-05	lb/gal	OxyCat		3.72E-03	8.92E-02	8.92E-02	0.00E+00	0.00E+00	8.92E-04
	Air compressors	4.78E-05	lb/gal	OxyCat		3.72E-03	8.92E-02	8.92E-02	0.00E+00	0.00E+00	8.92E-04
	Cranes	4.78E-05	lb/gal	OxyCat		8.92E-04	1.07E-02	6.42E-03	6.42E-03	1.07E-02	4.97E-04
	Heaters & Boilers	3.30E-05	lb/gal			1.47E-03	3.52E-02	3.52E-02	3.52E-02	3.52E-02	2.11E-03
	Seldom-used units	1.59E-04	lb/gal			1.25E-04	3.01E-03	3.01E-03	3.01E-03	3.01E-03	1.80E-04
	Emergency Generator	1.59E-04	lb/gal			6.13E-03	1.23E-02	1.23E-02	1.23E-02	1.23E-02	2.45E-05
Primary Ice Management											
	Propulsion & Generation	4.78E-05	lb/gal	SCR, OxyCat		7.98E-02	1.91E+00	1.91E+00	1.91E+00	1.91E+00	4.37E-02
	Heaters & Boilers	3.30E-05	lb/gal			2.44E-03	5.87E-02	5.87E-02	5.87E-02	5.87E-02	1.34E-03
	Seldom-used units	1.59E-04	lb/gal			9.48E-05	2.28E-03	2.28E-03	2.28E-03	2.28E-03	5.19E-05
Secondary Ice Management / Anchor Handler											
	Propulsion & Generation	4.78E-05	lb/gal	SCR, OxyCat		7.98E-02	1.91E+00	1.91E+00	1.91E+00	1.91E+00	4.37E-02
	Heaters & Boilers	3.30E-05	lb/gal			2.44E-03	5.87E-02	5.87E-02	5.87E-02	5.87E-02	1.34E-03
	Seldom-used units	1.59E-04	lb/gal			9.48E-05	2.28E-03	2.28E-03	2.28E-03	2.28E-03	5.19E-05
Resupply Ship - transport mode											
	Propulsion & Generation	1.59E-04	lb/gal		*9.91E-02*	(0*)	1.91E-01	(0*)	(0*)	(0*)	4.59E-03
	Seldom-used units	1.59E-04	lb/gal		*1.90E-05*	(0*)	4.55E-04	(0*)	(0*)	(0*)	2.73E-05
Resupply Ship - DP mode											
	Propulsion & Generation	1.59E-04	lb/gal			9.91E-02	7.65E-01	7.65E-01	7.65E-01	7.65E-01	9.18E-03
	Seldom-used units	1.59E-04	lb/gal			1.90E-05	4.55E-04	4.55E-04	4.55E-04	4.55E-04	2.73E-05
OSR vessel											
	Propulsion & Generation	1.59E-04	lb/gal			1.86E-02	4.46E-01	4.46E-01	4.46E-01	4.46E-01	1.61E-02
	Seldom-used units	1.59E-04	lb/gal			9.48E-05	2.28E-03	2.28E-03	2.28E-03	2.28E-03	1.37E-04
Quartering vessel											
	Propulsion & Generation	1.59E-04	lb/gal	CDPF		3.19E-02	7.65E-01	7.65E-01	7.65E-01	7.65E-01	2.75E-02
	Seldom-used units	1.59E-04	lb/gal			9.48E-05	2.28E-03	2.28E-03	2.28E-03	2.28E-03	1.37E-04
OSR work boats											
	Work boats	1.59E-04	lb/gal			3.59E-03	8.62E-02	8.62E-02	8.62E-02	8.62E-02	5.17E-03
TOTAL						**0.35**	**6.88**	**6.68**	**6.51**	**6.38**	**0.18**

FORMALDEHYDE EMISSIONS

Source	Emission Factor	unit	CH_2O lb/hr	CH_2O lb/day	CH_2O ton/year
			I_CH2O_pph	I_CH2O_ppd	I_CH2O_tpy
Incinerators					
Kulluk	0.00E+00	lb/ton	0.00	0.00	0.00
Ice Management	0.00E+00	lb/ton	0.00	0.00	0.00
Anchor Handler	0.00E+00	lb/ton	0.00	0.00	0.00
OSR vessel	0.00E+00	lb/ton	0.00	0.00	0.00
Quartering vessel	0.00E+00	lb/ton	0.00	0.00	0.00
			0.00	**0.00**	**0.00**

Source	pollutant	EF	unit
IC Engines-uncontrolled	CH_2O	1.59E-04	lb/gal
IC Engines-OxyCat controlled	CH_2O	4.78E-05	lb/gal
Boilers	CH_2O	3.30E-05	lb/gal
Incinerators	CH_2O	0.00E+00	lb/ton

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

HAPs Emission Factors -(from AP42)

ICE Engines Emission Factors

AP42 Table 3.3-2, Speciated Organic Compound Emission Factors For Uncontrolled Diesel Engines

Pollutant	EF lb/MMBtu	EF lb/gal
Acaldehyde	7.67E-04	1.04E-04
Acenaphthene	1.42E-06	1.92E-07
Acenaphthylene	5.06E-06	6.83E-07
Acrolein	9.25E-05	1.25E-05
Anthracene	1.87E-06	2.52E-07
Benzene	9.33E-04	1.26E-04
Benzo(a)anthracene	1.68E-06	2.27E-07
Benzo(a)pyrene	1.88E-07	2.54E-08
Benzo(b)fluoranthene	9.91E-08	1.34E-08
Benzo(g,h,l)perylene	4.89E-07	6.60E-08
Benzo(k)fluoranthene	1.55E-07	2.09E-08
1,3-Butadiene	3.91E-05	5.28E-06
Chrysene	3.53E-07	4.77E-08
Dibenz(a,h)anthracene	5.83E-07	7.87E-08
Fluoranthene	7.61E-06	1.03E-06
Fluorene	2.92E-05	3.94E-06
Formaldehyde	1.18E-03	1.59E-04
Indeno(1,2,3-cd)pyrene	3.75E-07	5.06E-08
Naphthalene	8.48E-05	1.14E-05
Phenanthrene	2.94E-05	3.97E-06
Pyrene	4.78E-06	6.45E-07
Toluene	4.09E-04	5.52E-05
Xylenes	2.85E-04	3.85E-05
		5.23E-04

Boiler Emission Factors

AP42 Table 1.3-9, Emission Factors For Speciated Organic Compounds From Fuel Oil Combustion

Pollutant	EF lb/10^3 gal	EF lb/gal
Acenaphthene	2.11E-05	2.11E-08
Acenaphthylene	2.53E-07	2.53E-10
Anthracene	1.22E-06	1.22E-09
Benzene	2.14E-04	2.14E-07
Benz(a)anthracene	4.01E-06	4.01E-09
Benzo(b,k)fluoranthene	1.48E-06	1.48E-09
Benzo(g,h,i)perylene	2.26E-06	2.26E-09
Chrysene	2.38E-06	2.38E-09
Dibenzo(a,h)anthracene	1.67E-06	1.67E-09
Ethylbenzene	6.36E-05	6.36E-08
Fluoranthene	4.84E-06	4.84E-09
Fluorene	4.47E-06	4.47E-09
Formaldehyde	3.30E-02	3.30E-05
Indo(1,2,3-cd)pyrene	2.14E-06	2.14E-09
Naphthalene	1.13E-03	1.13E-06
Phenanthrene	1.05E-05	1.05E-08
Pyrene	4.25E-06	4.25E-09
Toluene	6.20E-03	6.20E-06
o-Xylene	1.09E-04	1.09E-07
		4.08E-05

Incinerator Emission Factors

Table 1.3-10. Emission Factors For Trace Elements From Distillate Fuel Oil Combustion Sources

Metal				lb/MMBtu	lb/gal	Metal		EF lb/10^{12} Btu	EF lb/gal
Arsenic	As			4.90E-06	6.62E-07	Arsenic	As	4	5.40E-07
Cadmium	Cd	11	lb/10^{12} Btu	1.10E-05	1.49E-06	Cadmium	Cd	3	4.05E-07
Chromium	Cr	0.35	lb/10^{9} gal	2.59E-06	3.50E-07	Chromium	Cr	3	4.05E-07
Lead	Pb			2.9E-05	3.92E-06	Lead	Pb	9	1.22E-06
Mercury	Hg	6.2	lb/10^{12} Btu	6.20E-06	8.37E-07	Mercury	Hg	3	4.05E-07
Nickel	Ni	0.41	lb/10^{6} gal	3.04E-06	4.10E-07	Nickel	Ni	3	4.05E-07
	Total Metals				7.66E-06	Total Metals			3.38E-06
	Total HAPs				5.31E-04	Total HAPs			4.42E-05

Table 2.2-2 - Metals Emission Factors for Mass Burn and Modular Excess Air Combustors

Metal		lb/ton
Arsenic	As	4.37E-03
Cadmium	Cd	1.09E-02
Chromium	Cr	8.97E-03
Lead	Pb	2.13E-01
Mercury	Hg	5.60E-03
Nickel	Ni	7.85E-03
Total Metals		2.51E-01
Total HAPs		2.51E-01

Greatest Emited HAP

Formaldehyde	1.59E-04	3.30E-05	

ICE Metal References

Arsenic	L & E Air Emissions from Sources of Arsenic and Arsenic Compounds, EPA-454/R-98-013, June 1998, Table 4-20, Distillate Oil Fired Turbine
Cadmium	L & E Air Emissions from Sources of Cadmium and Cadmium Compounds, EPA-454/R-93-040, Sept. 1993, Table 6-12, No. 2 Distillate Oil
Chromium	L & E Air Emissions from Sources of Chromium, EPA-450/4-84-007g, July 1984, Table 36, Distillate #2
Lead	L & E Air Emissions from Sources of Lead and Lead Compounds, EPA 454/R-98-006, May 1998, Section 5.2.2, Distillate oil-fired gas turbines
Mercury	L & E Air Emissions from Sources of Mercury and Mercury Compounds, EPA-454/R-97-012, Dec. 1997, Table 6-12, Distillate No. 2
Nickel	L & E Air Emissions from Sources of Nickel, EPA-450/4-84-007f, March 1984, Table 26, Distillate #2

Maximum Annual Fuel

Total Annual Fuel	MMBtu/year	gallons/year
Kulluk & Associated Fleet	810,000	6,000,000

Waste	ton/yr
All Incinerators	727

Greenhouse Gas Emissions

$CO_2 + CH_4*21 + N_2O*310 \rightarrow CO_2e$

Pollutant	Type	Multiplier	Reference	EF	unit	ton/year	Reference
CO_2	comb	1	40 CFR 98, Table A-1	73.96	kg/MMBtu	66,037	40 CFR Part 98, Subpart C, Table C-1 (Distillate Fuel Oil No. 2)
CH_4	comb	21	40 CFR 98, Table A-1	3.00E-03	kg/MMBtu	56	40 CFR Part 98, Subpart C, Table C-2 (Fuel Type: Petroleum)
N_2O	comb	310	40 CFR 98, Table A-1	6.00E-04	kg/MMBtu	166	40 CFR Part 98, Subpart C, Table C-2 (Fuel Type: Petroleum)
CH_4	offgas	21	40 CFR 98, Table A-1	399	lb	4	Methane Mass Caculation.xls October 22,2010
Annual CO_2e						66,263	

Sulfuric Acid

$S + O_2 \rightarrow SO_2$

$2SO_2 + O_2 \rightarrow 2SO_3$

$SO_3 + H_2O \rightarrow H_2SO_4$

Pollutant	Formula	MW
Sulfuric Acid	H_2SO_4	98.079 g/g-mol
Sulfur	S	32.066 g/g-mol

3.06 weight conversion of S to H_2SO_4

Source	S content	H_2SO_4 EF		Reference	H_2SO_4 [b] ton/year
Kulluk & Associated Fleet	0.0100%	0.0161	lb/MMBtu	Calculation	0.33
All Incinerators		1.2	lb/ton	AP42 Table 2.2-2, 1/95 [a]	0.44
					0.76

[a] Acid Gas Emission Factors for Multiple Hearth Sewage Sludge Incinerators, Uncontrolled

[b] Conversion assumed of 5.0% Ref: AP42, Section 1.3.3.2 Sulfur Oxides Emissions. Maximum conversion of SO2 to SO3 from fuel oil combustion in boilers

Fluorides

Fluoride is not a listed and quantified trace pollutant from diesel combustion as provided by AP42, so it is assumed to be an extremely small constituent. Furthermore, fluoride is a reduced form of fluorine and diesel combustion is an oxidizing process. Therefore, it is unlikely that it would exist as a combustion bi-product and should be a negligible emission from the project.

Hydrogen Sulfide, Total Reduced Sulfur, Reduced Sulfur Compounds

TRS	Formula
Dimethyl disulfide (DMDS)	$(CH_3)_2S_2$
Dimethyl sulfide (DMS)	$(CH_3)_2S$
Hydrogen sulfide	H_2S
Methyl mercaptan (MeSH)	CH_4S

RSC	Formula
Carbon disulfide	CS_2
Carbonyl sulfide	COS
Hydrogen sulfide	H_2S

Pollutant	MW
SO_2	64 g/g-mol
H_2S	34.081 g/g-mol

0.53 weight conversion of SO_2 to H_2S

Source	SO_2 EF		SO_2 ton/year	H_2S EF [a]		H_2S ton/year
Kulluk & Associated Fleet	0.0105	lb/MMBtu	4.26	5.60E-03	lb/MMBtu	2.27
All Incinerators	2.5	lb/ton	0.91	1.33E+00	lb/ton	0.48
			5.16			2.75

[a] It is assumed that all SO_2 is transformed to H_2S

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
ENGINEERING CALCULATIONS	PROJECT NO: 180-20-6	PAGE: 1	OF: 4	SHEET: 3
	SUBJECT: Model Emission Summary	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group
MLC Case

STACK	NO_X g/s	$PM_{2.5}$ g/s	PM_{10} g/s	CO g/s	SO_2 g/s	NH_3 g/s
Kulluk						
MAINENGS	2.395	0.374	0.374	1.08	6.70E-02	0.09
MLCHPU_A	2.330	0.093	0.093	0.13	6.95E-03	0.00
MLCHPU_B	2.330	0.093	0.093	0.13	6.95E-03	0.00
AIRCMP_A	1.864	0.039	0.039	0.11	6.95E-03	0.00
AIRCMP_B	1.864	0.039	0.039	0.11	6.95E-03	0.00
CRANE_A	0.112	0.004	0.004	0.01	3.34E-04	0.00
CRANE_B	0.112	0.004	0.004	0.01	3.34E-04	0.00
CRANE_C	0.112	0.004	0.004	0.01	3.34E-04	0.00
HEATBOIL	0.112	0.018	0.018	0.03	7.94E-03	0.00
INCIN_K	0.052	0.243	0.285	5.22	0.04	0.00
SELDOML (no egen.)	0.047	0.004	0.004	0.01	1.41E-04	0.00
SELDOMH (egen.)	2.307	0.185	0.185	0.62	6.88E-03	0.00
Primary Ice Management						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Secondary Ice Management / Anchor Handler						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Model ID: ICEMGMT; ICE MGMT/AH AREAPOLY [1, 2]	*2.51E-06*	*4.21E-07*	*4.27E-07*	*1.79E-06*	*7.71E-08*	*4.63E-08*
Resupply Ship - DP mode						
Propulsion & Generation	9.588	0.399	0.399	2.89	3.57E-02	0.00
Seldom-used units	0.007	0.001	0.001	0.00	2.13E-05	0.00
Model ID: RESUP_DP	*9.59*	*0.40*	*0.40*	*2.89*	*0.04*	*0.00*
Resupply Ship - transport mode						
Propulsion & Generation	0.000	0.000	0.000	0.00	0.00E+00	0.00
Seldom-used units	0.000	0.000	0.000	0.00	0.00E+00	0.00
OSR vessel						
Propulsion & Generation	5.593	0.233	0.233	1.69	2.09E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_MAIN; OSR Vessel AREAPOLY [1, 3]	*1.41E-06*	*8.66E-08*	*9.13E-08*	*1.02E-06*	*1.02E-08*	*0.00E+00*
Quartering vessel						
Propulsion & Generation	7.191	0.060	0.060	0.29	3.57E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_QTR; Quartering Vessel AREAPOLY [1,	*1.81E-06*	*4.33E-08*	*4.80E-08*	*6.66E-07*	*1.39E-08*	*0.00E+00*
OSR work boats						
Work boats	1.352	0.108	0.108	0.36	4.03E-03	0.00
Model ID: OSR_WORK; OSR Work Boats AREAPOLY [1]	*3.38E-07*	*2.70E-08*	*2.70E-08*	*9.12E-08*	*1.01E-09*	*0.00E+00*

[1] AREAPOLY units = $g/s/m^2$

[2] Ice Mngt/AH divide by area of the AREAPOLY = 8,718,385 sq. meters

[3] OSR divide by area of the AREAPOLY = 3,997,350 sq. meters

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 2	OF: 4	SHEET: 3
ENGINEERING CALCULATIONS	SUBJECT: Model Emission Summary	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group
Drill Case

STACK	NO_X g/s	$PM_{2.5}$ g/s	PM_{10} g/s	CO g/s	SO_2 g/s	NH_3 g/s
Kulluk						
MAINENGS	2.395	0.374	0.374	1.08	6.70E-02	0.09
MLCHPU_A	0.000	0.000	0.000	0.00	0.00E+00	0.00
MLCHPU_B	0.000	0.000	0.000	0.00	0.00E+00	0.00
AIRCMP_A	0.000	0.000	0.000	0.00	0.00E+00	0.00
AIRCMP_B	0.000	0.000	0.000	0.00	0.00E+00	0.00
CRANE_A	0.112	0.004	0.004	0.01	3.34E-04	0.00
CRANE_B	0.112	0.004	0.004	0.01	3.34E-04	0.00
CRANE_C	0.112	0.004	0.004	0.01	3.34E-04	0.00
HEATBOIL	0.112	0.018	0.018	0.03	7.94E-03	0.00
INCIN_K	0.052	0.243	0.285	5.22	0.04	0.00
SELDOML (no egen.)	0.047	0.004	0.004	0.01	1.41E-04	0.00
SELDOMH (egen.)	2.307	0.185	0.185	0.62	6.88E-03	0.00
Primary Ice Management						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Secondary Ice Management / Anchor Handler						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Model ID: ICEMGMT; ICE MGMT/AH AREAPOLY [1, 2]	*2.51E-06*	*4.21E-07*	*4.27E-07*	*1.79E-06*	*7.71E-08*	*4.63E-08*
Resupply Ship - DP mode						
Propulsion & Generation	9.588	0.399	0.399	2.89	3.57E-02	0.00
Seldom-used units	0.007	0.001	0.001	0.00	2.13E-05	0.00
Model ID: RESUP_DP	*9.59*	*0.40*	*0.40*	*2.89*	*0.04*	*0.00*
Resupply Ship - transport mode						
Propulsion & Generation	0.000	0.000	0.000	0.00	0.00E+00	0.00
Seldom-used units	0.000	0.000	0.000	0.00	0.00E+00	0.00
OSR vessel						
Propulsion & Generation	5.593	0.233	0.233	1.69	2.09E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_MAIN; OSR Vessel AREAPOLY [1, 3]	*1.41E-06*	*8.66E-08*	*9.13E-08*	*1.02E-06*	*1.02E-08*	*0.00E+00*
Quartering vessel						
Propulsion & Generation	7.191	0.060	0.060	0.29	3.57E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_QTR; Quartering Vessel AREAPOLY [1,	*1.81E-06*	*4.33E-08*	*4.80E-08*	*6.66E-07*	*1.39E-08*	*0.00E+00*
OSR work boats						
Work boats	1.352	0.108	0.108	0.36	4.03E-03	0.00
Model ID: OSR_WORK; OSR Work Boats AREAPOLY [1]	*3.38E-07*	*2.70E-08*	*2.70E-08*	*9.12E-08*	*1.01E-09*	*0.00E+00*

[1] AREAPOLY units = $g/s/m^2$

[2] Ice Mngt/AH divide by area of the AREAPOLY = 8,718,385 sq. meters

[3] OSR divide by area of the AREAPOLY = 3,997,350 sq. meters

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
ENGINEERING CALCULATIONS	PROJECT NO: 180-20-6	PAGE: 3	OF: 4	SHEET: 3
	SUBJECT: Model Emission Summary	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group
Cementing/Logging Case

STACK	NO_X g/s	$PM_{2.5}$ g/s	PM_{10} g/s	CO g/s	SO_2 g/s	NH_3 g/s
Kulluk						
MAINENGS	1.690	0.264	0.264	0.76	4.73E-02	0.09
MLCHPU_A	0.000	0.000	0.000	0.00	0.00E+00	0.00
MLCHPU_B	0.000	0.000	0.000	0.00	0.00E+00	0.00
AIRCMP_A	0.000	0.000	0.000	0.00	0.00E+00	0.00
AIRCMP_B	0.000	0.000	0.000	0.00	0.00E+00	0.00
CRANE_A	0.186	0.007	0.007	0.01	5.56E-04	0.00
CRANE_B	0.186	0.007	0.007	0.01	5.56E-04	0.00
CRANE_C	0.186	0.007	0.007	0.01	5.56E-04	0.00
HEATBOIL	0.112	0.018	0.018	0.03	7.94E-03	0.00
INCIN_K	0.052	0.243	0.285	5.22	0.04	0.00
SELDOML (no egen.)	0.047	0.004	0.004	0.01	1.41E-04	0.00
SELDOMH (egen.)	2.307	0.185	0.185	0.62	6.88E-03	0.00
Primary Ice Management						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Secondary Ice Management / Anchor Handler						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Model ID: ICEMGMT; ICE MGMT/AH AREAPOLY [1, 2]	*2.51E-06*	*4.21E-07*	*4.27E-07*	*1.79E-06*	*7.71E-08*	*4.63E-08*
Resupply Ship - DP mode						
Propulsion & Generation	9.588	0.399	0.399	2.89	3.57E-02	0.00
Seldom-used units	0.007	0.001	0.001	0.00	2.13E-05	0.00
Model ID: RESUP_DP	*9.59*	*0.40*	*0.40*	*2.89*	*0.04*	*0.00*
Resupply Ship - transport mode						
Propulsion & Generation	0.000	0.000	0.000	0.00	0.00E+00	0.00
Seldom-used units	0.000	0.000	0.000	0.00	0.00E+00	0.00
OSR vessel						
Propulsion & Generation	5.593	0.233	0.233	1.69	2.09E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_MAIN; OSR Vessel AREAPOLY [1, 3]	*1.41E-06*	*8.66E-08*	*9.13E-08*	*1.02E-06*	*1.02E-08*	*0.00E+00*
Quartering vessel						
Propulsion & Generation	7.191	0.060	0.060	0.29	3.57E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_QTR; Quartering Vessel AREAPOLY [1,	*1.81E-06*	*4.33E-08*	*4.80E-08*	*6.66E-07*	*1.39E-08*	*0.00E+00*
OSR work boats						
Work boats	1.352	0.108	0.108	0.36	4.03E-03	0.00
Model ID: OSR_WORK; OSR Work Boats AREAPOLY [1]	*3.38E-07*	*2.70E-08*	*2.70E-08*	*9.12E-08*	*1.01E-09*	*0.00E+00*

[1] AREAPOLY units = $g/s/m^2$

[2] Ice Mngt/AH divide by area of the AREAPOLY = 8,718,385 sq. meters

[3] OSR divide by area of the AREAPOLY = 3,997,350 sq. meters

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 4	OF: 4	SHEET: 3
ENGINEERING CALCULATIONS	SUBJECT: Model Emission Summary	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group
Maximum

STACK	CO g/s	SO_2 g/s	NH_3 g/s
Kulluk			
MAINENGS	1.08	6.70E-02	0.09
MLCHPU_A	0.13	6.95E-03	0.00
MLCHPU_B	0.13	6.95E-03	0.00
AIRCMP_A	0.11	6.95E-03	0.00
AIRCMP_B	0.11	6.95E-03	0.00
CRANE_A	0.01	5.56E-04	0.00
CRANE_B	0.01	5.56E-04	0.00
CRANE_C	0.01	5.56E-04	0.00
HEATBOIL	0.03	7.94E-03	0.00
INCIN_K	5.22	0.04	0.00
SELDOML (no egen.)	0.0127	1.41E-04	0.00
SELDOMH (egen.)	0.6221	6.88E-03	0.00
Primary Ice Management			
Propulsion & Generation	4.83	2.98E-01	0.20
Heaters & Boilers	0.05	1.32E-02	0.00
Seldom-used units	0.01	1.06E-04	0.00
Incinerator	2.91	0.02	0.00
Secondary Ice Management / Anchor Handler			
Propulsion & Generation	4.83	2.98E-01	0.20
Heaters & Boilers	0.05	1.32E-02	0.00
Seldom-used units	0.01	1.06E-04	0.00
Incinerator	2.91	0.02	0.00
Model ID: ICEMGMT; ICE MGMT/AH AREAPOLY [1, 2]	*1.79E-06*	*7.71E-08*	*4.63E-08*
Resupply Ship - DP mode			
Propulsion & Generation	2.89	3.57E-02	0.00
Seldom-used units	0.00	2.13E-05	0.00
Model ID: RESUP_DP	*2.89*	*0.04*	*0.00*
Resupply Ship - transport mode			
Propulsion & Generation	0.00	0.00	0.00
Seldom-used units	0.00	0.00	0.00
OSR vessel			
Propulsion & Generation	1.69	2.09E-02	0.00
Seldom-used units	0.01	1.06E-04	0.00
Incinerator	2.36	0.02	0.00
Model ID: OSR_MAIN; OSR Vessel AREAPOLY [1, 3]	*1.02E-06*	*1.02E-08*	*0.00E+00*
Quartering vessel			
Propulsion & Generation	0.29	3.57E-02	0.00
Seldom-used units	0.01	1.06E-04	0.00
Incinerator	2.36	0.02	0.00
Model ID: OSR_QTR; Quartering Vessel AREAPOLY [1,	*6.66E-07*	*1.39E-08*	*0.00E+00*
OSR work boats			
Work boats	0.36	4.03E-03	0.00
Model ID: OSR_WORK; OSR Work Boats AREAPOLY [1]	*9.12E-08*	*1.01E-09*	*0.00E+00*

[1] AREAPOLY units = $g/s/m^2$

[2] Ice Mngt/AH divide by area of the AREAPOLY = 8,718,385 sq. meters

[3] OSR divide by area of the AREAPOLY = 3,997,350 sq. meters

ALASKA MINOR-APPENDIX C

Potential to Emit Emissions – for ORL Purposes Only

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 1	OF: 1	SHEET: 1
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

SUMMARY - ALASKA OWNER REQUESTED LIMIT - POTENTIAL EMISSIONS

	NO_X tons/year	$PM_{2.5}$ tons/year	PM_{10} tons/year	CO tons/year	SO_2 tons/year	VOC tons/year	Lead tons/year	GHG tons/year
Engines	-	27.1	27.1	86.0	4.3	15.0	1.2E-02	-
Incinerators	-	6.5	7.6	138.9	1.2	46.3	9.9E-02	-
Total	250	33.6	34.7	224.9	5.4	61.3	1.1E-01	66,263.4
PSD trigger	250	250	250	250	250	250	250	100,000
Compare	Below	Below	Below	Below	Below	Below	Below	Below

	HAP tons/year	CH_2O tons/year	H_2SO_4 tons/year	Fluorides [a] tons/year	H_2S [b] tons/year	TRS [b] tons/year	RSC [b] tons/year
Engines	6.3E-01	1.9E-01	0.3	-	2.3	2.3	2.3
Incinerators	1.2E-01	0.0E+00	0.6	-	0.6	0.6	0.6
Total	0.7	0.2	0.9	-	2.9	2.9	2.9
PSD trigger	25	10	250	250	250	250	250
Compare	Below	Below	Below	Below	Below	Below	Below

[a] Fluoride is not a listed and quantified trace pollutant from diesel combustion as provided by AP42, so it is assumed to be an extremely small constituent. Furthermore, fluoride is a reduced form of fluorine and diesel combustion is an oxidizing process. Therefore, it is unlikely that it would exist as a combustion bi-product and should be a negligible emission from the project.

[b] H_2S also represents upper limit of total reduced sulfur and reduced sulfur compound emissions

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 1	OF: 11	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

Potential to Emit Emissions - for ORL Purposes only

shading represents owner requested limit (ORL) to be demonstrated by documentation of each event

shading represents ORLs to be demonstrated by documentation of weekly fuel consumption

Anticipated Kulluk Operating Maximums

Kulluk & Associated Fleet

Expected Operating Maximums	Limit		How Defined	How documented
Season maximum drilling duration as an OCS source (secure and stable for commencement of exploratory activity):	2,880	hrs/season	ORL	Manual recording of start and stop time
	120	days/season		
Ice mgmt vessel use within 25 miles	38%			
OSR vessel annual fuel limit	60%	of daily maximum - annualized		
Quartering vessel annual fuel limit	60%	of daily maximum - annualized		
All Activities				
Generators (three units combined) combined	85%	capacity	System Limitation	
Crane (three units combined) maximum	40%	capacity	System Limitation	
Kulluk emergency generator limited to	2	hr/30-days & hr/day		
Sulfur content of all stationary source engines on Kulluk	0.0100%	by wt.	ORL	Kulluk fuel testing
Sulfur content of associated fleet	0.0100%	by wt.	ORL	Fleet fuel testing
Annual NOx emissions recalculated as weekly rolling avg	250	ton/yr.	ORL	
Annual Kulluk and fleet fuel restriction	6,000,000	gallons/year	ORL	Fuel consumption measurement
Ice Management Fleet Propulsion & Generation	100%	capacity	System Limitation	
Resupply ship in transport limited to	1,200	gal/1-way	Expected Maximum	Fuel consumption measurement
Resupply ship in DP mode limited to	4,800	gal/event	Expected Maximum	Fuel consumption measurement
Resupply ship resupply events limited to	24	rnd trip/season	Expected Maximum	Manual tracking
Resupply ship DP events limited to	24	hr/day=hr/event	Expected Maximum	Manual tracking
OSR Vessel p & g aggregate power:	2,600	kW		Manufacturer specifications
OSR Vessel p & g aggregate consumption:	2,800	gal/day	Expected Maximum	Fuel consumption measurement
Quartering vessel p & g aggregate power:	7,502	kW		Manufacturer specifications
Quartering vessel p & g aggregate consumption:	4,800	gal/day	Expected Maximum	Fuel consumption measurement
OSR work boats	3,789	gallons/wk.	Expected Maximum	Fuel consumption measurement

OSR Boat Options

OSR vessel: Pt. Oliktuk/Arctic Endeavor

Quartering vessel: Nanuq

Work Boats

#1 OSR 34-foot	32	gal/hr
#2 OSR 34-foot	32	gal/hr
#1 OSR 47-foot	63	gal/hr
ALL	6	hr/day
ALL	5	day/week
ALL	100%	hourly fuel consumption

Assumptions			Reference
Diesel Density	7.1	lb/gal	AP42 Table 3.4-1; footnote a
Diesel Engine Thermal Efficiency	7,000	Btu/hp-hr	<600 hp; AP42 Table 3.3-1 Footnote (a) ver. 10/96. >600 hp, AP42 Table 3.4-1 ver. 10/96
Diesel Heating Value	0.1350	MMBtu/gallon	

Conversions

0.7457	kW / hp
1,000,000	Btu/MMBtu
453.6	g/lb
2,000	lb/ton
24	hr/day
168	hr/wk
2	one-way trips/ round trip
32.07	wt S
64.06	wt. SO2
2.00	wt. conversion of S to SO2

** seldom-used engines are those running < 4 hr/wk.

blue values are input, black values are calculated or linked

Anticipated Kulluk Operating Maximums

Kulluk & Associated Fleet (continued)

Emission Factors/Controls

	Controls				EF Reference			
Emission Unit	**NOx**	**PM**	**CO**	**VOC**	**NOx**	**PM**	**CO**	**VOC**
Kulluk								
Generation	Kulluk-SCR	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	4	7	7	7
MLC HPU'S	None-Sm	OxyCat-Sm	OxyCat-Sm	OxyCat-Sm	2	8	8	8
Air compressors	None-Lg	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	1	7	7	7
Cranes	None-Sm	OxyCat-Sm	OxyCat-Sm	OxyCat-Sm	2	8	8	8
Heaters & Boilers	heat&boil	heat&boil	heat&boil	heat&boil	3	3	3	3
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Emergency Generator	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Primary Ice Management								
Propulsion & Generation	SCR	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	5	7	7	7
Heaters & Boilers	heat&boil	heat&boil	heat&boil	heat&boil	3	3	3	3
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Secondary Ice Management / Anchor Handler								
Propulsion & Generation	SCR	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	5	7	7	7
Heaters & Boilers	heat&boil	heat&boil	heat&boil	heat&boil	3	3	3	3
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Resupply Ship - transport mode								
Propulsion & Generation	None-Lg	None-Lg	None-Lg	None-Lg	1	1	1	1
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Resupply Ship - DP mode								
Propulsion & Generation	None-Lg	None-Lg	None-Lg	None-Lg	1	1	1	1
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
OSR vessel								
Propulsion & Generation	None-Lg	None-Lg	None-Lg	None-Lg	1	1	1	1
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Quartering vessel								
Propulsion & Generation	Nanuq	CDPF-Lg	CDPF-Lg	CDPF-Lg	9	10	10	10
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
OSR work boats								
Work boats	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2

Assumed Control Device Effectiveness	**Restriction**	**Comment**	**Reference**
Oxidation Catalyst CO reduction efficiency	80%	50-100% of capacity	D.E.C. Marine AB letter, October 9, 2008, and initial stack test
Oxidation Catalyst VOC, HAPs (except metals), Formaldehyde reduction efficiency	70%	50-100% of capacity	D.E.C. Marine AB letter, October 9, 2008
Oxidation Catalyst PM reduction efficiency	50%		D.E.C. Marine AB email, February 9, 2009
CDPF reduction efficiency CO, VOC, HAPs	90%		CleanAIR CDPF guarantee
CDPF reduction efficiency PM	85%		CARB Currently verified, Jan. 2009, CleanAIR Systems PERMIT
Kulluk Generator SCR NOx control	1.6 g/kW-hr	50-100% of capacity	June 2010 Discoverer Stack Testing

Engine	**NOx**		**CO**		**VOC**		**PM***		
Emission Factors / Controls	**g/kW-hr**	**lb/gal**	**lb/MMBtu**	**lb/gal**	**lb/MMBtu**	**lb/gal**	**g/kWhr**	**lb/gal**	**Reference**
None-Lg	12.00	0.380	0.85	0.115	0.09	0.012	0.50	0.016	1
None-Sm	15.00	0.476	0.95	0.128	0.35	0.047	1.20	0.038	2
heat&boil	20 lb/kgal	0.020	5 lb/kgal	0.005	1 lb/kgal	0.001	3 lb/kgal	0.003	3
Kulluk-SCR	1.60	0.051	-	-	-	-	-	-	4
SCR	1.60	0.051	-	-	-	-	-	-	5
Kulluk-OxyCat	-	-	-	-	-	-	0.200	0.006	6
OxyCat-Lg	-	-	0.170	0.023	0.027	0.004	0.250	0.008	7
OxyCat-Sm	-	-	0.190	0.026	0.105	0.014	0.600	0.019	8
Nanuq	9	0.285	-	-	-	-	-	-	9
CDPF-Lg	-	-	0.085	0.011	0.009	0.001	0.075	0.002	10
Electric	0	0	0	0	0	0	0	0	NA

*PM2.5

References

None-Lg	1	NOx & PM: Recent stack test data, CO & VOC:AP-42 Table 3.4-1 Internal Combustion, Large Stationary Engines (fuel Input)-uncontrolled; ver. 10/1996
None-Sm	2	NOx & PM: Recent stack test data, CO & VOC: AP-42.Table 3.3-1 Internal Combustion, Diesel (fuel input)-uncontrolled; ver. 10/1996
heat&boil	3	NOx & PM: Recent Stack test data, CO & VOC: AP-42. Table 1.11-2 External Combustion, Small Boilers-waste oil; ver 10/1996
Kulluk-SCR	4	Emission factors based on stack tests from the Frontier Discoverer
SCR	5	Selective Catalytic Reduction NOx emission factor based on stack tests
Kulluk-OxyCat	6	PM: Tier 2 engines
OxyCat-Lg	7	Oxidation Catalyst controls applied to reference (1) emission factors
OxyCat-Sm	8	Oxidation Catalyst controls applied to reference (2) emission factors
Nanuq	9	CAT3806 Diesel Engine Technical data sheet
CDPF-Lg	10	Catalytic Diesel Particulate Filters controls applied to reference (1) emission factors

FUEL USE - MAX HOURLY

Emission Unit	Capacity Values		Capacity fuel - hourly MMBtu/hr	gal/hr	
Kulluk					
Generation	8,500	hp	50.58	375	
MLC HPU'S	1,500	hp	10.50	78	
Air compressors	1,500	hp	10.50	78	
Cranes	900	hp	2.52	19	
Heaters & Boilers	6	MMBtu/hr	6.00	44	
Seldom-used units	566	gal/30-days	0.11	0.79	group limit
Emergency Generator	77	gal/30-days	5.198	38.50	group limit
Primary Ice Management					
Propulsion & Generation	32,200	hp	225	1,670	
Heaters & Boilers	10	MMBtu/hr	10	74	
Seldom-used units	100	gal/wk	0.080	0.60	group limit
Secondary Ice Management / Anchor Handler					
Propulsion & Generation	32,200	hp	225	1,670	
Heaters & Boilers	10	MMBtu/hr	10	74	
Seldom-used units	100	gal/wk	0.080	0.60	group limit
Resupply Ship - transport mode					
Propulsion & Generation	12,000	hp	6.75	50	
Seldom-used units	20	gal/wk	0.016	0.12	group limit
Resupply Ship - DP mode					
Propulsion & Generation	12,000	hp	27	200	
Seldom-used units	20	gal/wk	0.016	0.12	group limit
OSR vessel					
Propulsion & Generation	3,487	hp	15.75	117	
Seldom-used units	100	gal/wk	0.080	0.60	group limit
Quartering vessel					
Propulsion & Generation	10,061	hp	27	200	
Seldom-used units	100	gal/wk	0.080	0.60	group limit
OSR work boats					
Work boats	3,789	gal/wk	3.05	23	

TOTAL WASTE INCINERATED

Incinerators	Capacity Values		Total tons /year
Kulluk	276	lb/hr	397
Ice Management	154	lb/hr	84
Anchor Handler	154	lb/hr	84
OSR vessel	125	lb/hr	180
Quartering vessel	125	lb/hr	180
			926

$PM_{2.5}$ EMISSIONS

Source	Emission Factor	unit	*lb/hr^*	lb/hr	ORL-only PTE TOTAL ton/year
Kulluk					
Generation	0.008	lb/gal		2.97	4.28
MLC HPU'S	0.019	lb/gal		1.48	2.13
Air compressors	0.008	lb/gal		0.62	0.89
Cranes	0.019	lb/gal		0.36	0.51
Heaters & Boilers	0.003	lb/gal		0.15	0.21
Seldom-used units	0.038	lb/gal		0.03	0.04
Emergency Generator	0.038	lb/gal		1.46	0.01
Primary Ice Management					
Propulsion & Generation	0.008	lb/gal		13.23	7.24
Heaters & Boilers	0.003	lb/gal		0.24	0.13
Seldom-used units	0.038	lb/gal		0.02	0.01
Secondary Ice Management / Anchor Handler					
Propulsion & Generation	0.008	lb/gal		13.23	7.24
Heaters & Boilers	0.003	lb/gal		0.24	0.13
Seldom-used units	0.038	lb/gal		0.02	0.01
Resupply Ship - transport mode					
Propulsion & Generation	0.016	lb/gal	*0.79*	(0*)	(0*)
Seldom-used units	0.038	lb/gal	*0.005*	(0*)	(0*)
Resupply Ship - DP mode					
Propulsion & Generation	0.016	lb/gal		3.17	0.91
Seldom-used units	0.038	lb/gal		0.00	0.01
OSR vessel					
Propulsion & Generation	0.016	lb/gal		1.85	1.60
Seldom-used units	0.038	lb/gal		0.02	0.03
Quartering vessel					
Propulsion & Generation	0.002	lb/gal		0.48	0.41
Seldom-used units	0.038	lb/gal		0.02	0.03
OSR work boats					
Work boats	0.038	lb/gal		0.86	1.24
TOTAL				**40**	**27**

PM_{10} & $PM_{2.5}$ EMISSIONS

Source	Emission Factor PM_{10}	Emission Factor $PM_{2.5}$	unit	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	OR-only PTE PM_{10} ton/year	OR-only PTE $PM_{2.5}$ ton/year
Incinerators							
Kulluk	16.4	14	lb/ton	2.26	1.93	3.26	2.78
Ice Management	16.4	14	lb/ton	1.26	1.08	0.69	0.59
Anchor Handler	16.4	14	lb/ton	1.26	1.08	0.69	0.59
OSR vessel	16.4	14	lb/ton	1.03	0.88	1.48	1.26
Quartering vessel	16.4	14	lb/ton	1.03	0.88	1.48	1.26
				6.84	**5.84**	**7.59**	**6.48**

Source	pollutant	EF	unit	Reference
Incinerators	PM_{10}	16.4	lb/ton	Disco Stack Test June 2010 (multiplied by a safety factor of 2)
	$PM_{2.5}$	14	lb/ton	Disco Stack Test June 2010 (multiplied by a safety factor of 2)

TOTAL

	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	OR-only PTE PM_{10} ton/year	OR-only PTE $PM_{2.5}$ ton/year
All sources	47	46	35	34

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.
^Values in this column represent maximum emissions independent of activity.

CO EMISSIONS

Source	Emission Factor	unit	*lb/hr^*	lb/hr	ORL-only PTE TOTAL ton/year
Kulluk					
Generation	0.023	lb/gal		8.60	12.38
MLC HPU'S	0.026	lb/gal		2.00	2.87
Air compressors	0.023	lb/gal		1.79	2.57
Cranes	0.026	lb/gal		0.48	0.69
Heaters & Boilers	0.005	lb/gal		0.22	0.32
Seldom-used units	0.128	lb/gal		0.10	0.15
Emergency Generator	0.128	lb/gal		4.94	0.02
Primary Ice Management					
Propulsion & Generation	0.023	lb/gal		38.32	20.97
Heaters & Boilers	0.005	lb/gal		0.37	0.20
Seldom-used units	0.128	lb/gal		0.08	0.04
Secondary Ice Management / Anchor Handler					
Propulsion & Generation	0.023	lb/gal		38.32	20.97
Heaters & Boilers	0.005	lb/gal		0.37	0.20
Seldom-used units	0.128	lb/gal		0.08	0.04
Resupply Ship - transport mode					
Propulsion & Generation	0.115	lb/gal	*5.74*	(0*)	(0*)
Seldom-used units	0.128	lb/gal	*0.015*	(0*)	(0*)
Resupply Ship - DP mode					
Propulsion & Generation	0.115	lb/gal		22.95	6.61
Seldom-used units	0.128	lb/gal		0.02	0.02
OSR vessel					
Propulsion & Generation	0.115	lb/gal		13.39	11.57
Seldom-used units	0.128	lb/gal		0.08	0.11
Quartering vessel					
Propulsion & Generation	0.011	lb/gal		2.30	1.98
Seldom-used units	0.128	lb/gal		0.08	0.11
OSR work boats					
Work boats	0.128	lb/gal		2.89	4.17
TOTAL				**137**	**86**

CO EMISSIONS

Source	Emission Factor	unit	CO lb/hr	OR-only PTE CO ton/year
Incinerators				
Kulluk	300	lb/ton	41.40	59.62
Ice Management	300	lb/ton	23.10	12.64
Anchor Handler	300	lb/ton	23.10	12.64
OSR vessel	300	lb/ton	18.75	27.00
Quartering vessel	300	lb/ton	18.75	27.00
			125.10	**138.90**

Source	pollutant	EF	unit	Reference
Incinerators	CO	300	lb/ton	AP42 Table 2.1-12, 10/96

TOTAL

	CO lb/hr	OR-only PTE CO ton/year
All sources	262	225

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.
^Values in this column represent maximum emissions independent of activity.

VOC EMISSIONS

Source	Emission Factor	unit	*lb/hr^*	lb/hr	ORL-only PTE TOTAL ton/year
Kulluk					
Generation	0.004	lb/gal		1.37	1.97
MLC HPU'S	0.014	lb/gal		1.10	1.59
Air compressors	0.004	lb/gal		0.28	0.41
Cranes	0.014	lb/gal		0.26	0.38
Heaters & Boilers	0.001	lb/gal		0.04	0.06
Seldom-used units	0.047	lb/gal		0.04	0.05
Emergency Generator	0.047	lb/gal		1.82	0.01
Primary Ice Management					
Propulsion & Generation	0.004	lb/gal		6.09	3.33
Heaters & Boilers	0.001	lb/gal		0.07	0.04
Seldom-used units	0.047	lb/gal		0.03	0.02
Secondary Ice Management / Anchor Handler					
Propulsion & Generation	0.004	lb/gal		6.09	3.33
Heaters & Boilers	0.001	lb/gal		0.07	0.04
Seldom-used units	0.047	lb/gal		0.03	0.02
Resupply Ship - transport mode					
Propulsion & Generation	0.012	lb/gal	*0.61*	(0*)	(0*)
Seldom-used units	0.047	lb/gal	*0.006*	(0*)	(0*)
Resupply Ship - DP mode					
Propulsion & Generation	0.012	lb/gal		2.43	0.70
Seldom-used units	0.047	lb/gal		0.0056	0.01
OSR vessel					
Propulsion & Generation	0.012	lb/gal		1.42	1.22
Seldom-used units	0.047	lb/gal		0.03	0.04
Quartering vessel					
Propulsion & Generation	0.001	lb/gal		0.24	0.21
Seldom-used units	0.047	lb/gal		0.03	0.04
OSR work boats					
Work boats	0.047	lb/gal		1.07	1.53
TOTAL				**23**	**15**

VOC EMISSIONS

Source	Emission Factor	unit	VOC lb/hr	OR-only PTE VOC ton/year
Incinerators				
Kulluk	100	lb/ton	13.80	19.87
Ice Management	100	lb/ton	7.70	4.21
Anchor Handler	100	lb/ton	7.70	4.21
OSR vessel	100	lb/ton	6.25	9.00
Quartering vessel	100	lb/ton	6.25	9.00
			41.70	**46.30**

Source	pollutant	EF	unit	Reference
Incinerators	VOC	100	lb/ton	AP42 Table 2.1-12, 10/96

TOTAL

	VOC lb/hr	OR-only PTE VOC ton/year
All sources	64	61

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.
^Values in this column represent maximum emissions independent of activity.

LEAD EMISSIONS

Source	Emission Factor	unit	*lb/hr^*	lb/hr	ORL-only PTE TOTAL ton/year
Kulluk					
Generation	3.92E-06	lb/gal		1.47E-03	2.11E-03
MLC HPU'S	3.92E-06	lb/gal		3.05E-04	4.38E-04
Air compressors	3.92E-06	lb/gal		3.05E-04	4.38E-04
Cranes	3.92E-06	lb/gal		7.31E-05	1.05E-04
Heaters & Boilers	1.22E-06	lb/gal		5.40E-05	7.78E-05
Seldom-used units	3.92E-06	lb/gal		3.08E-06	4.43E-06
Emergency Generator	3.92E-06	lb/gal		1.51E-04	6.03E-07
Primary Ice Management					
Propulsion & Generation	3.92E-06	lb/gal		6.54E-03	3.58E-03
Heaters & Boilers	1.22E-06	lb/gal		9.00E-05	4.92E-05
Seldom-used units	3.92E-06	lb/gal		2.33E-06	1.28E-06
Secondary Ice Management / Anchor Handler					
Propulsion & Generation	3.92E-06	lb/gal		6.54E-03	3.58E-03
Heaters & Boilers	1.22E-06	lb/gal		9.00E-05	4.92E-05
Seldom-used units	3.92E-06	lb/gal		2.33E-06	1.28E-06
Resupply Ship - transport mode					
Propulsion & Generation	3.92E-06	lb/gal	*1.96E-04*	(0*)	(0*)
Seldom-used units	3.92E-06	lb/gal	*4.66E-07*	(0*)	(0*)
Resupply Ship - DP mode					
Propulsion & Generation	3.92E-06	lb/gal		7.83E-04	2.26E-04
Seldom-used units	3.92E-06	lb/gal		4.66E-07	6.71E-07
OSR vessel					
Propulsion & Generation	3.92E-06	lb/gal		4.57E-04	3.95E-04
Seldom-used units	3.92E-06	lb/gal		2.33E-06	3.36E-06
Quartering vessel					
Propulsion & Generation	3.92E-06	lb/gal		7.83E-04	6.77E-04
Seldom-used units	3.92E-06	lb/gal		2.33E-06	3.36E-06
OSR work boats					
Work boats	3.92E-06	lb/gal		8.83E-05	1.27E-04
TOTAL				**1.77E-02**	**1.19E-02**

LEAD EMISSIONS

Source	Emission Factor	unit	Lead lb/hr	OR-only PTE Lead ton/year
Incinerators				
Kulluk	0.213	lb/ton	0.03	0.04
Ice Management	0.213	lb/ton	0.02	0.01
Anchor Handler	0.213	lb/ton	0.02	0.01
OSR vessel	0.213	lb/ton	0.01	0.02
Quartering vessel	0.213	lb/ton	0.01	0.02
			0.09	**0.10**

Source	pollutant	EF	unit	EF	unit
IC Engines	Lead	2.90E-05	lb/MMBtu	3.92E-06	lb/gal
Boilers	Lead	9	lb/10^12 Btu	1.22E-06	lb/gal
Incinerators	Lead			0.213	lb/ton

Reference	
IC Engines	L & E Air Emissions from Sources of Lead and Lead Compounds, EPA 454/R-98-006, May 1998, Section 5.2.2, Distillate oil-fired gas turbines
Boilers	AP42, Table 1.3-10. Emission Factors For Trace Elements From Distillate Fuel Oil Combustion Sources
Incinerators	AP42, Table 2.2-2 - Metals Emission Factors for Mass Burn and Modular Excess Air Combustors

TOTAL

	Lead lb/hr	OR-only PTE Lead ton/year
All sources	1.E-01	1.E-01

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.
^Values in this column represent maximum emissions independent of activity.

HAP EMISSIONS

Source	Emission Factor	unit	Control	*lb/hr^*	lb/hr	ORL-only PTE TOTAL ton/year
Kulluk						
Generation	1.65E-04	lb/gal	SCR, OxyCat		6.16E-02	8.88E-02
MLC HPU'S	1.65E-04	lb/gal	OxyCat		1.28E-02	1.84E-02
Air compressors	1.65E-04	lb/gal	OxyCat		1.28E-02	1.84E-02
Cranes	1.65E-04	lb/gal	OxyCat		3.07E-03	4.42E-03
Heaters & Boilers	4.42E-05	lb/gal			1.96E-03	2.83E-03
Seldom-used units	5.31E-04	lb/gal			4.17E-04	6.01E-04
Emergency Generator	5.31E-04	lb/gal			2.04E-02	8.17E-05
Primary Ice Management						
Propulsion & Generation	1.65E-04	lb/gal	SCR, OxyCat		2.75E-01	1.50E-01
Heaters & Boilers	4.42E-05	lb/gal			3.27E-03	1.79E-03
Seldom-used units	5.31E-04	lb/gal			3.16E-04	1.73E-04
Secondary Ice Management / Anchor Handler						
Propulsion & Generation	1.65E-04	lb/gal	SCR, OxyCat		2.75E-01	1.50E-01
Heaters & Boilers	4.42E-05	lb/gal			3.27E-03	1.79E-03
Seldom-used units	5.31E-04	lb/gal			3.16E-04	1.73E-04
Resupply Ship - transport mode						
Propulsion & Generation	5.31E-04	lb/gal		*2.65E-02*	(0*)	(0*)
Seldom-used units	5.31E-04	lb/gal		*6.32E-05*	(0*)	(0*)
Resupply Ship - DP mode						
Propulsion & Generation	5.31E-04	lb/gal			1.06E-01	3.06E-02
Seldom-used units	5.31E-04	lb/gal			6.32E-05	9.10E-05
OSR vessel						
Propulsion & Generation	5.31E-04	lb/gal			6.19E-02	5.35E-02
Seldom-used units	5.31E-04	lb/gal			3.16E-04	4.55E-04
Quartering vessel						
Propulsion & Generation	5.31E-04	lb/gal	CDPF		1.06E-01	9.17E-02
Seldom-used units	5.31E-04	lb/gal			3.16E-04	4.55E-04
OSR work boats						
Work boats	5.31E-04	lb/gal			1.20E-02	1.72E-02
TOTAL					**0.96**	**0.63**

HAP EMISSIONS

Source	Emission Factor	unit	HAP lb/hr	OR-only PTE HAP ton/year
Incinerators				
Kulluk	2.51E-01	lb/ton	0.03	0.05
Ice Management	2.51E-01	lb/ton	0.02	0.01
Anchor Handler	2.51E-01	lb/ton	0.02	0.01
OSR vessel	2.51E-01	lb/ton	0.02	0.02
Quartering vessel	2.51E-01	lb/ton	0.02	0.02
			0.10	**0.12**

Source	pollutant	EF	unit
IC Engines-uncontrolled	HAP	5.31E-04	lb/gal
IC Engines-OxyCat controlled	HAP	1.65E-04	lb/gal
Boilers	HAP	4.42E-05	lb/gal
Incinerators	HAP	2.51E-01	lb/ton

TOTAL

	HAP lb/hr	OR-only PTE HAP ton/year
All sources	1.06	0.75

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.
^Values in this column represent maximum emissions independent of activity.

FORMALDEHYDE EMISSIONS

Source	Emission Factor	unit	Control	*lb/hr^*	lb/hr	ORL-only PTE TOTAL ton/year
Kulluk						
Generation	4.78E-05	lb/gal	SCR, OxyCat		1.79E-02	2.58E-02
MLC HPU'S	4.78E-05	lb/gal	OxyCat		3.72E-03	5.35E-03
Air compressors	4.78E-05	lb/gal	OxyCat		3.72E-03	5.35E-03
Cranes	4.78E-05	lb/gal	OxyCat		8.92E-04	1.28E-03
Heaters & Boilers	3.30E-05	lb/gal			1.47E-03	2.11E-03
Seldom-used units	1.59E-04	lb/gal			1.25E-04	1.80E-04
Emergency Generator	1.59E-04	lb/gal			6.13E-03	2.45E-05
Primary Ice Management						
Propulsion & Generation	4.78E-05	lb/gal	SCR, OxyCat		7.98E-02	4.37E-02
Heaters & Boilers	3.30E-05	lb/gal			2.44E-03	1.34E-03
Seldom-used units	1.59E-04	lb/gal			9.48E-05	5.19E-05
Secondary Ice Management / Anchor Handler						
Propulsion & Generation	4.78E-05	lb/gal	SCR, OxyCat		7.98E-02	4.37E-02
Heaters & Boilers	3.30E-05	lb/gal			2.44E-03	1.34E-03
Seldom-used units	1.59E-04	lb/gal			9.48E-05	5.19E-05
Resupply Ship - transport mode						
Propulsion & Generation	1.59E-04	lb/gal		*7.97E-03*	(0*)	(0*)
Seldom-used units	1.59E-04	lb/gal		*1.90E-05*	(0*)	(0*)
Resupply Ship - DP mode						
Propulsion & Generation	1.59E-04	lb/gal			3.19E-02	9.18E-03
Seldom-used units	1.59E-04	lb/gal			1.90E-05	2.73E-05
OSR vessel						
Propulsion & Generation	1.59E-04	lb/gal			1.86E-02	1.61E-02
Seldom-used units	1.59E-04	lb/gal			9.48E-05	1.37E-04
Quartering vessel						
Propulsion & Generation	1.59E-04	lb/gal	CDPF		3.19E-02	2.75E-02
Seldom-used units	1.59E-04	lb/gal			9.48E-05	1.37E-04
OSR work boats						
Work boats	1.59E-04	lb/gal			3.59E-03	5.17E-03
TOTAL					**0.28**	**0.19**

FORMALDEHYDE EMISSIONS

Source	Emission Factor	unit	CH_2O lb/hr	OR-only PTE CH_2O ton/year
Incinerators				
Kulluk	0.00E+00	lb/ton	0.00	0.00
Ice Management	0.00E+00	lb/ton	0.00	0.00
Anchor Handler	0.00E+00	lb/ton	0.00	0.00
OSR vessel	0.00E+00	lb/ton	0.00	0.00
Quartering vessel	0.00E+00	lb/ton	0.00	0.00
			0.00	**0.00**

Source	pollutant	EF	unit
IC Engines-uncontrolled	CH_2O	1.59E-04	lb/gal
IC Engines-OxyCat controlled	CH_2O	4.78E-05	lb/gal
Boilers	CH_2O	3.30E-05	lb/gal
Incinerators	CH_2O	0.00E+00	lb/ton

TOTAL

	CH_2O lb/hr	OR-only PTE CH_2O ton/year
All sources	0.28	0.19

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.
^Values in this column represent maximum emissions independent of activity.

HAPs Emission Factors -(from AP42)

ICE Engines Emission Factors

AP42 Table 3.3-2, Speciated Organic Compound Emission Factors For Uncontrolled Diesel Engines

Boiler Emission Factors

AP42 Table 1.3-9, Emission Factors For Speciated Organic Compounds From Fuel Oil Combustion

Incinerator Emission Factors

Pollutant	EF lb/MMBtu	EF lb/gal	Pollutant	EF lb/10^3 gal	EF lb/gal
Acaldehyde	7.67E-04	1.04E-04			
Acenaphthene	1.42E-06	1.92E-07	Acenaphthene	2.11E-05	2.11E-08
Acenaphthylene	5.06E-06	6.83E-07	Acenaphthylene	2.53E-07	2.53E-10
Acrolein	9.25E-05	1.25E-05			
Anthracene	1.87E-06	2.52E-07	Anthracene	1.22E-06	1.22E-09
Benzene	9.33E-04	1.26E-04	Benzene	2.14E-04	2.14E-07
Benzo(a)anthracene	1.68E-06	2.27E-07	Benz(a)anthracene	4.01E-06	4.01E-09
Benzo(a)pyrene	1.88E-07	2.54E-08			
Benzo(b)fluoranthene	9.91E-08	1.34E-08			
			Benzo(b,k)fluoranthene	1.48E-06	1.48E-09
Benzo(g,h,l)perylene	4.89E-07	6.60E-08	Benzo(g,h,i)perylene	2.26E-06	2.26E-09
Benzo(k)fluoranthene	1.55E-07	2.09E-08			
1,3-Butadiene	3.91E-05	5.28E-06			
Chrysene	3.53E-07	4.77E-08	Chrysene	2.38E-06	2.38E-09
Dibenz(a,h)anthracene	5.83E-07	7.87E-08	Dibenzo(a,h)anthracene	1.67E-06	1.67E-09
			Ethylbenzene	6.36E-05	6.36E-08
Fluoranthene	7.61E-06	1.03E-06	Fluoranthene	4.84E-06	4.84E-09
Fluorene	2.92E-05	3.94E-06	Fluorene	4.47E-06	4.47E-09
Formaldehyde	1.18E-03	1.59E-04	Formaldehyde	3.30E-02	3.30E-05
Indeno(1,2,3-cd)pyrene	3.75E-07	5.06E-08	Indo(1,2,3-cd)pyrene	2.14E-06	2.14E-09
Naphthalene	8.48E-05	1.14E-05	Naphthalene	1.13E-03	1.13E-06
Phenanthrene	2.94E-05	3.97E-06	Phenanthrene	1.05E-05	1.05E-08
Pyrene	4.78E-06	6.45E-07	Pyrene	4.25E-06	4.25E-09
Toluene	4.09E-04	5.52E-05	Toluene	6.20E-03	6.20E-06
Xylenes	2.85E-04	3.85E-05			
			o-Xylene	1.09E-04	1.09E-07
		5.23E-04			4.08E-05

Table 1.3-10. Emission Factors For Trace Elements From Distillate Fuel Oil Combustion Sources

Table 2.2-2 - Metals Emission Factors for Mass Burn and Modular Excess Air Combustors

Metal			EF lb/MMBtu	EF lb/gal	Metal		EF lb/10^{12} Btu	EF lb/gal	Metal		EF lb/ton
Arsenic	As		4.90E-06	6.62E-07	Arsenic	As	4	5.40E-07	Arsenic	As	4.37E-03
Cadmium	Cd	11 lb/10^{12} Btu	1.10E-05	1.49E-06	Cadmium	Cd	3	4.05E-07	Cadmium	Cd	1.09E-02
Chromium	Cr	0.35 lb/10^6 gal	2.59E-06	3.50E-07	Chromium	Cr	3	4.05E-07	Chromium	Cr	8.97E-03
Lead	Pb		2.9E-05	3.92E-06	Lead	Pb	9	1.22E-06	Lead	Pb	2.13E-01
Mercury	Hg	6.2 lb/10^{12} Btu	6.20E-06	8.37E-07	Mercury	Hg	3	4.05E-07	Mercury	Hg	5.60E-03
Nickel	Ni	0.41 lb/10^9 gal	3.04E-06	4.10E-07	Nickel	Ni	3	4.05E-07	Nickel	Ni	7.85E-03
	Total Metals			7.66E-06	Total Metals			3.38E-06	Total Metals		2.51E-01
	Total HAPs			5.31E-04	Total HAPs			4.42E-05	Total HAPs		2.51E-01

Greatest Emited HAP

Formaldehyde	1.59E-04	3.30E-05	

ICE Metal References

Arsenic	L & E Air Emissions from Sources of Arsenic and Arsenic Compounds, EPA-454/R-98-013, June 1998, Table 4-20, Distillate Oil Fired Turbine
Cadmium	L & E Air Emissions from Sources of Cadmium and Cadmium Compounds, EPA-454/R-93-040, Sept. 1993, Table 6-12, No. 2 Distillate Oil
Chromium	L & E Air Emissions from Sources of Chromium, EPA-450/4-84-007g, July 1984, Table 36, Distillate #2
Lead	L & E Air Emissions from Sources of Lead and Lead Compounds, EPA 454/R-98-006, May 1998, Section 5.2.2, Distillate oil-fired gas turbines
Mercury	L & E Air Emissions from Sources of Mercury and Mercury Compounds, EPA-454/R-97-012, Dec. 1997, Table 6-12, Distillate No. 2
Nickel	L & E Air Emissions from Sources of Nickel, EPA-450/4-84-007f, March 1984, Table 26, Distillate #2

Maximum Annual Fuel

Source	MMBtu/year	gallons/year
Kulluk & Associated Fleet	810,000	6,000,000

Waste	ton/yr
All Incinerators	926

SO_2 Emissions

	S content	EF	unit	Reference	SO_2 ton/year
Kulluk & Associated Fleet	0.0100%	0.0105	lb/MMBtu	Calculation	4.26
All Incinerators		2.5	lb/ton	AP42 Table 2.1-12, 10/96	1.16
Total					5.41

Greenhouse Gas Emissions

$CO_2 + CH_4*21 + N_2O*310 \rightarrow CO_2e$

Pollutant	Type	Multiplier	Reference	EF	unit	Maximum ton/year	Reference
CO_2	comb	1	40 CFR 98, Table A-1	73.96	kg/MMBtu	66,037	40 CFR Part 98, Subpart C, Table C-1 (Distillate Fuel Oil No. 2)
CH_4	comb	21	40 CFR 98, Table A-1	3.00E-03	kg/MMBtu	56	40 CFR Part 98, Subpart C, Table C-2 (Fuel Type: Petroleum)
N_2O	comb	310	40 CFR 98, Table A-1	6.00E-04	kg/MMBtu	166	40 CFR Part 98, Subpart C, Table C-2 (Fuel Type: Petroleum)
CH_4	offgas	21	40 CFR 98, Table A-1	399	lb	4	Methane Mass Caculation.xls October 22,2010
Annual CO_2e						66,263	

Sulfuric Acid

$S + O_2 \rightarrow SO_2$

$2SO_2 + O_2 \rightarrow 2SO_3$

$SO_3 + H_2O \rightarrow H_2SO_4$

Pollutant	Formula	MW	
Sulfuric Acid	H_2SO_4	98.079	g/g-mol
Sulfur	S	32.066	g/g-mol

3.06 weight conversion of S to H_2SO_4

Maximum Emissions

Source	S content	H_2SO_4 EF		Reference	H_2SO_4 ton/year
Kulluk & Associated Fleet	0.0100%	0.0161	lb/MMBtu	Calculation	0.33
All Incinerators		1.2	lb/ton	AP42 Table 2.2-2, 1/95 [a]	0.56
					0.88

[a] Acid Gas Emission Factors for Multiple Hearth Sewage Sludge Incinerators, Uncontrolled

[b] Conversion assumed of 5.0% Ref: AP42, Section 1.3.3.2 Sulfur Oxides Emissions. Maximum conversion of SO2 to SO3 from fuel oil combustion in boilers

Fluorides

Fluoride is not a listed and quantified trace pollutant from diesel combustion as provided by AP42, so it is assumed to be an extremely small constituent. Furthermore, fluoride is a reduced form of fluorine and diesel combustion is an oxidizing process. Therefore, it is unlikely that it would exist as a combustion bi-product and should be a negligible emission from the project.

Hydrogen Sulfide, Total Reduced Sulfur, Reduced Sulfur Compounds

TRS	Formula
Dimethyl disulfide (DMDS)	$(CH_3)_2S_2$
Dimethyl sulfide (DMS)	$(CH_3)_2S$
Hydrogen sulfide	H_2S
Methyl mercaptan (MeSH)	CH_4S

RSC	Formula
Carbon disulfide	CS_2
Carbonyl sulfide	COS
Hydrogen sulfide	H_2S

Pollutant	MW	
SO_2	64	g/g-mol
H_2S	34.081	g/g-mol

0.53 weight conversion of SO_2 to H_2S

Maximum Emissions

Source	SO_2 EF		SO_2 ton/year	H_2S EF [a]		H_2S ton/year
Kulluk & Associated Fleet	0.0105	lb/MMBtu	4.26	5.60E-03	lb/MMBtu	2.27
All Incinerators	2.5	lb/ton	1.16	1.33E+00	lb/ton	0.62
			5.41			2.88

[a] It is assumed that all SO_2 is transformed to H_2S

CONICAL DRILLING UNIT KULLUK IN THE BEAUFORT SEA
ALASKA OPERATING PERMIT APPLICATION
(18 AAC PART 50.326) FOR OPERATION ON THE INNER OCS

CONTENTS

Page

GENERAL INFORMATION AND SUMMARY (GIS) 1
EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1) 7
INSIGNIFICANT EMISSIONS (IE) 83
EMISSION CALCULATIONS (EMISS) 85
POTENTIAL TO EMIT (PTE) 87
INITIAL COMPLIANCE PLAN AND COMPLIANCE CERTIFICATION (I-COMP) 90
ALTERNATE OPERATING SCENARIO 101
CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS (CTAC) 102

Appendices

Alaska OP-Appendix A: Beaufort Sea Lease Block Map and List
Alaska OP-Appendix B: General Information and Summary (GIS) Table 1
Alaska OP-Appendix C: Emission Calculations (EMISS) – Tables 1 & 2
Alaska OP-Appendix D: Updated Emission Inventory
Alaska OP-Appendix E: Title V Operating Permit Application Completeness Checklist

SECTION 1

GENERAL INFORMATION AND SUMMARY (GIS)

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

GENERAL INFORMATION AND SUMMARY (GIS)

A. Mailing Address and Contact Information

Facility name __Shell Offshore, Inc. – Conical Drilling Unit Kulluk_____

Mailing address: Street or P.O. Box __3601 C Street, Suite 1334_____

City __Anchorage_____ State __AK___ ZIP _99503_____-_____

Contact person: _Susan Childs_____ Title _Alaska Venture Support Integrator Manager_____

Telephone (_907__) _646___ - __7112_ Ext. _____

Facsimile (_907__) _770____ - _7145_____

B. Facility Location

Temporary source? __Yes _X_No Plant site location _ all OCS leases currently issued in the Beaufort Sea (see Appendix A: Beaufort Sea Lease Block Map and List)_____

City _____ State_AK__ County_____ EPA Region_10_

Is the facility located within:

Indian lands? ___YES _X_ NO OCS waters? _X_YES ___ NO

Non-attainment area? ___ YES _X_NO If yes, for what air pollutants? _____

Within 50 miles of affected State? _X_ YES __ NO If yes, What State(s)? _AK__

C. Owner

Name _Shell Offshore, Inc._____ Street/P.O. Box _3601 C Street, Suite 1334_____

City _Anchorage_____ State_AK___ ZIP_99503___ - _____

Telephone (_907_) _770__ - _3700_____ Ext_____

D. Operator

Name ___Same as owner _._____ Street/P.O. Box _____

City _____ State _____ ZIP _____ - _____

Telephone (_____) _____ - _____ Ext_____

E. Application Type

Mark only one permit application type and answer the supplementary question appropriate for the type marked.

_X_Initial Permit ___ Renewal ___ Significant Mod ___ Minor Permit Mod(MPM)

___ Group Processing, MPM ___ Administrative Amendment

For initial permits, when did operations commence? _future_ /_____ /_____

For permit renewal, what is the expiration date of current permit? _TBD_/____/_____

F. Applicable Requirement Summary

Mark all types of applicable requirements that apply.

___ SIP ___ FIP/TIP ___ PSD ___Non-attainment NSR

_X_ Minor source NSR ___ Section 111 ___ Phase I acid rain ___Phase II acid rain

___ Stratospheric ozone _X_ OCS regulations ___ NESHAP ___ Sec. 112(d) MACT

___ Sec. 112(g) MACT ___ Early reduction of HAP ___ Sec 112(j) MACT ___ RMP [Sec.112(r)]

___ Tank Vessel requirements, sec. 183(f)) ___ Section 129 Standards/Requirement

___ Consumer / comm.. products, ' 183(e) _X_ NAAQS, increments or visibility (temp. sources)

Has a risk management plan been registered? ___YES _X_NO Regulatory agency _____

Phase II acid rain application submitted? ___YES _X_NO If yes, Permitting authority _____

G. Source-Wide PTE Restrictions and Generic Applicable Requirements

Cite and describe any emissions-limiting requirements and/or facility-wide "generic" applicable requirements.

1. The permittee shall not have the Kulluk engage in its Mud Line Cellar activity for more than 480 hours, in aggregate, during a calendar year.
2. The permittee shall not have the Kulluk engage in its Well Drilling activity for more than 1,632 hours, in aggregate, during a calendar year.
3. The permittee shall not have the Kulluk occupy Drill Sites, in aggregate, for more than 2,880 hours, in aggregate during a calendar year.
4. The permittee shall not have the Kulluk incinerator operate for more than between 8 am and 8 pm (12 hours).
5. The permittee shall purchase only ultra low sulfur diesel (ULSD) and not combust any liquid fuel with sulfur content greater than 0.01 percent by weight in any emission unit on the Kulluk or a support vessel.
6. The permittee shall not allow the sum of NO_x emissions from the Kulluk and support vessels within 25 miles of that Exploratory Operation to equal or exceed 250.0 tons during a calendar year.
7. The permittee shall not allow the sum of NO_x emissions from the each specified source to exceed the limits set forth in Appendix B: GIS Table 1 during a calendar year.
8. The permittee shall not allow the sum of $PM_{2.5}$ emissions from the each specified source to exceed the limits set forth in Appendix B: GIS Table 1 during a calendar year.
9. The permittee shall not allow the sum of PM_{10} emissions from the each specified source to exceed the limits set forth in Appendix B: GIS Table 1 during a calendar year.
10. The permittee shall not allow more than 24 resupply and waste removal vessel trips to the Kulluk during a calendar year.

11. 40 CFR Part 60.4200, NSPS Subpart IIII: Applicable to certification of CI engines. Certifications are required according to year of manufacture.
12. 40 CFR Part 6-.110a, NSPS part Ka: Diesel fuel tanks manufactured prior to 1984.
13. Alaska 18AAC 50.050: Incinerator emission standards. Visibility through the exhaust effluent of an incinerator, including an air curtain incinerator, may not be reduced by visible emissions, excluding condensed water vapor, by more than 20 percent averaged over any six consecutive minutes.
14. Alaska 18AAC 50.055: Industrial processes and fuel-burning equipment. (a) Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes. (b) Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains. (c) Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.
15. The permittee shall not allow more than 6,000,000 gallons of fuel to be combusted.

H. Process Description

List processes, products, and SIC codes for the facility.

Process	Products	SIC
Exploratory Drilling for oil and gas	Information on oil & gas resource	1311

I. Emission Unit Identification

Assign an emissions unit ID and describe each emissions unit at the facility. Control equipment and/or alternative operating scenarios associated with emissions units should by listed on a separate line. Applicants may exclude from this list any insignificant emissions units or activities.

Emissions Unit ID	Description of Unit	Capacity Value
Kulluk – Gens	Generation	8,500 horsepower (hp)
Kulluk – MLCHPUs	MLC HPU's	1,500 hp
Kulluk – Comps	Air Compressors	1,500 hp
Kulluk – Cranes	Cranes	900 hp
Kulluk – Heaters	Heaters & Boilers	6 MMBtu/hour
Kulluk – Seldom	Seldom-used units	566 gallons/month
Kulluk – Egen	Emergency Generator	77 gallons/month
Kulluk – Incin	Incinerator	276 pounds(lb)/hour
Ice – P&G	Propulsion & Generation	32,200 hp
Ice – Heaters	Heaters & Boilers	10 MMBtu/hour
Ice – Seldom	Seldom-used units	100 gallons/week
Ice – Incin	Incinerator	154 lb/hr
AH – P&G	Propulsion & Generation	32,200 hp
AH – Heaters	Heaters & Boilers	10 MMBtu/hour
AH – Seldom	Seldom-used units	100 gallons/week
AH – Incin	Incinerator	154 lb/hr
Resupply – P&G	Propulsion & Generation	12,000 hp
Resupply – Seldom	Seldom-used units	20 gallons/week
OSR – P&G	Propulsion & Generation	3,487 hp
OSR – Seldom	Seldom-used units	100 gallons/week
OSR – Incin	Incinerator	125 lb/hr
Quartering – P&G	Propulsion & Generation	10,061 hp
Quartering – Seldom	Seldom-used units	100 gallons/week
Quartering – Incin	Incinerator	125 lb/hr
OSR Work Boats	Work Boats	3,789 gallons/week

J. Facility Emissions Summary

Enter potential to emit (PTE) for the facility as a whole for each air pollutant listed below. Enter the name of the single HAP emitted in the greatest amount and its PTE. For all pollutants stipulations to major source status may be indicated by entering "major" in the space for PTE. Indicate the total actual emissions for fee purposes for the facility in the space provided. Applications for permit modifications need not include actual emissions information.

NOx _<250___ tons/yr VOC __50_____ tons/yr SO2 __5_____ tons/yr

PM-10 _30_____ tons/yr CO __192_____ tons/yr Lead __0.09_____ tons/yr

Total HAP _0.69_____ tons/yr

Single HAP emitted in the greatest amount _Formaldehyde___ PTE _0.18__ tons/yr

Total of regulated pollutants (for fee calculation), Sec. F, line 5 of form FEE _336_ tons/yr

K. Existing Federally-Enforceable Permits

NONE

Permit number(s) _____ Permit type _____ Permitting authority _____

Permit number(s) _____ Permit type _____ Permitting authority _____

L. Emission Unit(s) Covered by General Permits

Emission unit(s) subject to general permit _NONE_____

Check one: ___ Application made ___ Coverage granted

General permit identifier _____ Expiration Date ____/____/____

M. Cross-referenced Information

Does this application cross-reference information? _X_ YES ___ NO (If yes, see instructions)

Appendix A: Beaufort Sea Lease Block Map and List
Appendix B: GIS Table 1

SECTION 2

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Gens Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20100102

B. Emissions Unit Description

Primary use Electrical generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 50.58 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[1]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	375 gallons	941,422 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Gens Device type Selective Catalytic Reduction (SCR), Oxidation Catalyst (OxyCat)

Air pollutant(s) Controlled NOx, PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) NOx-1.6 g/kW-hr, PM-50%, CO-80%, VOC-70%

Efficiency estimation method Manufacture Guarantee

1 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 45	Inside stack diameter (ft) 1.97
Stack temp(^{o}F) 632	Design stack flow rate (ACFM) 18,273
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 100.07

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – MLCHPUs Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Hydralic pumps Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 10.5 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[2]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	78 gallons	37,333 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – MLCHPUs Device type OxyCat

Air pollutant(s) Controlled PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) PM-50%, CO-80%, VOC-70%

Efficiency estimation method Manufacture Guarantee

2 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 34 Inside stack diameter (ft) 0.6

Stack temp(^{o}F) 800 Design stack flow rate (ACFM) 2,243

Actual stack flow rate (ACFM) not yet operating Velocity (ft/sec) 131.23

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Comps Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Compressors Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 10.5 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[3]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	78 gallons	37,333 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Comps Device type OxyCat

Air pollutant(s) Controlled PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) PM-50%, CO-80%, VOC-70%

Efficiency estimation method Manufacture Guarantee

3 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 36	Inside stack diameter (ft) 1.97
Stack temp(^{o}F) 632	Design stack flow rate (ACFM) 18,273
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 100.07

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Cranes Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Powering Cranes Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 2.52 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[4]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	19 gallons	20,787 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Cranes Device type OxyCat

Air pollutant(s) Controlled PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) PM-50%, CO-80%, VOC-70%

Efficiency estimation method Manufacture Guarantee

4 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 79.75	Inside stack diameter (ft) 0.83
Stack temp(^{o}F) 750	Design stack flow rate (ACFM) 2,154
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 65.82

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Heaters Description Heaters & Boilers

SIC Code (4-digit) 1311 SCC Code 10300503

B. Emissions Unit Description

Primary use Heat Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: X Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 6 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[5]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	44 gallons	128,000 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Heaters Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

5 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 45 Inside stack diameter (ft) 0.5

Stack temp(^{o}F) 200 Design stack flow rate (ACFM) 622

Actual stack flow rate (ACFM) not yet operating Velocity (ft/sec) 52.82

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Seldom Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Power smaller engines Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 0.11 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[6]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	0.79 gallons	2,264 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Seldom Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

6 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 42.9	Inside stack diameter (ft) 0.59
Stack temp(^{o}F) 800	Design stack flow rate (ACFM) 2,157
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 131.23

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Egen Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Emergency generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 5.2 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[7]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	38.50 gallons	308 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Egen Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

7 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 42.9 Inside stack diameter (ft) 0.59

Stack temp(^{o}F) 800 Design stack flow rate (ACFM) 2,157

Actual stack flow rate (ACFM) not yet operating Velocity (ft/sec) 131.23

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Kulluk – Incin Description Incinerator

SIC Code (4-digit) 1311 SCC Code 50300101

B. Emissions Unit Description

Primary use Domestic Waste Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input N/A MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[8]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	276 lbs of waste	199 tons of waste

E. Associated Air Pollution Control Equipment

Emissions unit ID Kulluk – Incin Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

8 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 52.9	Inside stack diameter (ft) 1.5
Stack temp(^{o}F) 662	Design stack flow rate (ACFM) 3,479
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 32.81

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Ice – P&G Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 28000212

B. Emissions Unit Description

Primary use Propulsion & Generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 225 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[9]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	1,670 gallons	1,827,243 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Ice – P&G Device type SCR, OxyCat

Air pollutant(s) Controlled NOx, PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) PM-50%, CO-80%, VOC-70%

Efficiency estimation method Manufacture Guarantee

9 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Ice – Heaters Description Heaters & Boilers

SIC Code (4-digit) 1311 SCC Code 10300503

B. Emissions Unit Description

Primary use Heat Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: X Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 10 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[10]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	74 gallons	81,067 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Ice – Heaters Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

10 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Ice – Seldom Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Power smaller engines Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 0.08 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[11]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	0.60 gallons	651 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Ice – Seldom Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

11 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Ice – Incin Description Incinerator

SIC Code (4-digit) 1311 SCC Code 50300101

B. Emissions Unit Description

Primary use Domestic Waste Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input N/A MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[12]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	154 lbs of waste	84 tons waste

E. Associated Air Pollution Control Equipment

Emissions unit ID Ice – Incin Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

12 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID AH – P&G Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 28000212

B. Emissions Unit Description

Primary use Propulsion & Generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 225 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[13]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	1,670 gallons	1,827,243 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID AH – P&G Device type SCR, OxyCat

Air pollutant(s) Controlled NOx, PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) PM-50%, CO-80%, VOC-70%

Efficiency estimation method Manufacture Guarantee

13 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID AH – Heaters Description Heaters & Boilers

SIC Code (4-digit) 1311 SCC Code 10300503

B. Emissions Unit Description

Primary use Heat Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: X Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 10 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[14]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	74 gallons	81,067 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID AH – Heaters Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

14 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID AH – Seldom Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Power smaller engines Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 0.08 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[15]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	0.60 gallons	651 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID AH – Seldom Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

15 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID AH – Incin Description Incinerator

SIC Code (4-digit) 1311 SCC Code 50300101

B. Emissions Unit Description

Primary use Domestic Waste Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input N/A MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[16]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	154 lbs of waste	84 tons waste

E. Associated Air Pollution Control Equipment

Emissions unit ID AH – Incin Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

16 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Resupply – P&G Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 28000217

B. Emissions Unit Description

Primary use Propulsion & Generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 84 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[17]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	622 gallons	172,800 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Resupply – P&G Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

17 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Stack height (ft) 60	Inside stack diameter (ft) 1.97
Stack temp(^{o}F) 709	Design stack flow rate (ACFM) 8,759
Actual stack flow rate (ACFM) not yet operating	Velocity (ft/sec) 47.97

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Resupply – Seldom Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Power smaller engines Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 0.016 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[18]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	0.12 gallons	686 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Resupply – Seldom Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

18 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID OSR – P&G Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 28000212

B. Emissions Unit Description

Primary use Propulsion & Generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 16 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[19]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	117 gallons	201,600 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID OSR – P&G Device type Catalyzed Diesel Particulate Filter (CDPF)

Air pollutant(s) Controlled PM, CO, VOC Manufacturer TBD

Model No. TBD Serial No. TBD

Installation date TBD Control efficiency (%) PM-85%, CO, VOC-90%

Efficiency estimation method Manufacture Guarantee

19 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID OSR – Seldom Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Power smaller engines Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 0.08 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[20]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	0.60 gallons	1,714 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID OSR – Seldom Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

20 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID OSR – Incin Description Incinerator

SIC Code (4-digit) 1311 SCC Code 50300101

B. Emissions Unit Description

Primary use Domestic Waste Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input N/A MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[21]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	125 lbs of waste	180 tons of waste

E. Associated Air Pollution Control Equipment

Emissions unit ID OSR – Incin Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

21 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Quartering – P&G Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 28000212

B. Emissions Unit Description

Primary use Propulsion & Generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 27 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[22]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	200 gallons	345,600 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Quartering – P&G Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

22 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Quartering – Seldom Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 20200102

B. Emissions Unit Description

Primary use Power smaller engines Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 0.08 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[23]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	0.60 gallons	1,714 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID Quartering – Seldom Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

23 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID Quartering – Incin Description Incinerator

SIC Code (4-digit) 1311 SCC Code 50300101

B. Emissions Unit Description

Primary use Domestic Waste Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input N/A MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[24]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	125 lbs of waste	180 tons of waste

E. Associated Air Pollution Control Equipment

Emissions unit ID Quartering – Incin Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

24 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____.____

Actual stack flow rate (ACFM) _____.____ Velocity (ft/sec) _____._____

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

EMISSION UNIT DESCRIPTION FOR FUEL COMBUSTION SOURCES (EUD-1)

A. General Information

Emissions unit ID OSR Work Boats Description Diesel (RICE) engines

SIC Code (4-digit) 1311 SCC Code 28000212

B. Emissions Unit Description

Primary use Propulsion & Generation Temporary Source ___Yes X No

Manufacturer N/A Model No. N/A

Serial Number N/A Installation Date N/A

Boiler Type: ___ Industrial boiler ___ Process burner ___ Electric utility boiler

Other (describe) _____

Boiler horsepower rating_____ Boiler steam flow (lb/hr)_____

Type of Fuel-Burning Equipment (coal burning only):

___ Hand fired ___Spreader stoker ___Underfeed stoker ___Overfeed stoker

___ Traveling grate ___Shaking grate ___Pulverized, wet bed ___ Pulverized, dry bed

Actual Heat Input TBD MM BTU/hr Max. Design Heat Input 3.05 MM BTU/hr

C. Fuel Data

Primary fuel type(s) Diesel Standby fuel type(s) None

Describe each fuel you expected to use during the term of the permit.

Fuel Type	Max. Sulfur Content (%)	Max. Ash Content (%)	BTU Value (cf, gal., or lb.)
Diesel Fuel No. 1	0.010%	0%	135,000 Btu/gallon

D. Fuel Usage Rates

Fuel Type	Annual Actual Usage	Maximum Usage[25]	
		Hourly	Annual
Diesel Fuel No. 1	not yet operating	23 gallons	64,960 gallons

E. Associated Air Pollution Control Equipment

Emissions unit ID OSR Work Boats Device type NONE

Air pollutant(s) Controlled NONE Manufacturer N/A

Model No. N/A Serial No. N/A

Installation date N/A Control efficiency (%) NONE

Efficiency estimation method N/A

25 To be updated based on actual NOx emission factors, to ensure PTE of <250 tons of NOx.

F. Ambient Impact Assessment

This information must be completed by temporary sources or when ambient impact assessment is an applicable requirement for this emissions unit (this is not common).

Various - see Supplemental Report, Section 3.3.4

Stack height (ft) _____._____ Inside stack diameter (ft) _____._____

Stack temp(^{o}F) _____._____ Design stack flow rate (ACFM) _____._____

Actual stack flow rate (ACFM) _____._____ Velocity (ft/sec) _____._____

SECTION 3

INSIGNIFICANT EMISSIONS (IE)

Federal Operating Permit Program (40 CFR Part 71)

INSIGNIFICANT EMISSIONS (IE)

On this page list each insignificant activity or emission unit. In the "number" column, indicate the number of units in this category. Descriptions should be brief but unique. Indicate which emissions criterion of part 71 is the basis for the exemption.

Number	Description of Activities or Emissions Units	RAP, except HAP	HAP
1	Kulluk Fuel Tank A, 680 m^3	X	X
1	Kulluk Fuel Tank B, 676 m^3	X	X
1	Kulluk Fuel Tank C, 247 m^3	X	X
1	Drilling Mud De-gassing	X	X

SECTION 4

EMISSION CALCULATIONS (EMISS)

Federal Operating Permit Program (40 CFR Part 71)

EMISSION CALCULATIONS (EMISS)

Calculate potential to emit (PTE) for applicability purposes and actual emissions for fee purposes for each emissions unit, control device, or alternative operating scenario identified in section I of form **GIS**. If form **FEE** does not need to be submitted with the application, do not calculate actual emissions.

A. Emissions Unit ID Kulluk and Associated Fleet (See Appendix C: EMISS Tables for all units)

B. Identification and Quantification of Emissions

First, list each air pollutant that is either regulated at the unit or present in major amounts, then list any other regulated pollutant (for fee calculation) not already listed. HAP may be simply listed as "HAP." Next, calculate PTE for applicability purposes and actual emissions for fee purposes for each pollutant. Do not calculate PTE for air pollutants listed solely for fee purposes. Include all fugitives for fee purposes. You may round to the nearest tenth of a ton for yearly values or tenth of a pound for hourly values.

Air Pollutants	Emission Rates			CAS No.
	Actual Annual Emissions (tons/yr)	Potential to Emit		
		Hourly (lb/hr)	Annual (tons/yr)	
NO_x	<250	638	<250	NO_2 - 10102-44-0
VOC		69	50	N/A
SO_2		8	5	7446-09-5
PM_{10}		54	30	N/A
CO		311	192	630-08-0
Lead		0.11	0.09	7439-92-1
HAP		1.29	0.69	Various
Formaldehyde		0.35	0.18	50-00-0

SECTION 5

POTENTIAL TO EMIT (PTE)

Federal Operating Permit Program (40 CFR Part 71)

POTENTIAL TO EMIT (PTE)

For each unit with emissions that count towards applicability, list the emissions unit ID and the PTE for the air pollutants listed below and sum them up to show totals for the facility. You may find it helpful to complete form **EMISS** before completing this form. Show other pollutants not listed that are present in major amounts at the facility on attachment in a similar fashion. You may round values to the nearest tenth of a ton. Also report facility totals in section **J** of form **GIS**.

Emissions Unit ID	Regulated Air Pollutants and Pollutants for which the Source is Major (tons/yr)						
	NOx	VOC	SO2	PM10	CO	Lead	HAP
Kulluk emission units							
Kulluk – Gens	23.9	1.7	6.7E-01	3.7	10.8	1.8E-03	7.7E-02
Kulluk – MLCHPUs	8.9	0.3	2.6E-02	0.4	0.5	7.3E-05	3.1E-03
Kulluk – Comps	7.1	0.1	2.6E-02	0.1	0.4	7.3E-05	3.1E-03
Kulluk – Cranes	4.9	0.1	1.5E-02	0.2	0.3	4.1E-05	1.7E-03
Kulluk – Heaters	1.3	0.1	9.1E-02	0.2	0.3	7.8E-05	2.8E-03
Kulluk – Seldom	5.4E-01	5.3E-02	1.6E-03	4.3E-02	1.5E-01	4.4E-06	6.0E-04
Kulluk – Egen	7.3E-02	7.3E-03	2.2E-04	5.9E-03	2.0E-02	6.0E-07	8.2E-05
Kulluk – Incin	0.3	9.9	2.5E-01	1.6	29.8	2.1E-02	2.5E-02
Ice Management							
Ice – P&G	46.3	3.3	1.3E+00	7.2	21.0	3.6E-03	1.5E-01
Ice – Heaters	0.8	0.0	5.7E-02	0.1	0.2	4.9E-05	1.8E-03
Ice – Seldom	1.5E-01	1.5E-02	4.6E-04	1.2E-02	4.2E-02	1.3E-06	1.7E-04
Ice – Incin	0.1	4.2	1.1E-01	0.7	12.6	9.0E-03	1.1E-02
Anchor Handler							
AH – P&G	46.3	3.3	1.3E+00	7.2	21.0	3.6E-03	1.5E-01
AH – Heaters	0.8	0.0	5.7E-02	0.1	0.2	4.9E-05	1.8E-03
AH – Seldom	1.5E-01	1.5E-02	4.6E-04	1.2E-02	4.2E-02	1.3E-06	1.7E-04
AH – Incin	0.1	4.2	1.1E-01	0.7	12.6	9.0E-03	1.1E-02
Resupply Ship - transport							
Resupply – P&G	11.0	0.3	4.1E-02	0.5	3.3	1.1E-04	1.5E-02
Resupply – Seldom	8.2E-02	8.1E-03	2.4E-04	6.5E-03	2.2E-02	6.7E-07	9.1E-05
Resupply Ship - DP mode							
Resupply – P&G	21.9	0.7	8.2E-02	0.9	6.6	2.3E-04	3.1E-02
Resupply – Seldom	8.2E-02	8.1E-03	2.4E-04	6.5E-03	2.2E-02	6.7E-07	9.1E-05
OSR vessel							
OSR – P&G	38.4	1.2	1.4E-01	1.6	11.6	3.9E-04	5.3E-02

	OSR – Seldom	4.1E-01	4.1E-02	1.2E-03	3.3E-02	1.1E-01	3.4E-06	4.5E-04
	OSR – Incin	0.3	9.0	2.3E-01	1.5	27.0	1.9E-02	2.3E-02
Quartering vessel								
	Quartering – P&G	49.3	0.2	2.5E-01	0.4	2.0	6.8E-04	9.2E-02
	Quartering – Seldom	4.1E-01	4.1E-02	1.2E-03	3.3E-02	1.1E-01	3.4E-06	4.5E-04
	Quartering – Incin	0.3	9.0	2.3E-01	1.5	27.0	1.9E-02	2.3E-02
OSR Work Boats								
	OSR Work Boats	15.4	1.5	4.6E-02	1.2	4.2	1.3E-04	1.7E-02
FACILITY TOTALS:		**<250**	**50**	**5**	**30**	**192**	**0.09**	**0.69**

SECTION 6

INITIAL COMPLIANCE PLAN AND COMPLIANCE CERTIFICATION (I-COMP)

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

INITIAL COMPLIANCE PLAN AND COMPLIANCE CERTIFICATION (I-COMP)

SECTION A - COMPLIANCE STATUS AND COMPLIANCE PLAN

Complete this section for each unique combination of applicable requirements and emissions units at the facility. List all compliance methods (monitoring, recordkeeping and reporting) you used to determine compliance with the applicable requirement described above. Indicate your compliance status at this time for this requirement and compliance methods and check "YES" or "NO" to the follow-up question.

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not have the Kulluk engage in its Mud Line Cellar activity for more than 480 hours, in aggregate, during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by recording beginning and end time of activity while the Kulluk is an OCS source.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not have the Kulluk engage in its Well Drilling activity for more than 1,632 hours, in aggregate, during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of each event while the Kulluk is an OCS source.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not have the Kulluk occupy Drill Sites, in aggregate, for more than 2,880 hours, in aggregate during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of each event while the Kulluk is an OCS source.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk – Incin

Applicable Requirement (Describe and Cite):

The permittee shall not have the Kulluk incinerator operate for more than between 8 am and 8 pm (12 hours).

Compliance Methods for the Above (Description and Citation):

To be demonstrated by recording of start and stop times while the Kulluk is an OCS source.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall purchase only ULSD and not combust any liquid fuel with sulfur content greater than 0.01 percent by weight in any emission unit on the Kulluk or a support vessel.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by fuel purchase records and / or representative fuel sampling and determination of sulfur content using ASTM D 5453-08b, prior to the beginning of each drilling season and thereafter each fuel shipment. To be determined while the Kulluk is an OCS source.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not allow the sum of NO_x emissions from the Kulluk and support vessels within 25 miles of that Exploratory Operation to equal or exceed 250.0 tons during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of the annual rolling weekly sum of NOx emissions.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not allow the sum of NO_x emissions from the each specified source to exceed the limits set forth in Appendix B: GIS Table 1 during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of daily and/or weekly NOx emissions, calculated from fuel consumption records and acceptable NOx emission factors for the fuel-burning equipment, and calculated from time interval of incineration assumed to be at capacity rate and the acceptable NOx emission factor.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not allow the sum of $PM_{2.5}$ emissions from the each specified source to exceed the limits set forth in Appendix B: GIS Table 1 during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of daily and/or weekly $PM_{2.5}$ emissions, calculated from fuel consumption records and acceptable PM emission factors.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not allow the sum of PM_{10} emissions from the each specified source to exceed the limits set forth in Appendix B: GIS Table 1 during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of daily and/or weekly PM_{10} emissions, calculated from fuel consumption records and acceptable PM emission factors.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not allow more than 24 resupply and waste removal vessel trips to the Kulluk during a calendar year.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by manual recording of resupply and waste removal events while the Kulluk is an OCS source.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk – Gens, MLCHPUs, Comps, Cranes, Seldom, Egen

Applicable Requirement (Describe and Cite):

40 CFR Part 60.4200, NSPS Subpart IIII: Applicable to certification of CI engines. Certifications are required according to year of manufacture.

Compliance Methods for the Above (Description and Citation):

Shell will maintain the applicable certification for the size and model year of CI engines.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk Fuel tank A, B, and C

Applicable Requirement (Describe and Cite):

40 CFR Part 6-.110a, NSPS part Ka: Diesel fuel tanks manufactured prior to 1984.

Compliance Methods for the Above (Description and Citation):

Vapor pressure of diesel fuel is less than 1.5 psia (60.112 (a)). Diesel fuel MSDS lists vapor pressure at 0.4 mm Hg (<0.01 psia). Shell will maintain a record of these tank sizes.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk – Incin

Applicable Requirement (Describe and Cite):

Alaska 18AAC 50.050: Incinerator emission standards. Visibility through the exhaust effluent of an incinerator, including an air curtain incinerator, may not be reduced by visible emissions, excluding condensed water vapor, by more than 20 percent averaged over any six consecutive minutes.

Compliance Methods for the Above (Description and Citation):

Opacity by EPA Method 9 as part of the initial stack testing.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk – Gens, MLCHPUs, Comps, Cranes, Heaters, Seldom, Egen

Applicable Requirement (Describe and Cite):

Alaska 18AAC 50.055: Industrial processes and fuel-burning equipment. (a) Visible emissions, excluding condensed water vapor, from an industrial process or fuel-burning equipment may not reduce visibility through the exhaust effluent by more than 20 percent averaged over any six consecutive minutes.

(b) Particulate matter emitted from an industrial process or fuel-burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions and averaged over three hours, 0.05 grains.

(c) Sulfur-compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel-burning equipment may not exceed 500 ppm averaged over a period of three hours.

Compliance Methods for the Above (Description and Citation):

Opacity by EPA Method 9 as part of the initial stack testing.
Particulate matter emission rate to be demonstrated as met by meeting the requested limits within this application.
Sulfur-compound emissions – met through the use of ULSD fuel

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

Emission Unit ID(s): Kulluk and Associated Fleet

Applicable Requirement (Describe and Cite):

The permittee shall not allow more than 6,000,000 gallons of fuel to be combusted.

Compliance Methods for the Above (Description and Citation):

To be demonstrated by documentation of daily and/or weekly fuel consumption records.

Compliance Status:

___ In Compliance: Will you continue to comply up to permit issuance? ____Yes ____No

___ Not In Compliance: Will you be in compliance at permit issuance? ___Yes ___No

_X_ Future-Effective Requirement: Do you expect to meet this on a timely basis? _X__Yes ____No

B. SCHEDULE OF COMPLIANCE – To start in the future

Complete this section if you answered "NO" to any of the questions in section A. Also complete this section if required to submit a schedule of compliance by an applicable requirement. Please attach copies of any judicial consent decrees or administrative orders for this requirement.

Unit(s)_____ Requirement_____

Reason for Noncompliance. Briefly explain reason for noncompliance at time of permit issuance or that future-effective requirement will not be met on a timely basis:

Narrative Description of how Source Compliance Will be Achieved. Briefly explain your plan for achieving compliance:

Schedule of Compliance. Provide a schedule of remedial measures, including an enforceable sequence of actions with milestones, leading to compliance, including a date for final compliance.

Remedial Measure or Action	Date to be Achieved

C. SCHEDULE FOR SUBMISSION OF PROGRESS REPORTS – To start in the future

Only complete this section if you are required to submit one or more schedules of compliance in section B or if an applicable requirement requires submittal of a progress report. If a schedule of compliance is required, your progress report should start within 6 months of application submittal and subsequently, no less than every six months. One progress report may include information on multiple schedules of compliance.

Contents of Progress Report (describe):

First Report____/____/___ Frequency of Submittal_____

Contents of Progress Report (describe):

First Report____/____/___ Frequency of Submittal_____

D. SCHEDULE FOR SUBMISSION OF COMPLIANCE CERTIFICATIONS

This section must be completed once by every source. Indicate when you would prefer to submit compliance certifications during the term of your permit (at least once per year).

Frequency of submittal Annual_____ Beginning____/____/____

E. COMPLIANCE WITH ENHANCED MONITORING & COMPLIANCE CERTIFICATION REQUIREMENTS

This section must be completed once by every source. To certify compliance with these, you must be able to certify compliance for every applicable requirement related to monitoring and compliance certification at every unit.

Enhanced Monitoring Requirements: ____ In Compliance ____ Not In Compliance

Compliance Certification Requirements: ____ In Compliance ____ Not In Compliance

SECTION 7

ALTERNATE OPERATING SCENARIO

Shell requests that it have the flexibility of repowering the Kulluk so that any one or more of the three source groups:

- Kulluk – MLCHPU
- Kulluk – Comps
- Kulluk – Cranes

be electrified and powered by the Kulluk–Gens. If this were to occur, the Kulluk –Gens would be increased in power rating, fuel consumption and emission allowances (NOx and PM) equal to the power, fuel consumption and emission allowances allotted to the group or groups being electrified.

SECTION 8

CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS (CTAC)

United States Environmental Protection Agency

OMB No. 2060-0336, Approval Expires 04/30/2012

Federal Operating Permit Program (40 CFR Part 71)

CERTIFICATION OF TRUTH, ACCURACY, AND COMPLETENESS (CTAC)

This form must be completed, signed by the "Responsible Official" designated for the facility or emission unit, and sent with each submission of documents (i.e., application forms, updates to applications, reports, or any information required by a part 71 permit).

A. Responsible Official

Name: (Last) Childs (First) Susan (MI) ____

Title Alaska Venture Support Integrator Manager

Street or P.O. Box 3601 C Street, Suite 1334

City Anchorage State AK ZIP 99503 - _____

Telephone (907) 646 - 7112 Ext. _____ Facsimile (907) 770 - 7145

B. Certification of Truth, Accuracy and Completeness (to be signed by the responsible official)

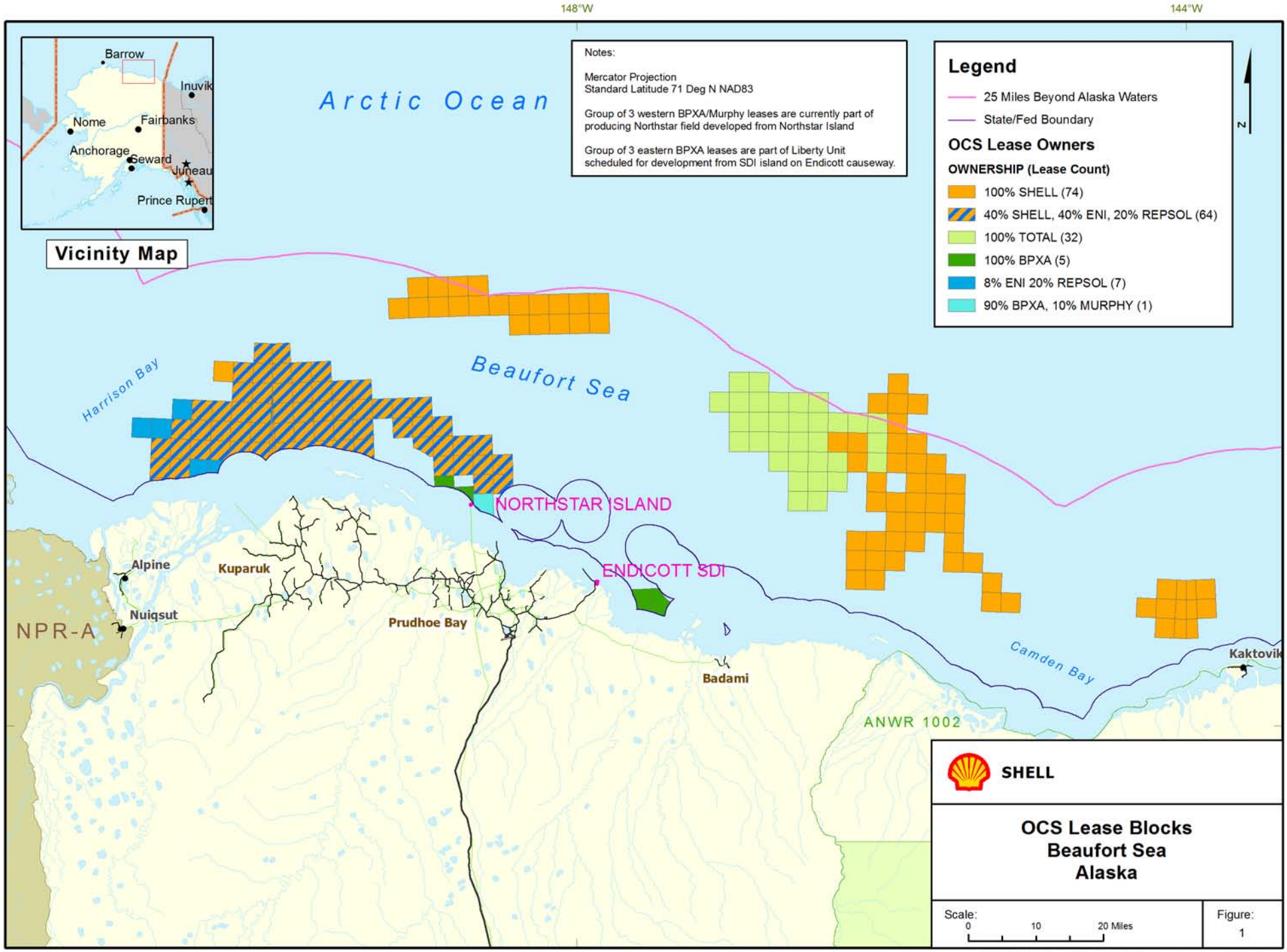
I certify under penalty of law, based on information and belief formed after reasonable inquiry, the statements and information contained in these documents are true, accurate and complete.

Name (signed) Susan Childs

Name (typed) Susan Childs Date: 3/29/2011

ALASKA OP-APPENDIX A

Beaufort Sea Lease Block Map and List


148°W
144°W
Arctic Ocean
Notes:
Mercator Projection
Standard Latitude 71 Deg N NAD83
Group of 3 western BPXA/Murphy leases are currently part of producing Northstar field developed from Northstar Island
Group of 3 eastern BPXA leases are part of Liberty Unit scheduled for development from SDI island on Endicott causeway.
Legend
25 Miles Beyond Alaska Waters
State/Fed Boundary
OCS Lease Owners
OWNERSHIP (Lease Count)
100% SHELL (74)
40% SHELL, 40% ENI, 20% REPSOL (64)
100% TOTAL (32)
100% BPXA (5)
8% ENI 20% REPSOL (7)
90% BPXA, 10% MURPHY (1)
N
Barrow
Inuvik
Nome
Fairbanks
Anchorage
Seward
Juneau
Prince Rupert
Vicinity Map
Harrison Bay
Beaufort Sea
NORTHSTAR ISLAND
ENDICOTT SDI
Alpine
Kuparuk
Nuiqsut
NPR-A
Prudhoe Bay
Badami
Camden Bay
Kaktovik
ANWR 1002
70°N
SHELL
OCS Lease Blocks
Beaufort Sea
Alaska
Scale:
0
10
20 Miles
Figure:
1
Shell AV GIS/3-23-2011/OCS_Blocks_By_Operator_Fig1_v1.mxd

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y0179	Inside	08/01/1980	BF	470(1) 470(2) 471 515	NR06-0327		12/19/1979	NORTHSTAR	BPXA	BPXA	100
Y0181	Inside	08/01/1980	BF	516 560	NR06-0327		12/19/1979	NORTHSTAR	BPXA	BPXA	90
										MURPHY AK	10
Y1585	Inside	08/01/1991	124	745 746 789	NR06-0327		6/1/1991	LIBERTY	BPXA	BPXA	100
Y1645	Inside	12/01/1996	144	6510C	NR06-03	Beechey Point	9/1/1996	NORTHSTAR	BPXA	BPXA	100
Y1650	Inside	06/27/2003	144	6819B 6820B 6870B 6871G	NR06-03	Beechey Point	9/1/1996	LIBERTY	BPXA	BPXA	100
Y1699	Inside	07/01/2007	186	6369	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1700	Inside	07/01/2007	186	6370	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1701	Inside	07/01/2007	186	6419	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1702	Inside	07/01/2007	186	6420	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1703	Inside	07/01/2007	186	6421BC	NR05-04	Harrison Bay	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1704	Inside	07/01/2007	186	6352	NR06-03	Beechey Point	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1705	Inside	07/01/2007	186	6402A 6403B	NR06-03	Beechey Point	9/24/2003		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1742	Inside	07/01/2007	195	6173	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1743	Inside	07/01/2007	195	6222	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1744	Inside	07/01/2007	195	6223	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1745	Inside	07/01/2007	195	6272	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1746	Inside	07/01/2007	195	6273	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1747	Inside	07/01/2007	195	6320	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1748	Inside	07/01/2007	195	6321	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1749	Inside	07/01/2007	195	6322	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1750	Inside	07/01/2007	195	6323	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1751	Inside	07/01/2007	195	6371	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1752	Inside	07/01/2007	195	6372	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1753	Inside	07/01/2007	195	6373	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1754	Inside	07/01/2007	195	6374BC 6424C	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1755	Inside	07/01/2007	195	6418	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1756	Inside	07/01/2007	195	6422B	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1757	Inside	07/01/2007	195	6423B	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1758	Inside	07/01/2007	195	6468	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1759	Inside	07/01/2007	195	6469B	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1760	Inside	07/01/2007	195	6518B 6519A	NR05-04	Harrison Bay	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1761	Inside	07/01/2007	195	6152	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1762	Inside	07/01/2007	195	6202	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1763	Inside	07/01/2007	195	6203	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1764	Inside	07/01/2007	195	6204	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1765	Inside	07/01/2007	195	6251A 6301B	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1766	Inside	07/01/2007	195	6252	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1767	Inside	07/01/2007	195	6253	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1768	Inside	07/01/2007	195	6254	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1769	Inside	07/01/2007	195	6255	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1770	Inside	07/01/2007	195	6256	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1771	Inside	07/01/2007	195	6302	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1772	Inside	07/01/2007	195	6303	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1773	Inside	07/01/2007	195	6304	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1774	Inside	07/01/2007	195	6305	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1775	Inside	07/01/2007	195	6306	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1776	Inside	07/01/2007	195	6307	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1777	Inside	07/01/2007	195	6308	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1778	Inside	07/01/2007	195	6309	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1779	Inside	07/01/2007	195	6351AB 6401C	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1780	Inside	07/01/2007	195	6353	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1781	Inside	07/01/2007	195	6354	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1782	Inside	07/01/2007	195	6355	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1783	Inside	07/01/2007	195	6356	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1784	Inside	07/01/2007	195	6358	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1785	Inside	07/01/2007	195	6359	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1786	Inside	07/01/2007	195	6360	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1787	Inside	07/01/2007	195	6404A 6405B	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1788	Inside	07/01/2007	195	6406B	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1789	Inside	07/01/2007	195	6409B	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1790	Inside	07/01/2007	195	6410	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1791	Inside	07/01/2007	195	6411	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1792	Inside	07/01/2007	195	6412	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1793	Inside	07/01/2007	195	6460	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1794	Inside	07/01/2007	195	6461	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1795	Inside	07/01/2007	195	6462	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1796	Inside	07/01/2007	195	6463	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1799	Inside	07/01/2007	195	6512ABC	NR06-03	Beechey Point	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1800	Inside	07/01/2007	195	6513BCE	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	40
										ENI US	40
										REPSOL	20
Y1804	Inside	08/01/2005	195	6657	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1805	Inside	08/01/2005	195	6658	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1806	Inside	08/01/2005	195	6659	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1807	Inside	08/01/2005	195	6707	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1808	Inside	08/01/2005	195	6708	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1809	Inside	08/01/2005	195	6709	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1810	Inside	08/01/2005	195	6712	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1811	Inside	08/01/2005	195	6713	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1812	Inside	08/01/2005	195	6757	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1813	Inside	08/01/2005	195	6758	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1816	Inside	08/01/2005	195	6764	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1820	Inside	08/01/2005	195	6773	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1821	Inside	08/01/2005	195	6774	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1822	Inside	08/01/2005	195	6814	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1823	Inside	08/01/2005	195	6815	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1826	Inside	08/01/2005	195	6822	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1827	Inside	08/01/2005	195	6823	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1828	Inside	08/01/2005	195	6824	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1833	Inside	08/01/2005	195	6873	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100
Y1834	Inside	08/01/2005	195	6874	NR06-04	Flaxman Island	3/30/2005		SHELL	SHELL	100

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1839	Inside	08/01/2005	195	6751	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1840	Inside	08/01/2005	195	6752	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1841	Inside	08/01/2005	195	6801	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1842	Inside	08/01/2005	195	6802	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1843	Inside	08/01/2005	195	6851	NR07-03	Barter Island	3/30/2005		SHELL	SHELL	100
Y1857	Inside	07/01/2007	202	6221	NR05-04	Harrison Bay	4/18/2007		SHELL	SHELL	100
Y1858	Inside	07/01/2007	202	6274	NR05-04	Harrison Bay	4/18/2007		ENI US	SHELL	40
										ENI US	40
										REPSOL	20
Y1859	Inside	12/15/2008	202	6319	NR05-04	Harrison Bay	4/18/2007		ENI US	ENI US	80
										REPSOL	20
Y1860	Inside	07/01/2007	202	6324	NR05-04	Harrison Bay	4/18/2007		ENI US	SHELL	40
										ENI US	40
										REPSOL	20
Y1861	Inside	07/01/2007	202	6367	NR05-04	Harrison Bay	4/18/2007		ENI US	ENI US	80
										REPSOL	20
Y1862	Inside	07/01/2007	202	6368	NR05-04	Harrison Bay	4/18/2007		ENI US	ENI US	80
										REPSOL	20
Y1863	Inside	07/01/2007	202	6470	NR05-04	Harrison Bay	4/18/2007		ENI US	SHELL	40
										ENI US	40
										REPSOL	20
Y1864	Inside	07/01/2007	202	6471	NR05-04	Harrison Bay	4/18/2007		ENI US	SHELL	40
										ENI US	40
										REPSOL	20
Y1865	Inside	08/01/2007	202	6009	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1866	Crossing	08/01/2007	202	6010	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1867	Crossing	08/01/2007	202	6011	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1868	Crossing	08/01/2007	202	6012	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1869	Inside	08/01/2007	202	6058	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1870	Inside	08/01/2007	202	6059	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1871	Inside	08/01/2007	202	6060	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1872	Inside	08/01/2007	202	6061	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1873	Crossing	08/01/2007	202	6062	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1874	Inside	08/01/2007	202	6063	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1875	Inside	08/01/2007	202	6064	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1876	Inside	08/01/2007	202	6065	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1877	Inside	08/01/2007	202	6066	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1878	Inside	08/01/2007	202	6067	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1879	Inside	08/01/2007	202	6068	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1880	Inside	08/01/2007	202	6114	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1881	Inside	08/01/2007	202	6115	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1882	Inside	08/01/2007	202	6116	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1883	Inside	08/01/2007	202	6117	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1884	Inside	08/01/2007	202	6118	NR06-03	Beechey Point	4/18/2007		SHELL	SHELL	100
Y1885	Inside	08/01/2007	202	6324	NR06-03	Beechey Point	4/18/2007		TOTAL	TOTAL	100
Y1886	Inside	07/01/2007	202	6871	NR06-03	Beechey Point	4/18/2007		BPXA	BPXA	100
Y1887	Inside	08/01/2007	202	6251	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1888	Inside	08/01/2007	202	6252	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1889	Outside	08/01/2007	202	6259	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1890	Inside	08/01/2007	202	6301	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1891	Inside	08/01/2007	202	6302	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1892	Inside	08/01/2007	202	6303	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1893	Crossing	08/01/2007	202	6304	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1894	Crossing	08/01/2007	202	6305	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1895	Outside	08/01/2007	202	6308	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1896	Outside	08/01/2007	202	6309	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1897	Outside	08/01/2007	202	6310	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1898	Inside	08/01/2007	202	6351	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1899	Inside	08/01/2007	202	6352	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1900	Inside	08/01/2007	202	6353	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1901	Inside	08/01/2007	202	6354	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1902	Inside	08/01/2007	202	6355	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1903	Inside	08/01/2007	202	6356	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1904	Crossing	08/01/2007	202	6357	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1905	Crossing	08/01/2007	202	6358	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1906	Crossing	08/01/2007	202	6359	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1907	Inside	08/01/2007	202	6401	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1908	Inside	08/01/2007	202	6402	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1909	Inside	08/01/2007	202	6403	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1910	Inside	08/01/2007	202	6404	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1911	Inside	08/01/2007	202	6405	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1912	Inside	07/01/2007	202	6406	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1913	Inside	07/01/2007	202	6407	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1914	Inside	08/01/2007	202	6408	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1915	Inside	08/01/2007	202	6409	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1916	Inside	08/01/2007	202	6410	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

Beaufort Sea Lease Ownership List

Lease	28mile	Effective Date	Sale	Block(s)	OPD	OPD Name	Sale Date	Unit	Operator	Company	Working Interest
Y1917	Inside	08/01/2007	202	6453	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1918	Inside	08/01/2007	202	6454	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1919	Inside	08/01/2007	202	6455	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1920	Inside	08/01/2007	202	6456	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1921	Inside	07/01/2007	202	6457	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1922	Inside	08/01/2007	202	6458	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1923	Inside	08/01/2007	202	6459	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1924	Inside	08/01/2007	202	6460	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1925	Inside	08/01/2007	202	6461	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1926	Inside	08/01/2007	202	6504	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1927	Inside	08/01/2007	202	6505	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1928	Inside	08/01/2007	202	6506	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1929	Inside	08/01/2007	202	6508	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1930	Inside	08/01/2007	202	6510	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1931	Inside	08/01/2007	202	6511	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1932	Inside	08/01/2007	202	6512	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1933	Inside	08/01/2007	202	6554	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1934	Inside	08/01/2007	202	6555	NR06-04	Flaxman Island	4/18/2007		TOTAL	TOTAL	100
Y1935	Inside	08/01/2007	202	6558	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1936	Inside	07/01/2007	202	6559	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1937	Inside	07/01/2007	202	6560	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1938	Inside	08/01/2007	202	6561	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1939	Inside	08/01/2007	202	6562	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1940	Inside	07/01/2007	202	6609	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1941	Inside	07/01/2007	202	6610	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1942	Inside	07/01/2007	202	6611	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1943	Inside	08/01/2007	202	6612	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1944	Inside	07/01/2007	202	6660	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100
Y1945	Inside	08/01/2007	202	6662	NR06-04	Flaxman Island	4/18/2007		SHELL	SHELL	100

Leases crossing 28-mile boundary shaded beige
Leases outside 28-mile boundary shaded rust

ALASKA OP-APPENDIX B

General Information and Summary (GIS) Table 1

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
ENGINEERING CALCULATIONS	PROJECT NO: 180-20-6	PAGE: 1	OF: 1	APPENDIX B
	SUBJECT: Title V Form Tables	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group

GIS TABLE 1

Source Group by Vessel	MLC NO_X lb/day	Drill NO_X lb/day	C/L NO_X lb/day	MLC $PM_{2.5}$ lb/day	Drill $PM_{2.5}$ lb/day	C/L $PM_{2.5}$ lb/day	MLC PM_{10} lb/day	Drill PM_{10} lb/day	C/L PM_{10} lb/day
Kulluk									
Generation	456.1	456.1	322.0	71.3	71.3	50.3	71.3	71.3	50.3
MLC HPU'S	887.8	0.0	0.0	35.5	0.0	0.0	35.5	0.0	0.0
Air compressors	710.2	0.0	0.0	14.8	0.0	0.0	14.8	0.0	0.0
Cranes	63.9	63.9	106.5	2.6	2.6	4.3	2.6	2.6	4.3
Heaters & Boilers	21.3	21.3	21.3	3.5	3.5	3.5	3.5	3.5	3.5
Seldom-used units	9.0	9.0	9.0	0.7	0.7	0.7	0.7	0.7	0.7
Emergency Generator	36.6	36.6	36.6	2.9	2.9	2.9	2.9	2.9	2.9
Incinerator	5.0	5.0	5.0	23.2	23.2	23.2	27.2	27.2	27.2
Primary Ice Management									
Propulsion & Generation	2,032.8	2,032.8	2,032.8	317.6	317.6	317.6	317.6	317.6	317.6
Heaters & Boilers	35.6	35.6	35.6	5.9	5.9	5.9	5.9	5.9	5.9
Seldom-used units	6.8	6.8	6.8	0.5	0.5	0.5	0.5	0.5	0.5
Incinerator	5.5	5.5	5.5	25.9	25.9	25.9	30.3	30.3	30.3
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	2,032.8	2,032.8	2,032.8	317.6	317.6	317.6	317.6	317.6	317.6
Heaters & Boilers	35.6	35.6	35.6	5.9	5.9	5.9	5.9	5.9	5.9
Seldom-used units	6.8	6.8	6.8	0.5	0.5	0.5	0.5	0.5	0.5
Incinerator	5.5	5.5	5.5	25.9	25.9	25.9	30.3	30.3	30.3
Resupply Ship - transport mode									
Propulsion & Generation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Seldom-used units	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Resupply Ship - DP mode									
Propulsion & Generation	1,826.2	1,826.2	1,826.2	76.1	76.1	76.1	76.1	76.1	76.1
Seldom-used units	1.4	1.4	1.4	0.1	0.1	0.1	0.1	0.1	0.1
OSR vessel									
Propulsion & Generation	1,065.3	1,065.3	1,065.3	44.4	44.4	44.4	44.4	44.4	44.4
Seldom-used units	6.8	6.8	6.8	0.5	0.5	0.5	0.5	0.5	0.5
Incinerator	4.5	4.5	4.5	21.0	21.0	21.0	24.6	24.6	24.6
Quartering vessel									
Propulsion & Generation	1,369.7	1,369.7	1,369.7	11.4	11.4	11.4	11.4	11.4	11.4
Seldom-used units	6.8	6.8	6.8	0.5	0.5	0.5	0.5	0.5	0.5
Incinerator	4.5	4.5	4.5	21.0	21.0	21.0	24.6	24.6	24.6
OSR work boats									
Work boats	257.4	257.4	257.4	20.6	20.6	20.6	20.6	20.6	20.6
TOTAL- (lb/day)	**10,894**	**9,296**	**9,204**	**1,050**	**1,000**	**980**	**1,070**	**1,020**	**1,000**
TOTAL- (lb/day)-w/o Egen	**10,600**	**9,002**	**8,910**	**1,026**	**976**	**957**	**1,046**	**996**	**977**

shading represents proposed OR to be demonstrated on a daily basis

shading represents OR to be demonstrated by on weekly basis

MLC=Mud-line Cellar Activity

Drill=Well Drilling Activity

C/L=Cementing/Logging Activity

ALASKA OP-APPENDIX C

Emission Calculations (EMISS) – Tables 1 & 2

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 1	OF: 2	APPENDIX C
ENGINEERING CALCULATIONS	SUBJECT: Title V Form Tables	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Hourly and Annual Emissions

EMISS TABLE 1

Source Group by Vessel	NO_X lb/hr	NO_X tons/year	VOC lb/hr	VOC tons/year	SO_2 lb/hr	SO_2 tons/year	PM_{10} lb/hr	PM_{10} tons/year
Kulluk								
Generation	19.0	23.9	1.4	1.7	5.3E-01	6.7E-01	3.0	3.7
MLC HPU'S	37.0	8.9	1.1	0.3	1.1E-01	2.6E-02	1.5	0.4
Air compressors	29.6	7.1	0.3	0.1	1.1E-01	2.6E-02	0.6	0.1
Cranes	8.9	4.9	0.3	0.1	2.6E-02	1.5E-02	0.4	0.2
Heaters & Boilers	0.9	1.3	0.0	0.1	6.3E-02	9.1E-02	0.1	0.2
Seldom-used units	3.7E-01	5.4E-01	3.7E-02	5.3E-02	1.1E-03	1.6E-03	3.0E-02	4.3E-02
Emergency Generator	1.8E+01	7.3E-02	1.8E+00	7.3E-03	5.5E-02	2.2E-04	1.5E+00	5.9E-03
Incinerator	0.4	0.3	13.8	9.9	3.5E-01	2.5E-01	2.3	1.6
Primary Ice Management								
Propulsion & Generation	84.7	46.3	6.1	3.3	2.4E+00	1.3E+00	13.2	7.2
Heaters & Boilers	1.5	0.8	0.1	0.0	1.1E-01	5.7E-02	0.2	0.1
Seldom-used units	2.8E-01	1.5E-01	2.8E-02	1.5E-02	8.4E-04	4.6E-04	2.3E-02	1.2E-02
Incinerator	0.2	0.1	7.7	4.2	1.9E-01	1.1E-01	1.3	0.7
Secondary Ice Management / Anchor Handler								
Propulsion & Generation	84.7	46.3	6.1	3.3	2.4E+00	1.3E+00	13.2	7.2
Heaters & Boilers	1.5	0.8	0.1	0.0	1.1E-01	5.7E-02	0.2	0.1
Seldom-used units	2.8E-01	1.5E-01	2.8E-02	1.5E-02	8.4E-04	4.6E-04	2.3E-02	1.2E-02
Incinerator	0.2	0.1	7.7	4.2	1.9E-01	1.1E-01	1.3	0.7
Resupply Ship - transport mode								
Propulsion & Generation	0.0	11.0	0.0	0.3	0.0E+00	4.1E-02	0.0	0.5
Seldom-used units	0.0E+00	8.2E-02	0.0E+00	8.1E-03	0.0E+00	2.4E-04	0.0E+00	6.5E-03
Resupply Ship - DP mode								
Propulsion & Generation	236.7	21.9	7.6	0.7	8.8E-01	8.2E-02	9.9	0.9
Seldom-used units	5.7E-02	8.2E-02	5.6E-03	8.1E-03	1.7E-04	2.4E-04	4.5E-03	6.5E-03
OSR vessel								
Propulsion & Generation	44.4	38.4	1.4	1.2	1.7E-01	1.4E-01	1.8	1.6
Seldom-used units	2.8E-01	4.1E-01	2.8E-02	4.1E-02	8.4E-04	1.2E-03	2.3E-02	3.3E-02
Incinerator	0.2	0.3	6.3	9.0	1.6E-01	2.3E-01	1.0	1.5
Quartering vessel								
Propulsion & Generation	57.1	49.3	0.2	0.2	2.8E-01	2.5E-01	0.5	0.4
Seldom-used units	2.8E-01	4.1E-01	2.8E-02	4.1E-02	8.4E-04	1.2E-03	2.3E-02	3.3E-02
Incinerator	0.2	0.3	6.3	9.0	1.6E-01	2.3E-01	1.0	1.5
OSR work boats								
Work boats	10.7	15.4	1.1	1.5	3.2E-02	4.6E-02	0.9	1.2
Total - without NOx Limit	**638**	**279**	**69**	**50**	**8**	**5**	**54**	**30**
Total - PTE	**638**	**<250**	**69**	**50**	**8**	**5**	**54**	**30**

Conical Drilling Unit Kulluk OCS Source - Hourly and Annual Emissions

EMISS TABLE 2

Source Group by Vessel	CO lb/hr	CO tons/year	Lead lb/hr	Lead tons/year	HAP lb/hr	HAP tons/year	CH_2O lb/hr	CH_2O tons/year
Kulluk								
Generation	8.6	10.8	1.5E-03	1.8E-03	6.2E-02	7.7E-02	1.8E-02	2.2E-02
MLC HPU'S	2.0	0.5	3.0E-04	7.3E-05	1.3E-02	3.1E-03	3.7E-03	8.9E-04
Air compressors	1.8	0.4	3.0E-04	7.3E-05	1.3E-02	3.1E-03	3.7E-03	8.9E-04
Cranes	0.5	0.3	7.3E-05	4.1E-05	3.1E-03	1.7E-03	8.9E-04	5.0E-04
Heaters & Boilers	0.2	0.3	5.4E-05	7.8E-05	2.0E-03	2.8E-03	1.5E-03	2.1E-03
Seldom-used units	1.0E-01	1.5E-01	3.1E-06	4.4E-06	4.2E-04	6.0E-04	1.3E-04	1.8E-04
Emergency Generator	4.9E+00	2.0E-02	1.5E-04	6.0E-07	2.0E-02	8.2E-05	6.1E-03	2.5E-05
Incinerator	41.4	29.8	2.9E-02	2.1E-02	3.5E-02	2.5E-02	0.0E+00	0.0E+00
Primary Ice Management								
Propulsion & Generation	38.3	21.0	6.5E-03	3.6E-03	2.7E-01	1.5E-01	8.0E-02	4.4E-02
Heaters & Boilers	0.4	0.2	9.0E-05	4.9E-05	3.3E-03	1.8E-03	2.4E-03	1.3E-03
Seldom-used units	7.6E-02	4.2E-02	2.3E-06	1.3E-06	3.2E-04	1.7E-04	9.5E-05	5.2E-05
Incinerator	23.1	12.6	1.6E-02	9.0E-03	1.9E-02	1.1E-02	0.0E+00	0.0E+00
Secondary Ice Management / Anchor Handler								
Propulsion & Generation	38.3	21.0	6.5E-03	3.6E-03	2.7E-01	1.5E-01	8.0E-02	4.4E-02
Heaters & Boilers	0.4	0.2	9.0E-05	4.9E-05	3.3E-03	1.8E-03	2.4E-03	1.3E-03
Seldom-used units	7.6E-02	4.2E-02	2.3E-06	1.3E-06	3.2E-04	1.7E-04	9.5E-05	5.2E-05
Incinerator	23.1	12.6	1.6E-02	9.0E-03	1.9E-02	1.1E-02	0.0E+00	0.0E+00
Resupply Ship - transport mode								
Propulsion & Generation	0.0	3.3	0.0E+00	1.1E-04	0.0E+00	1.5E-02	0.0E+00	4.6E-03
Seldom-used units	0.0E+00	2.2E-02	0.0E+00	6.7E-07	0.0E+00	9.1E-05	0.0E+00	2.7E-05
Resupply Ship - DP mode								
Propulsion & Generation	71.4	6.6	2.4E-03	2.3E-04	3.3E-01	3.1E-02	9.9E-02	9.2E-03
Seldom-used units	1.5E-02	2.2E-02	4.7E-07	6.7E-07	6.3E-05	9.1E-05	1.9E-05	2.7E-05
OSR vessel								
Propulsion & Generation	13.4	11.6	4.6E-04	3.9E-04	6.2E-02	5.3E-02	1.9E-02	1.6E-02
Seldom-used units	7.6E-02	1.1E-01	2.3E-06	3.4E-06	3.2E-04	4.5E-04	9.5E-05	1.4E-04
Incinerator	18.8	27.0	1.3E-02	1.9E-02	1.6E-02	2.3E-02	0.0E+00	0.0E+00
Quartering vessel								
Propulsion & Generation	2.3	2.0	7.8E-04	6.8E-04	1.1E-01	9.2E-02	3.2E-02	2.8E-02
Seldom-used units	7.6E-02	1.1E-01	2.3E-06	3.4E-06	3.2E-04	4.5E-04	9.5E-05	1.4E-04
Incinerator	18.8	27.0	1.3E-02	1.9E-02	1.6E-02	2.3E-02	0.0E+00	0.0E+00
OSR work boats								
Work boats	2.9	4.2	8.8E-05	1.3E-04	1.2E-02	1.7E-02	3.6E-03	5.2E-03
Total - without NOx Limit	**311**	**192**	**0.11**	**0.09**	**1.29**	**0.69**	**0.35**	**0.18**
Total - PTE	**311**	**192**	**0.11**	**0.09**	**1.29**	**0.69**	**0.35**	**0.18**

ALASKA OP-APPENDIX D

Updated Emission Inventory

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 1	OF: 1	SHEET: 1
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

SUMMARY - ANNUAL POTENTIAL EMISSIONS

	NO_X tons/year	$PM_{2.5}$ tons/year	PM_{10} tons/year	CO tons/year	SO_2 tons/year	VOC tons/year	Lead tons/year	GHG tons/year
Engines	-	24.2	24.2	82.8	4.1	13.2	1.1E-02	-
Incinerators	-	5.1	6.0	109.1	0.9	36.4	7.7E-02	-
Total	<250	29.3	30.1	191.9	5.0	49.6	0.1	66,263.4
PSD trigger	250	250	250	250	250	250	250	100,000
Compare	Below	Below	Below	Below	Below	Below	Below	Below

	HAP tons/year	CH_2O tons/year	H_2SO_4 tons/year	Fluorides [a] tons/year	H_2S [b] tons/year	TRS [b] tons/year	RSC [b] tons/year
Engines	6.0E-01	1.8E-01	0.3	-	2.3	2.3	2.3
Incinerators	9.1E-02	0.0E+00	0.4	-	0.5	0.5	0.5
Total	0.7	0.2	0.8	-	2.8	2.8	2.8
PSD trigger	25	10	250	250	250	250	250
Compare	Below	Below	Below	Below	Below	Below	Below

[a] Fluoride is not a listed and quantified trace pollutant from diesel combustion as provided by AP42, so it is assumed to be an extremely small constituent. Furthermore, fluoride is a reduced form of fluorine and diesel combustion is an oxidizing process. Therefore, it is unlikely that it would exist as a combustion bi-product and should be a negligible emission from the project.

[b] H_2S also represents upper limit of total reduced sulfur and reduced sulfur compound emissions

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 1	OF: 14	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

shading represents owner restriction (OR) to be demonstrated by documentation of each event
shading represents OR to be demonstrated by documentation of daily fuel consumption
shading represents OR to be demonstrated by documentation of weekly fuel consumption

Anticipated Kulluk Operating Maximums

Kulluk & Associated Fleet

Expected Operating Maximums	Limit		How Defined	How documented
MLC Drilling Activity	480	hrs/activity	20 days/activity	
Well Drilling Activity	1,152	hrs/activity	48 days/activity	
Cementing/Logging Activity	1,248	hrs/activity	52 days/activity	
Season maximum drilling duration as an OCS source (secure and stable for commencement of exploratory activity):	2,880	hrs/season	120 days/season	
Ice mgmt vessel use within 25 miles	38%			
OSR vessel annual fuel limit	60%	of daily maximum - annualized		
Quartering vessel annual fuel limit	60%	of daily maximum - annualized		
MLC Activity				
Generators (three units combined) combined	85%	capacity	System Limitation	
Crane (three units combined) maximum	40%	capacity	System Limitation	
Crane (three units combined) maximum	30%	of time (day)	Shell engineering estimate	
Well Drilling Activity				
Generators (three units combined) combined production maximum	85%	capacity	System Limitation	
Crane (three units combined) maximum	40%	capacity	System Limitation	
Crane (three units combined) maximum	30%	of time (day)	Shell engineering estimate	
Cementing/Logging Activity				
Generators (three units combined) combined	60%	capacity	Shell OR	
Crane (three units combined) maximum	40%	capacity	System Limitation	
Crane (three units combined) maximum	50%	of time (day)	Shell engineering estimate	
All Activities - OR				
Kulluk Incinerator limited to	12	hr/day	Shell OR	manual - recording of start and stop time
Kulluk emergency generator limited to	2	hr/30-days & hr/day		
Sulfur content of all stationary source engines on Kulluk	0.0100%	by wt.	Shell OR	Kulluk fuel testing
Sulfur content of associated fleet	0.0100%	by wt.	Shell OR	Fleet fuel testing
Annual NOx emissions recalculated as weekly rolling avg	250	ton/yr.	Shell OR	
Annual Kulluk and fleet fuel restriction	6,000,000	gallons/year		Fuel consumption measurement
Ice Management Fleet Propulsion & Generation	100%	capacity	System Limitation	
Resupply ship in transport limited to	1,200	gal/1-way	Shell OR	Fuel consumption measurement
Resupply ship in DP mode limited to	4,800	gal/event	Shell OR	Fuel consumption measurement
Resupply ship resupply events limited to	24	rnd trip/season	Shell OR	Manual tracking
Resupply ship DP events limited to	24	hr/day=hr/event	Shell OR	Manual tracking
OSR Vessel p & g aggregate power:	2,600	kW		Manufacturer specifications
OSR Vessel p & g aggregate consumption:	2,800	gal/day	Shell OR	Fuel consumption measurement
Quartering vessel p & g aggregate power:	7,502	kW	Shell OR	Manufacturer specifications
Quartering vessel p & g aggregate consumption:	4,800	gal/day	Shell OR	Fuel consumption measurement
OSR work boats	3,789	gallons/wk.	Shell OR	Fuel consumption measurement

OSR Boat Options

OSR vessel	Pt. Oliktuk/Arctic Endeavor
Quartering vessel	Nanuq

Work Boats

#1 OSR 34-foot	32	gal/hr
#2 OSR 34-foot	32	gal/hr
#1 OSR 47-foot	63	gal/hr
ALL	6	hr/day
ALL	5	day/week
ALL	100%	hourly fuel consumption

Diesel Engine Thermal Efficiency Assumptions

		Reference
7.1	lb/gal	AP42 Table 3.4-1; footnote a
7,000	Btu/hp-hr	<600 hp; AP42 Table 3.3-1 Footnote (a) ver. 10/96.
		>600 hp, AP42 Table 3.4-1 ver. 10/96

Conversions

0.1350	MMBtu/gallon
0.7457	kW / hp
1,000,000	Btu/MMBtu
453.6	g/lb
2,000	lb/ton
24	hr/day
168	hr/wk
2	one-way trips/ round trip
32.07	wt S
64.06	wt. SO2
2.00	wt. conversion of S to SO2

** seldom-used engines are those running < 4 hr/wk.
blue values are input, black values are calculated or linked

Anticipated Kulluk Operating Maximums

Kulluk & Associated Fleet (continued)

Expected Operating Maximums	Controls NOx	Controls PM	Controls CO	Controls VOC	EF Reference NOx	EF Reference PM	EF Reference CO	EF Reference VOC
Kulluk								
Generation	Kulluk-SCR	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	4	7	7	7
MLC HPU'S	None-Sm	OxyCat-Sm	OxyCat-Sm	OxyCat-Sm	2	8	8	8
Air compressors	None-Lg	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	1	7	7	7
Cranes	None-Sm	OxyCat-Sm	OxyCat-Sm	OxyCat-Sm	2	8	8	8
Heaters & Boilers	heat&boil	heat&boil	heat&boil	heat&boil	3	3	3	3
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Emergency Generator	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Primary Ice Management								
Propulsion & Generation	SCR	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	5	7	7	7
Heaters & Boilers	heat&boil	heat&boil	heat&boil	heat&boil	3	3	3	3
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Secondary Ice Management / Anchor Handler								
Propulsion & Generation	SCR	OxyCat-Lg	OxyCat-Lg	OxyCat-Lg	5	7	7	7
Heaters & Boilers	heat&boil	heat&boil	heat&boil	heat&boil	3	3	3	3
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Resupply Ship - transport mode								
Propulsion & Generation	None-Lg	None-Lg	None-Lg	None-Lg	1	1	1	1
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Resupply Ship - DP mode								
Propulsion & Generation	None-Lg	None-Lg	None-Lg	None-Lg	1	1	1	1
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
OSR vessel								
Propulsion & Generation	None-Lg	None-Lg	None-Lg	None-Lg	1	1	1	1
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
Quartering vessel								
Propulsion & Generation	Nanuq	CDPF-Lg	CDPF-Lg	CDPF-Lg	9	10	10	10
Seldom-used units	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2
OSR work boats								
Work boats	None-Sm	None-Sm	None-Sm	None-Sm	2	2	2	2

Assumed Control Device Effectiveness	Restriction	Comment	Reference
Oxidation Catalyst CO reduction efficiency	80%	50-100% of capacity	D.E.C. Marine AB letter, October 9, 2008, and initial stack test
Oxidation Catalyst VOC, HAPs (except metals), Formaldehyde reduction efficiency	70%	50-100% of capacity	D.E.C. Marine AB letter, October 9, 2008
Oxidation Catalyst PM reduction efficiency	50%		D.E.C. Marine AB email, February 9, 2009
CDPF reduction efficiency CO, VOC, HAPs	90%		CleanAIR CDPF guarantee
CDPF reduction efficiency PM	85%		CARB Currently verified, Jan. 2009, CleanAIR Systems PERMIT
Kulluk Generator SCR NOx control	1.6 g/kW-hr	50-100% of capacity	June 2010 Discoverer Stack Testing

Engine	NOx		CO		VOC		PM*		
Emission Factors / Controls	g/kW-hr	lb/gal	lb/MMBtu	lb/gal	lb/MMBtu	lb/gal	g/kWhr	lb/gal	Reference
None-Lg	12.00	0.380	0.85	0.115	0.09	0.012	0.50	0.016	1
None-Sm	15.00	0.476	0.95	0.128	0.35	0.047	1.20	0.038	2
heat&boil	20 lb/kgal	0.020	5 lb/kgal	0.005	1 lb/kgal	0.001	3 lb/kgal	0.003	3
Kulluk-SCR	1.60	0.051	-	-	-	-	-	-	4
SCR	1.60	0.051	-	-	-	-	-	-	5
Kulluk-OxyCat	-	-	-	-	-	-	0.200	0.006	6
OxyCat-Lg	-	-	0.170	0.023	0.027	0.004	0.250	0.008	7
OxyCat-Sm	-	-	0.190	0.026	0.105	0.014	0.600	0.019	8
Nanuq	9	0.285	-	-	-	-	-	-	9
CDPF-Lg	-	-	0.085	0.011	0.009	0.001	0.075	0.002	10
Electric	0	0	0	0	0	0	0	0	NA

*PM2.5

References

None-Lg	1	NOx & PM: Recent stack test data, CO & VOC:AP-42 Table 3.4-1 Internal Combustion, Large Stationary Engines (fuel Input)-uncontrolled; ver. 10/1996
None-Sm	2	NOx & PM: Recent stack test data, CO & VOC: AP-42.Table 3.3-1 Internal Combustion, Diesel (fuel input)-uncontrolled; ver. 10/1996
heat&boil	3	NOx & PM: Recent Stack test data, CO & VOC: AP-42. Table 1.11-2 External Combustion, Small Boilers-waste oil; ver 10/1996
Kulluk-SCR	4	Emission factors based on stack tests from the Frontier Discoverer
SCR	5	Selective Catalytic Reduction NOx emission factor based on stack tests
Kulluk-OxyCat	6	PM: Tier 2 engines
OxyCat-Lg	7	Oxidation Catalyst controls applied to reference (1) emission factors
OxyCat-Sm	8	Oxidation Catalyst controls applied to reference (2) emission factors
Nanuq	9	CAT3806 Diesel Engine Technical data sheet
CDPF-Lg	10	Catalytic Diesel Particulate Filters controls applied to reference (1) emission factors

FUEL USE - MAX DAILY

Emission Units to permit:	Capacity Values	Capacity fuel - hourly		Max fuel - daily					
				MLC Case		Drilling Case		Cementing/Logging Case	
		MMBtu/hr	gal/hr	MMBtu	gal	MMBtu	gal	MMBtu	gal
Kulluk									
Generation	8,500 hp	50.58	375	1,214	8,991	1,214	8,991	857	6,347
MLC HPU'S	1,500 hp	10.50	78	252	1,867	0	0	0	0
Air compressors	1,500 hp	10.50	78	252	1,867	0	0	0	0
Cranes	900 hp	2.52	19	18	134	18	134	30	224
Heaters & Boilers	6 MMBtu/hr	6.00	44	144	1,067	144	1,067	144	1,067
Seldom-used units	566 gal/30-days	0.11	0.79 group limit	3	19	3	19	3	19
Emergency Generator	77 gal/30-days	5.198	38.50 group limit	10	77	10	77	10	77
			KULLUK - SUBTOTAL		*14,021*		*10,288*		*7,733*
Primary Ice Management									
Propulsion & Generation	32,200 hp	225	1,670	5,410	40,071	5,410	40,071	5,410	40,071
Heaters & Boilers	10 MMBtu/hr	10	74	240	1,778	240	1,778	240	1,778
Seldom-used units	100 gal/wk	0.080	0.60 group limit	2	14	2	14	2	14
			ICE MANAGEMENT - SUBTOTAL		*41,863*		*41,863*		*41,863*
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	32,200 hp	225	1,670	5,410	40,071	5,410	40,071	5,410	40,071
Heaters & Boilers	10 MMBtu/hr	10	74	240	1,778	240	1,778	240	1,778
Seldom-used units	100 gal/wk	0.080	0.60 group limit	2	14	2	14	2	14
			ANCHOR HANDLER - SUBTOTAL		*41,863*		*41,863*		*41,863*
Resupply Ship - transport mode									
Propulsion & Generation	12,000 hp	84	622	162	1,200	162	1,200	162	1,200
Seldom-used units	20 gal/wk	0.016	0.12 group limit	0.4	2.9	0.4	2.9	0.4	2.9
Resupply Ship - DP mode									
Propulsion & Generation	12,000 hp	84	622	648	4,800	648	4,800	648	4,800
Seldom-used units	20 gal/wk	0.016	0.12 group limit	0.4	2.9	0.4	2.9	0.4	2.9
			RESUPPLY SHIPS - SUBTOTAL		*6,006*		*6,006*		*6,006*
OSR vessel									
Propulsion & Generation	3,487 hp	16	117	378	2,800	378	2,800	378	2,800
Seldom-used units	100 gal/wk	0.080	0.60 group limit	2	14	2	14	2	14
Quartering vessel									
Propulsion & Generation	10,061 hp	27	200	648	4,800	648	4,800	648	4,800
Seldom-used units	100 gal/wk	0.080	0.60 group limit	2	14	2	14	2	14
OSR work boats									
Work boats	3,789 gal/wk	3.05	23	73	541	73	541	73	541
			OSR SHIPS - SUBTOTAL		*8,170*		*8,170*		*8,170*
			Total daily use		**111,923**		**108,190**		**105,635**

TOTAL WASTE INCINERATED

	Capacity Values	MLC Case	Drilling Case	Cementing/Logging case
Incinerators		lbs/day	lbs/day	lbs/day
Kulluk	276 lb/hr	3,312	3,312	3,312
Ice Management	154 lb/hr	3,696	3,696	3,696
Anchor Handler	154 lb/hr	3,696	3,696	3,696
OSR vessel	125 lb/hr	3,000	3,000	3,000
Quartering vessel	125 lb/hr	3,000	3,000	3,000
	total lbs/day	**16,704**	**16,704**	**16,704**

FUEL USE - MAX ANNUAL

Emission Units to permit:	Capacity Values	Capacity fuel - hourly		Max fuel - Annual (Modeling only)						
				MLC Case		Drilling Case		Cementing/Logging Case		Total
		MMBtu/hr	gal/hr	MMBtu	gal	MMBtu	gal	MMBtu	gal	gal
Kulluk										
Generation	8,500 hp	50.58	375	24,276	179,822	58,262	431,573	44,554	330,027	941,422
MLC HPU'S	1,500 hp	10.50	78	5,040	37,333	0	0	0	0	37,333
Air compressors	1,500 hp	10.50	78	5,040	37,333	0	0	0	0	37,333
Cranes	900 hp	2.52	19	363	2,688	871	6,451	1,572	11,648	20,787
Heaters & Boilers	6 MMBtu/hr	6.00	44	2,880	21,333	6,912	51,200	7,488	55,467	128,000
Seldom-used units	566 gal/30-days	0.11	0.79 group limit	51	377	122	906	132	981	2,264
Emergency Generator	77 gal/30-days	5.198	38.50 group limit	7	51	17	123	18	133	308
			KULLUK - SUBTOTAL		*278,939*		*490,253*		*398,256*	*1,167,448*
Primary Ice Management										
Propulsion & Generation	32,200 hp	225	1670	41,113	304,540	98,671	730,897	106,894	791,805	1,827,243
Heaters & Boilers	10 MMBtu/hr	10	74	1,824	13,511	4,378	32,427	4,742	35,129	81,067
Seldom-used units	100 gal/wk	0.080	0.60 group limit	15	109	35	261	38	282	651
		ICE MANAGEMENT - SUBTOTAL			*318,160*		*763,584*		*827,216*	*1,908,961*
Secondary Ice Management / Anchor Handler										
Propulsion & Generation	32,200 hp	225	1670	41,113	304,540	98,671	730,897	106,894	791,805	1,827,243
Heaters & Boilers	10 MMBtu/hr	10	74	1,824	13,511	4,378	32,427	4,742	35,129	81,067
Seldom-used units	100 gal/wk	0.080	0.595 group limit	15	109	35	261	38	282	651
		ANCHOR HANDLER - SUBTOTAL			*318,160*		*763,584*		*827,216*	*1,908,961*
Resupply Ship - transport mode										
Propulsion & Generation	12,000 hp	84	622	1,296	9,600	3,110	23,040	3,370	24,960	57,600
Seldom-used units	20 gal/wk	0.016	0.12 group limit	8	57	19	137	20	149	343
Resupply Ship - DP mode										
Propulsion & Generation	12,000 hp	84	622	2,592	19,200	6,221	46,080	6,739	49,920	115,200
Seldom-used units	20 gal/wk	0.016	0.12 group limit	8	57	19	137	20	149	343
		RESUPPLY SHIPS - SUBTOTAL			*28,914*		*69,394*		*75,177*	*173,486*
OSR vessel										
Propulsion & Generation	3,487 hp	16	117	4,536	33,600	10,886	80,640	11,794	87,360	201,600
Seldom-used units	100 gal/wk	0.080	0.6 group limit	39	286	93	686	100	743	1,714
Quartering vessel										
Propulsion & Generation	10,061 hp	27	200	7,776	57,600	18,662	138,240	20,218	149,760	345,600
Seldom-used units	100 gal/wk	0.080	0.6 group limit	39	286	93	686	100	743	1,714
OSR work boats										
Work boats	3,789 gal/wk	3.05	23	1,462	10,827	3,508	25,984	3,800	28,149	64,960
			OSR SHIPS - SUBTOTAL		*102,598*		*246,235*		*266,755*	*615,589*
			Total Annual Use		**1,046,772**		**2,333,052**		**2,394,621**	**5,774,444**
				TOTAL ANNUAL GALLONS		**5,774,444**				

TOTAL WASTE INCINERATED

	Capacity Values	MLC Case	Drilling Case	Cementing/Logging case	Total
Incinerators		lbs/year	lbs/year	lbs/year	tons /year
Kulluk	276 lb/hr	66,240	158,976	172,224	199
Ice Management	154 lb/hr	28,090	67,415	73,033	84
Anchor Handler	154 lb/hr	28,090	67,415	73,033	84
OSR vessel	125 lb/hr	60,000	144,000	156,000	180
Quartering vessel	125 lb/hr	60,000	144,000	156,000	180
	total lbs/yr	**242,419**	**581,806**	**630,290**	**727**

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 5	OF: 14	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

NOx EMISSIONS - FOR IMPACT MODELING

shading represents OR to be demonstrated by documentation of daily fuel consumption

shading represents OR to be demonstrated by documentation of weekly fuel consumption

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	0.051	lb/gal		19.00	456	456	456	322	24
MLC HPU'S	0.476	lb/gal		36.99	888	888	0	0	9
Air compressors	0.380	lb/gal		29.59	710	710	0	0	7
Cranes	0.476	lb/gal		8.88	107	64	64	107	5
Heaters & Boilers	0.020	lb/gal		0.89	21	21	21	21	1
Seldom-used units	0.476	lb/gal		0.37	8.97	8.97	8.97	8.97	0.54
Emergency Generator	0.476	lb/gal		18.31	36.62	36.62	36.62	36.62	0.07
Primary Ice Management									
Propulsion & Generation	0.051	lb/gal		85	2,033	2,033	2,033	2,033	46
Heaters & Boilers	0.020	lb/gal		1.48	36	36	36	36	0.81
Seldom-used units	0.476	lb/gal		0.28	6.79	6.79	6.79	6.79	0.15
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	0.051	lb/gal		85	2,033	2,033	2,033	2,033	46
Heaters & Boilers	0.020	lb/gal		1.48	36	36	36	36	0.81
Seldom-used units	0.476	lb/gal		0.28	6.79	6.79	6.79	6.79	0.15
Resupply Ship - transport mode									
Propulsion & Generation	0.380	lb/gal	*237*	(0*)	457	(0*)	(0*)	(0*)	11
Seldom-used units	0.476	lb/gal	*0.057*	(0*)	1.36	(0*)	(0*)	(0*)	0.08
Resupply Ship - DP mode									
Propulsion & Generation	0.380	lb/gal		237	1,826	1,826	1,826	1,826	22
Seldom-used units	0.476	lb/gal		0.06	1.36	1.36	1.36	1.36	0.08
OSR vessel									
Propulsion & Generation	0.380	lb/gal		44	1,065	1,065	1,065	1,065	38
Seldom-used units	0.476	lb/gal		0.28	6.79	6.79	6.79	6.79	0.41
Quartering vessel									
Propulsion & Generation	0.285	lb/gal		57	1,370	1,370	1,370	1,370	49
Seldom-used units	0.476	lb/gal		0.28	6.79	6.79	6.79	6.79	0.41
OSR work boats									
Work boats	0.476	lb/gal		11	257	257	257	257	15
TOTAL				**637**	**11,369**	**10,869**	**9,271**	**9,179**	**278**

NOx EMISSIONS

Source	Emission Factor	unit	NO_X lb/hr	NO_X lb/day	NO_X ton/year
Incinerators					
Kulluk	3	lb/ton	0.41	4.97	0.30
Ice Management	3	lb/ton	0.23	5.54	0.13
Anchor Handler	3	lb/ton	0.23	5.54	0.13
OSR vessel	3	lb/ton	0.19	4.50	0.27
Quartering vessel	3	lb/ton	0.19	4.50	0.27
			1.25	**25.06**	**1.09**

Source	pollutant	EF	unit	reference
Incinerators	NO_X	3	lb/ton	AP42 Table 2.1-12, 10/96

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 6	OF: 14	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

$PM_{2.5}$ EMISSIONS - FOR IMPACT MODELING

shading represents OR to be demonstrated by documentation of daily fuel consumption

shading represents OR to be demonstrated by documentation of weekly fuel consumption

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	0.008	lb/gal		2.97	71	71	71	50	3.73
MLC HPU'S	0.019	lb/gal		1.48	36	36	0	0	0.36
Air compressors	0.008	lb/gal		0.62	15	15	0	0	0.15
Cranes	0.019	lb/gal		0.36	4	3	3	4	0.20
Heaters & Boilers	0.003	lb/gal		0.15	4	4	4	4	0.21
Seldom-used units	0.038	lb/gal		0.03	0.72	0.72	0.72	0.72	0.04
Emergency Generator	0.038	lb/gal		1.46	2.93	2.93	2.93	2.93	0.01
Primary Ice Management									
Propulsion & Generation	0.008	lb/gal		13	318	318	318	318	7
Heaters & Boilers	0.003	lb/gal		0.24	6	6	6	6	0.13
Seldom-used units	0.038	lb/gal		0.02	0.54	0.54	0.54	0.54	0.01
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	0.008	lb/gal		13	318	318	318	318	7
Heaters & Boilers	0.003	lb/gal		0.24	6	6	6	6	0.13
Seldom-used units	0.038	lb/gal		0.02	0.54	0.54	0.54	0.54	0.01
Resupply Ship - transport mode									
Propulsion & Generation	0.016	lb/gal	*10*	(0*)	19	(0*)	(0*)	(0*)	0.46
Seldom-used units	0.038	lb/gal	*0.005*	(0*)	0.11	(0*)	(0*)	(0*)	0.01
Resupply Ship - DP mode									
Propulsion & Generation	0.016	lb/gal		10	76	76	76	76	1
Seldom-used units	0.038	lb/gal		0.00	0.11	0.11	0.11	0.11	0.01
OSR vessel									
Propulsion & Generation	0.016	lb/gal		2	44	44	44	44	2
Seldom-used units	0.038	lb/gal		0.02	0.54	0.54	0.54	0.54	0.03
Quartering vessel									
Propulsion & Generation	0.002	lb/gal		0	11	11	11	11	0
Seldom-used units	0.038	lb/gal		0.02	0.54	0.54	0.54	0.54	0.03
OSR work boats									
Work boats	0.038	lb/gal		0.86	21	21	21	21	1
TOTAL				**47**	**954**	**933**	**883**	**863**	**24**

PM_{10} & $PM_{2.5}$ EMISSIONS

Source	Emission Factor PM_{10}	Emission Factor $PM_{2.5}$	unit	PM_{10} lb/hr	$PM_{2.5}$ lb/hr	PM_{10} lb/day	$PM_{2.5}$ lb/day	PM_{10} ton/year	$PM_{2.5}$ ton/year
Incinerators									
Kulluk	16.4	14	lb/ton	2.26	1.93	27.16	23.18	1.63	1.39
Ice Management	16.4	14	lb/ton	1.26	1.08	30.31	25.87	0.69	0.59
Anchor Handler	16.4	14	lb/ton	1.26	1.08	30.31	25.87	0.69	0.59
OSR vessel	16.4	14	lb/ton	1.03	0.88	24.60	21.00	1.48	1.26
Quartering vessel	16.4	14	lb/ton	1.03	0.88	24.60	21.00	1.48	1.26
				6.84	**5.84**	**136.97**	**116.93**	**5.96**	**5.09**

Source	pollutant	EF	unit	reference
Incinerators	PM_{10}	16.4	lb/ton	Disco Stack Test June 2010 (multiplied by a safety factor of 2)
	$PM_{2.5}$	14	lb/ton	Disco Stack Test June 2010 (multiplied by a safety factor of 2)

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

CO EMISSIONS - FOR IMPACT MODELING

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	0.023	lb/gal		8.60	206	206	206	146	10.80
MLC HPU'S	0.026	lb/gal		2.00	48	48	0	0	0.48
Air compressors	0.023	lb/gal		1.79	43	43	0	0	0.43
Cranes	0.026	lb/gal		0.48	6	3	3	6	0.27
Heaters & Boilers	0.005	lb/gal		0.22	5	5	5	5	0.32
Seldom-used units	0.128	lb/gal		0.10	2.42	2.42	2.42	2.42	0.15
Emergency Generator	0.128	lb/gal		4.94	9.88	9.88	9.88	9.88	0.02
Primary Ice Management									
Propulsion & Generation	0.023	lb/gal		38.32	920	920	920	920	21
Heaters & Boilers	0.005	lb/gal		0.37	9	9	9	9	0.20
Seldom-used units	0.128	lb/gal		0.08	1.83	1.83	1.83	1.83	0.04
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	0.023	lb/gal		38.32	920	920	920	920	21
Heaters & Boilers	0.005	lb/gal		0.37	9	9	9	9	0.20
Seldom-used units	0.128	lb/gal		0.08	1.83	1.83	1.83	1.83	0.04
Resupply Ship - transport mode									
Propulsion & Generation	0.115	lb/gal	*71*	(0*)	138	(0*)	(0*)	(0*)	3.30
Seldom-used units	0.128	lb/gal	*0.015*	(0*)	0.37	(0*)	(0*)	(0*)	0.02
Resupply Ship - DP mode									
Propulsion & Generation	0.115	lb/gal		71	551	551	551	551	7
Seldom-used units	0.128	lb/gal		0.02	0.37	0.37	0.37	0.37	0.02
OSR vessel									
Propulsion & Generation	0.115	lb/gal		13	321	321	321	321	12
Seldom-used units	0.128	lb/gal		0.08	1.83	1.83	1.83	1.83	0.11
Quartering vessel									
Propulsion & Generation	0.011	lb/gal		2	55	55	55	55	2
Seldom-used units	0.128	lb/gal		0.08	1.83	1.83	1.83	1.83	0.11
OSR work boats									
Work boats	0.128	lb/gal		3	69	69	69	69	4
TOTAL				**186**	**3,320**	**3,179**	**3,089**	**3,030**	**83**

CO EMISSIONS

Source	Emission Factor	unit	CO lb/hr	CO lb/day	CO ton/year
Incinerators					
Kulluk	300	lb/ton	41.40	496.80	29.81
Ice Management	300	lb/ton	23.10	554.40	12.64
Anchor Handler	300	lb/ton	23.10	554.40	12.64
OSR vessel	300	lb/ton	18.75	450.00	27.00
Quartering vessel	300	lb/ton	18.75	450.00	27.00
			125.10	**2,505.60**	**109.09**

Source	pollutant	EF	unit	reference
Incinerators	CO	300	lb/ton	AP42 Table 2.1-12, 10/96

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 8	OF: 14	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

SO_2 EMISSIONS - FOR IMPACT MODELING

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	0.001419	lb/gal		0.53	12.75	12.75	12.75	9.00	0.67
MLC HPU'S	0.001419	lb/gal		0.11	2.65	2.65	0	0	0.03
Air compressors	0.001419	lb/gal		0.11	2.65	2.65	0	0	0.03
Cranes	0.001419	lb/gal		0.03	0.32	0.19	0.19	0.32	0.01
Heaters & Boilers	0.001419	lb/gal		0.06	1.51	1.51	1.51	1.51	0.09
Seldom-used units	0.001419	lb/gal		0.0011	0.0268	0.0268	0.0268	0.0268	0.0016
Emergency Generator	0.001419	lb/gal		0.0546	0.1092	0.1092	0.1092	0.1092	0.0002
Primary Ice Management									
Propulsion & Generation	0.001419	lb/gal		2.37	56.84	56.84	56.84	56.84	1.30
Heaters & Boilers	0.001419	lb/gal		0.11	2.52	2.52	2.52	2.52	0.06
Seldom-used units	0.001419	lb/gal		0.0008	0.0203	0.0203	0.0203	0.0203	0.0005
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	0.001419	lb/gal		2.37	56.84	56.84	56.84	56.84	1.30
Heaters & Boilers	0.001419	lb/gal		0.11	2.52	2.52	2.52	2.52	0.06
Seldom-used units	0.001419	lb/gal		0.0008	0.0203	0.0203	0.0203	0.0203	0.0005
Resupply Ship - transport mode									
Propulsion & Generation	0.001419	lb/gal	*0.88*	(0*)	1.70	(0*)	(0*)	(0*)	0.04
Seldom-used units	0.001419	lb/gal	*0.000*	(0*)	0.00	(0*)	(0*)	(0*)	0.00
Resupply Ship - DP mode									
Propulsion & Generation	0.001419	lb/gal		0.88	6.81	6.81	6.81	6.81	0.08
Seldom-used units	0.001419	lb/gal		0.0002	0.0041	0.0041	0.0041	0.0041	0.0002
OSR vessel									
Propulsion & Generation	0.001419	lb/gal		0.17	3.97	3.97	3.97	3.97	0.14
Seldom-used units	0.001419	lb/gal		0.0008	0.0203	0.0203	0.0203	0.0203	0.0012
Quartering vessel									
Propulsion & Generation	0.001419	lb/gal		0.28	6.81	6.81	6.81	6.81	0.25
Seldom-used units	0.001419	lb/gal		0.0008	0.0203	0.0203	0.0203	0.0203	0.0012
OSR work boats									
Work boats	0.001419	lb/gal		0.03	0.77	0.77	0.77	0.77	0.05
TOTAL				**7**	**159**	**157**	**152**	**148**	**4**

SO2 EMISSIONS

Source	Emission Factor	unit	SO_2 lb/hr	SO_2 lb/day	SO_2 ton/year
Incinerators					
Kulluk	2.5	lb/ton	0.35	4.14	0.25
Ice Management	2.5	lb/ton	0.19	4.62	0.11
Anchor Handler	2.5	lb/ton	0.19	4.62	0.11
OSR vessel	2.5	lb/ton	0.16	3.75	0.23
Quartering vessel	2.5	lb/ton	0.16	3.75	0.23
			1.04	**20.88**	**0.91**

Source	pollutant	EF	unit	reference
Incinerators	SO_2	2.5	lb/ton	AP42 Table 2.1-12, 10/96

S = the weight % Sulfur in the Fuel 0.0100% 0.0105 lb/MMBtu

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

VOC EMISSIONS

	Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
					VOC_pph	Max_VOC_ppd	MLC_VOC_ppd	Drill_VOC_ppd	C/L_VOC_ppd	VOC_tpy
Kulluk										
	Generation	0.004	lb/gal		1.37	32.77	32.77	32.77	23.13	1.72
	MLC HPU'S	0.014	lb/gal		1.10	26.46	26.46	0	0	0.26
	Air compressors	0.004	lb/gal		0.28	6.80	6.80	0	0	0.07
	Cranes	0.014	lb/gal		0.26	3.18	1.91	1.91	3.18	0.15
	Heaters & Boilers	0.001	lb/gal		0.04	1.07	1.07	1.07	1.07	0.06
	Seldom-used units	0.047	lb/gal		0.04	0.89	0.89	0.89	0.89	0.05
	Emergency Generator	0.047	lb/gal		1.82	3.64	3.64	3.64	3.64	0.01
Primary Ice Management										
	Propulsion & Generation	0.004	lb/gal		6.09	146.06	146.06	146.06	146.06	3.33
	Heaters & Boilers	0.001	lb/gal		0.07	1.78	1.78	1.78	1.78	0.04
	Seldom-used units	0.047	lb/gal		0.03	0.68	0.68	0.68	0.68	0.02
Secondary Ice Management / Anchor Handler										
	Propulsion & Generation	0.004	lb/gal		6.09	146.06	146.06	146.06	146.06	3.33
	Heaters & Boilers	0.001	lb/gal		0.07	1.78	1.78	1.78	1.78	0.04
	Seldom-used units	0.047	lb/gal		0.03	0.68	0.68	0.68	0.68	0.02
Resupply Ship - transport mode										
	Propulsion & Generation	0.012	lb/gal	*7.56*	(0*)	14.58	(0*)	(0*)	(0*)	0.35
	Seldom-used units	0.047	lb/gal	*0.006*	(0*)	0.14	(0*)	(0*)	(0*)	0.01
Resupply Ship - DP mode										
	Propulsion & Generation	0.012	lb/gal		7.56	58.32	58.32	58.32	58.32	0.70
	Seldom-used units	0.047	lb/gal		0.0056	0.1350	0.1350	0.1350	0.1350	0.0081
OSR vessel										
	Propulsion & Generation	0.012	lb/gal		1.42	34.02	34.02	34.02	34.02	1.22
	Seldom-used units	0.047	lb/gal		0.03	0.68	0.68	0.68	0.68	0.04
Quartering vessel										
	Propulsion & Generation	0.001	lb/gal		0.24	5.83	5.83	5.83	5.83	0.21
	Seldom-used units	0.047	lb/gal		0.03	0.68	0.68	0.68	0.68	0.04
OSR work boats										
	Work boats	0.047	lb/gal		1.07	25.58	25.58	25.58	25.58	1.53
TOTAL					**28**	**512**	**496**	**463**	**454**	**13**

VOC EMISSIONS

Source	Emission Factor	unit	VOC lb/hr	VOC lb/day	VOC ton/year
			I_VOC_pph	I_VOC_ppd	I_VOC_tpy
Incinerators					
Kulluk	100	lb/ton	13.80	165.60	9.94
Ice Management	100	lb/ton	7.70	184.80	4.21
Anchor Handler	100	lb/ton	7.70	184.80	4.21
OSR vessel	100	lb/ton	6.25	150.00	9.00
Quartering vessel	100	lb/ton	6.25	150.00	9.00
			41.70	**835.20**	**36.36**

Source	pollutant	EF	unit	reference
Incinerators	VOC	100	lb/ton	AP42 Table 2.1-12, 10/96

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

LEAD EMISSIONS

Source	Emission Factor	unit	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk									
Generation	3.92E-06	lb/gal		1.47E-03	3.52E-02	3.52E-02	3.52E-02	2.48E-02	1.84E-03
MLC HPU'S	3.92E-06	lb/gal		3.05E-04	7.31E-03	7.31E-03	0.00E+00	0.00E+00	7.31E-05
Air compressors	3.92E-06	lb/gal		3.05E-04	7.31E-03	7.31E-03	0.00E+00	0.00E+00	7.31E-05
Cranes	3.92E-06	lb/gal		7.31E-05	8.77E-04	5.26E-04	5.26E-04	8.77E-04	4.07E-05
Heaters & Boilers	1.22E-06	lb/gal		5.40E-05	1.30E-03	1.30E-03	1.30E-03	1.30E-03	7.78E-05
Seldom-used units	3.92E-06	lb/gal		3.08E-06	7.39E-05	7.39E-05	7.39E-05	7.39E-05	4.43E-06
Emergency Generator	3.92E-06	lb/gal		1.51E-04	3.01E-04	3.01E-04	3.01E-04	3.01E-04	6.03E-07
Primary Ice Management									
Propulsion & Generation	3.92E-06	lb/gal		6.54E-03	1.57E-01	1.57E-01	1.57E-01	1.57E-01	3.58E-03
Heaters & Boilers	1.22E-06	lb/gal		9.00E-05	2.16E-03	2.16E-03	2.16E-03	2.16E-03	4.92E-05
Seldom-used units	3.92E-06	lb/gal		2.33E-06	5.59E-05	5.59E-05	5.59E-05	5.59E-05	1.28E-06
Secondary Ice Management / Anchor Handler									
Propulsion & Generation	3.92E-06	lb/gal		6.54E-03	1.57E-01	1.57E-01	1.57E-01	1.57E-01	3.58E-03
Heaters & Boilers	1.22E-06	lb/gal		9.00E-05	2.16E-03	2.16E-03	2.16E-03	2.16E-03	4.92E-05
Seldom-used units	3.92E-06	lb/gal		2.33E-06	5.59E-05	5.59E-05	5.59E-05	5.59E-05	1.28E-06
Resupply Ship - transport mode									
Propulsion & Generation	3.92E-06	lb/gal	*2.44E-03*	(0*)	4.70E-03	(0*)	(0*)	(0*)	1.13E-04
Seldom-used units	3.92E-06	lb/gal	*4.66E-07*	(0*)	1.12E-05	(0*)	(0*)	(0*)	6.71E-07
Resupply Ship - DP mode									
Propulsion & Generation	3.92E-06	lb/gal		2.44E-03	1.88E-02	1.88E-02	1.88E-02	1.88E-02	2.26E-04
Seldom-used units	3.92E-06	lb/gal		4.66E-07	1.12E-05	1.12E-05	1.12E-05	1.12E-05	6.71E-07
OSR vessel									
Propulsion & Generation	3.92E-06	lb/gal		4.57E-04	1.10E-02	1.10E-02	1.10E-02	1.10E-02	3.95E-04
Seldom-used units	3.92E-06	lb/gal		2.33E-06	5.59E-05	5.59E-05	5.59E-05	5.59E-05	3.36E-06
Quartering vessel									
Propulsion & Generation	3.92E-06	lb/gal		7.83E-04	1.88E-02	1.88E-02	1.88E-02	1.88E-02	6.77E-04
Seldom-used units	3.92E-06	lb/gal		2.33E-06	5.59E-05	5.59E-05	5.59E-05	5.59E-05	3.36E-06
OSR work boats									
Work boats	3.92E-06	lb/gal		8.83E-05	2.12E-03	2.12E-03	2.12E-03	2.12E-03	1.27E-04
TOTAL				**1.94E-02**	**4.26E-01**	**4.21E-01**	**4.06E-01**	**3.96E-01**	**1.09E-02**

LEAD EMISSIONS

Source	Emission Factor	unit	Lead lb/hr	Lead lb/day	Lead ton/year
Incinerators					
Kulluk	0.213	lb/ton	0.03	0.35	0.02
Ice Management	0.213	lb/ton	0.02	0.39	0.01
Anchor Handler	0.213	lb/ton	0.02	0.39	0.01
OSR vessel	0.213	lb/ton	0.01	0.32	0.02
Quartering vessel	0.213	lb/ton	0.01	0.32	0.02
			0.09	**1.78**	**0.08**

Source	pollutant	EF	unit	EF	unit
IC Engines	Lead	2.90E-05	lb/MMBtu	3.92E-06	lb/gal
Boilers	Lead	9	lb/10^{12} Btu	1.22E-06	lb/gal
Incinerators	Lead			0.213	lb/ton

Reference	
IC Engines	L & E Air Emissions from Sources of Lead and Lead Compounds, EPA 454/R-98-006, May 1998, Section 5.2.2, Distillate oil-fired gas turbines
Boilers	AP42, Table 1.3-10. Emission Factors For Trace Elements From Distillate Fuel Oil Combustion Sources
Incinerators	AP42, Table 2.2-2 - Metals Emission Factors for Mass Burn and Modular Excess Air Combustors

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

Air Sciences Inc.	PROJECT TITLE: Shell - Exploration Drilling	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 11	OF: 14	SHEET: 2
ENGINEERING CALCULATIONS	SUBJECT: Kulluk / Beaufort Pmt App	DATE: March 28, 2011		

HAP EMISSIONS

Source	Emission Factor	unit	Control	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
Kulluk										
Generation	1.65E-04	lb/gal	SCR, OxyCat		6.16E-02	1.48E+00	1.48E+00	1.48E+00	1.04E+00	7.75E-02
MLC HPU'S	1.65E-04	lb/gal	OxyCat		1.28E-02	3.07E-01	3.07E-01	0.00E+00	0.00E+00	3.07E-03
Air compressors	1.65E-04	lb/gal	OxyCat		1.28E-02	3.07E-01	3.07E-01	0.00E+00	0.00E+00	3.07E-03
Cranes	1.65E-04	lb/gal	OxyCat		3.07E-03	3.69E-02	2.21E-02	2.21E-02	3.69E-02	1.71E-03
Heaters & Boilers	4.42E-05	lb/gal			1.96E-03	4.71E-02	4.71E-02	4.71E-02	4.71E-02	2.83E-03
Seldom-used units	5.31E-04	lb/gal			4.17E-04	1.00E-02	1.00E-02	1.00E-02	1.00E-02	6.01E-04
Emergency Generator	5.31E-04	lb/gal			2.04E-02	4.09E-02	4.09E-02	4.09E-02	4.09E-02	8.17E-05
Primary Ice Management										
Propulsion & Generation	1.65E-04	lb/gal	SCR, OxyCat		2.75E-01	6.59E+00	6.59E+00	6.59E+00	6.59E+00	1.50E-01
Heaters & Boilers	4.42E-05	lb/gal			3.27E-03	7.85E-02	7.85E-02	7.85E-02	7.85E-02	1.79E-03
Seldom-used units	5.31E-04	lb/gal			3.16E-04	7.58E-03	7.58E-03	7.58E-03	7.58E-03	1.73E-04
Secondary Ice Management / Anchor Handler										
Propulsion & Generation	1.65E-04	lb/gal	SCR, OxyCat		2.75E-01	6.59E+00	6.59E+00	6.59E+00	6.59E+00	1.50E-01
Heaters & Boilers	4.42E-05	lb/gal			3.27E-03	7.85E-02	7.85E-02	7.85E-02	7.85E-02	1.79E-03
Seldom-used units	5.31E-04	lb/gal			3.16E-04	7.58E-03	7.58E-03	7.58E-03	7.58E-03	1.73E-04
Resupply Ship - transport mode										
Propulsion & Generation	5.31E-04	lb/gal		*3.30E-01*	(0*)	6.37E-01	(0*)	(0*)	(0*)	1.53E-02
Seldom-used units	5.31E-04	lb/gal		*6.32E-05*	(0*)	1.52E-03	(0*)	(0*)	(0*)	9.10E-05
Resupply Ship - DP mode										
Propulsion & Generation	5.31E-04	lb/gal			3.30E-01	2.55E+00	2.55E+00	2.55E+00	2.55E+00	3.06E-02
Seldom-used units	5.31E-04	lb/gal			6.32E-05	1.52E-03	1.52E-03	1.52E-03	1.52E-03	9.10E-05
OSR vessel										
Propulsion & Generation	5.31E-04	lb/gal			6.19E-02	1.49E+00	1.49E+00	1.49E+00	1.49E+00	5.35E-02
Seldom-used units	5.31E-04	lb/gal			3.16E-04	7.58E-03	7.58E-03	7.58E-03	7.58E-03	4.55E-04
Quartering vessel										
Propulsion & Generation	5.31E-04	lb/gal	CDPF		1.06E-01	2.55E+00	2.55E+00	2.55E+00	2.55E+00	9.17E-02
Seldom-used units	5.31E-04	lb/gal			3.16E-04	7.58E-03	7.58E-03	7.58E-03	7.58E-03	4.55E-04
OSR work boats										
Work boats	5.31E-04	lb/gal			1.20E-02	2.87E-01	2.87E-01	2.87E-01	2.87E-01	1.72E-02
TOTAL					**1.18**	**23.11**	**22.46**	**21.84**	**21.42**	**0.60**

HAP EMISSIONS

Source	Emission Factor	unit	HAP lb/hr	HAP lb/day	HAP ton/year
Incinerators					
Kulluk	2.51E-01	lb/ton	0.03	0.42	0.02
Ice Management	2.51E-01	lb/ton	0.02	0.46	0.01
Anchor Handler	2.51E-01	lb/ton	0.02	0.46	0.01
OSR vessel	2.51E-01	lb/ton	0.02	0.38	0.02
Quartering vessel	2.51E-01	lb/ton	0.02	0.38	0.02
			0.10	**2.09**	**0.09**

Source	pollutant	EF	unit
IC Engines-uncontrolled	HAP	5.31E-04	lb/gal
IC Engines-OxyCat controlled	HAP	1.65E-04	lb/gal
Boilers	HAP	4.42E-05	lb/gal
Incinerators	HAP	2.51E-01	lb/ton

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

FORMALDEHYDE EMISSIONS

	Source	Emission Factor	unit	Control	*lb/hr^*	lb/hr	Max *lb/day^*	MLC lb/day	DRILL lb/day	C/L lb/day	TOTAL ton/year
						CH2O_pph	Max_CH2O_ppd	MLC_CH2O_ppd	Drill_CH2O_ppd	C/L_CH2O_ppd	CH2O_tpy
Kulluk											
	Generation	4.78E-05	lb/gal	SCR, OxyCat		1.79E-02	4.30E-01	4.30E-01	4.30E-01	3.03E-01	2.25E-02
	MLC HPU'S	4.78E-05	lb/gal	OxyCat		3.72E-03	8.92E-02	8.92E-02	0.00E+00	0.00E+00	8.92E-04
	Air compressors	4.78E-05	lb/gal	OxyCat		3.72E-03	8.92E-02	8.92E-02	0.00E+00	0.00E+00	8.92E-04
	Cranes	4.78E-05	lb/gal	OxyCat		8.92E-04	1.07E-02	6.42E-03	6.42E-03	1.07E-02	4.97E-04
	Heaters & Boilers	3.30E-05	lb/gal			1.47E-03	3.52E-02	3.52E-02	3.52E-02	3.52E-02	2.11E-03
	Seldom-used units	1.59E-04	lb/gal			1.25E-04	3.01E-03	3.01E-03	3.01E-03	3.01E-03	1.80E-04
	Emergency Generator	1.59E-04	lb/gal			6.13E-03	1.23E-02	1.23E-02	1.23E-02	1.23E-02	2.45E-05
Primary Ice Management											
	Propulsion & Generation	4.78E-05	lb/gal	SCR, OxyCat		7.98E-02	1.91E+00	1.91E+00	1.91E+00	1.91E+00	4.37E-02
	Heaters & Boilers	3.30E-05	lb/gal			2.44E-03	5.87E-02	5.87E-02	5.87E-02	5.87E-02	1.34E-03
	Seldom-used units	1.59E-04	lb/gal			9.48E-05	2.28E-03	2.28E-03	2.28E-03	2.28E-03	5.19E-05
Secondary Ice Management / Anchor Handler											
	Propulsion & Generation	4.78E-05	lb/gal	SCR, OxyCat		7.98E-02	1.91E+00	1.91E+00	1.91E+00	1.91E+00	4.37E-02
	Heaters & Boilers	3.30E-05	lb/gal			2.44E-03	5.87E-02	5.87E-02	5.87E-02	5.87E-02	1.34E-03
	Seldom-used units	1.59E-04	lb/gal			9.48E-05	2.28E-03	2.28E-03	2.28E-03	2.28E-03	5.19E-05
Resupply Ship - transport mode											
	Propulsion & Generation	1.59E-04	lb/gal		*9.91E-02*	(0*)	1.91E-01	(0*)	(0*)	(0*)	4.59E-03
	Seldom-used units	1.59E-04	lb/gal		*1.90E-05*	(0*)	4.55E-04	(0*)	(0*)	(0*)	2.73E-05
Resupply Ship - DP mode											
	Propulsion & Generation	1.59E-04	lb/gal			9.91E-02	7.65E-01	7.65E-01	7.65E-01	7.65E-01	9.18E-03
	Seldom-used units	1.59E-04	lb/gal			1.90E-05	4.55E-04	4.55E-04	4.55E-04	4.55E-04	2.73E-05
OSR vessel											
	Propulsion & Generation	1.59E-04	lb/gal			1.86E-02	4.46E-01	4.46E-01	4.46E-01	4.46E-01	1.61E-02
	Seldom-used units	1.59E-04	lb/gal			9.48E-05	2.28E-03	2.28E-03	2.28E-03	2.28E-03	1.37E-04
Quartering vessel											
	Propulsion & Generation	1.59E-04	lb/gal	CDPF		3.19E-02	7.65E-01	7.65E-01	7.65E-01	7.65E-01	2.75E-02
	Seldom-used units	1.59E-04	lb/gal			9.48E-05	2.28E-03	2.28E-03	2.28E-03	2.28E-03	1.37E-04
OSR work boats											
	Work boats	1.59E-04	lb/gal			3.59E-03	8.62E-02	8.62E-02	8.62E-02	8.62E-02	5.17E-03
TOTAL						**0.35**	**6.88**	**6.68**	**6.51**	**6.38**	**0.18**

FORMALDEHYDE EMISSIONS

Source	Emission Factor	unit	CH_2O lb/hr	CH_2O lb/day	CH_2O ton/year
			I_CH2O_pph	I_CH2O_ppd	I_CH2O_tpy
Incinerators					
Kulluk	0.00E+00	lb/ton	0.00	0.00	0.00
Ice Management	0.00E+00	lb/ton	0.00	0.00	0.00
Anchor Handler	0.00E+00	lb/ton	0.00	0.00	0.00
OSR vessel	0.00E+00	lb/ton	0.00	0.00	0.00
Quartering vessel	0.00E+00	lb/ton	0.00	0.00	0.00
			0.00	**0.00**	**0.00**

Source	pollutant	EF	unit
IC Engines-uncontrolled	CH_2O	1.59E-04	lb/gal
IC Engines-OxyCat controlled	CH_2O	4.78E-05	lb/gal
Boilers	CH_2O	3.30E-05	lb/gal
Incinerators	CH_2O	0.00E+00	lb/ton

*This activity cannot occur simultaneously with Resupply - DP mode. DP mode has greater impacts.

^Values in this column represent maximum emissions independent of activity.

HAPs Emission Factors -(from AP42)

ICE Engines Emission Factors

AP42 Table 3.3-2, Speciated Organic Compound Emission Factors For Uncontrolled Diesel Engines

Pollutant	EF lb/MMBtu	EF lb/gal
Acaldehyde	7.67E-04	1.04E-04
Acenaphthene	1.42E-06	1.92E-07
Acenaphthylene	5.06E-06	6.83E-07
Acrolein	9.25E-05	1.25E-05
Anthracene	1.87E-06	2.52E-07
Benzene	9.33E-04	1.26E-04
Benzo(a)anthracene	1.68E-06	2.27E-07
Benzo(a)pyrene	1.88E-07	2.54E-08
Benzo(b)fluoranthene	9.91E-08	1.34E-08
Benzo(g,h,l)perylene	4.89E-07	6.60E-08
Benzo(k)fluoranthene	1.55E-07	2.09E-08
1,3-Butadiene	3.91E-05	5.28E-06
Chrysene	3.53E-07	4.77E-08
Dibenz(a,h)anthracene	5.83E-07	7.87E-08
Fluoranthene	7.61E-06	1.03E-06
Fluorene	2.92E-05	3.94E-06
Formaldehyde	1.18E-03	1.59E-04
Indeno(1,2,3-cd)pyrene	3.75E-07	5.06E-08
Naphthalene	8.48E-05	1.14E-05
Phenanthrene	2.94E-05	3.97E-06
Pyrene	4.78E-06	6.45E-07
Toluene	4.09E-04	5.52E-05
Xylenes	2.85E-04	3.85E-05
		5.23E-04

Boiler Emission Factors

AP42 Table 1.3-9, Emission Factors For Speciated Organic Compounds From Fuel Oil Combustion

Pollutant	EF lb/10^3 gal	EF lb/gal
Acenaphthene	2.11E-05	2.11E-08
Acenaphthylene	2.53E-07	2.53E-10
Anthracene	1.22E-06	1.22E-09
Benzene	2.14E-04	2.14E-07
Benz(a)anthracene	4.01E-06	4.01E-09
Benzo(b,k)fluoranthene	1.48E-06	1.48E-09
Benzo(g,h,i)perylene	2.26E-06	2.26E-09
Chrysene	2.38E-06	2.38E-09
Dibenzo(a,h)anthracene	1.67E-06	1.67E-09
Ethylbenzene	6.36E-05	6.36E-08
Fluoranthene	4.84E-06	4.84E-09
Fluorene	4.47E-06	4.47E-09
Formaldehyde	3.30E-02	3.30E-05
Indo(1,2,3-cd)pyrene	2.14E-06	2.14E-09
Naphthalene	1.13E-03	1.13E-06
Phenanthrene	1.05E-05	1.05E-08
Pyrene	4.25E-06	4.25E-09
Toluene	6.20E-03	6.20E-06
o-Xylene	1.09E-04	1.09E-07
		4.08E-05

Incinerator Emission Factors

Table 1.3-10. Emission Factors For Trace Elements From Distillate Fuel Oil Combustion Sources

Metal				lb/MMBtu	lb/gal	Metal		EF lb/10^{12} Btu	EF lb/gal
Arsenic	As			4.90E-06	6.62E-07	Arsenic	As	4	5.40E-07
Cadmium	Cd	11	lb/10^{12} Btu	1.10E-05	1.49E-06	Cadmium	Cd	3	4.05E-07
Chromium	Cr	0.35	lb/10^{9} gal	2.59E-06	3.50E-07	Chromium	Cr	3	4.05E-07
Lead	Pb			2.9E-05	3.92E-06	Lead	Pb	9	1.22E-06
Mercury	Hg	6.2	lb/10^{12} Btu	6.20E-06	8.37E-07	Mercury	Hg	3	4.05E-07
Nickel	Ni	0.41	lb/10^{6} gal	3.04E-06	4.10E-07	Nickel	Ni	3	4.05E-07
	Total Metals				7.66E-06	Total Metals			3.38E-06
	Total HAPs				5.31E-04	Total HAPs			4.42E-05

Table 2.2-2 - Metals Emission Factors for Mass Burn and Modular Excess Air Combustors

Metal		lb/ton
Arsenic	As	4.37E-03
Cadmium	Cd	1.09E-02
Chromium	Cr	8.97E-03
Lead	Pb	2.13E-01
Mercury	Hg	5.60E-03
Nickel	Ni	7.85E-03
Total Metals		2.51E-01
Total HAPs		2.51E-01

Greatest Emited HAP

Formaldehyde	1.59E-04	3.30E-05	

ICE Metal References

Arsenic	L & E Air Emissions from Sources of Arsenic and Arsenic Compounds, EPA-454/R-98-013, June 1998, Table 4-20, Distillate Oil Fired Turbine
Cadmium	L & E Air Emissions from Sources of Cadmium and Cadmium Compounds, EPA-454/R-93-040, Sept. 1993, Table 6-12, No. 2 Distillate Oil
Chromium	L & E Air Emissions from Sources of Chromium, EPA-450/4-84-007g, July 1984, Table 36, Distillate #2
Lead	L & E Air Emissions from Sources of Lead and Lead Compounds, EPA 454/R-98-006, May 1998, Section 5.2.2, Distillate oil-fired gas turbines
Mercury	L & E Air Emissions from Sources of Mercury and Mercury Compounds, EPA-454/R-97-012, Dec. 1997, Table 6-12, Distillate No. 2
Nickel	L & E Air Emissions from Sources of Nickel, EPA-450/4-84-007f, March 1984, Table 26, Distillate #2

Maximum Annual Fuel

Total Annual Fuel	MMBtu/year	gallons/year
Kulluk & Associated Fleet	810,000	6,000,000

Waste	ton/yr
All Incinerators	727

Greenhouse Gas Emissions

$CO_2 + CH_4*21 + N_2O*310 \rightarrow CO_2e$

Pollutant	Type	Multiplier	Reference	EF	unit	ton/year	Reference
CO_2	comb	1	40 CFR 98, Table A-1	73.96	kg/MMBtu	66,037	40 CFR Part 98, Subpart C, Table C-1 (Distillate Fuel Oil No. 2)
CH_4	comb	21	40 CFR 98, Table A-1	3.00E-03	kg/MMBtu	56	40 CFR Part 98, Subpart C, Table C-2 (Fuel Type: Petroleum)
N_2O	comb	310	40 CFR 98, Table A-1	6.00E-04	kg/MMBtu	166	40 CFR Part 98, Subpart C, Table C-2 (Fuel Type: Petroleum)
CH_4	offgas	21	40 CFR 98, Table A-1	399	lb	4	Methane Mass Caculation.xls October 22,2010
Annual CO_2e						66,263	

Sulfuric Acid

$S + O_2 \rightarrow SO_2$

$2SO_2 + O_2 \rightarrow 2SO_3$

$SO_3 + H_2O \rightarrow H_2SO_4$

Pollutant	Formula	MW
Sulfuric Acid	H_2SO_4	98.079 g/g-mol
Sulfur	S	32.066 g/g-mol

3.06 weight conversion of S to H_2SO_4

Source	S content	H_2SO_4 EF		Reference	H_2SO_4 [b] ton/year
Kulluk & Associated Fleet	0.0100%	0.0161	lb/MMBtu	Calculation	0.33
All Incinerators		1.2	lb/ton	AP42 Table 2.2-2, 1/95 [a]	0.44
					0.76

[a] Acid Gas Emission Factors for Multiple Hearth Sewage Sludge Incinerators, Uncontrolled

[b] Conversion assumed of 5.0% Ref: AP42, Section 1.3.3.2 Sulfur Oxides Emissions. Maximum conversion of SO2 to SO3 from fuel oil combustion in boilers

Fluorides

Fluoride is not a listed and quantified trace pollutant from diesel combustion as provided by AP42, so it is assumed to be an extremely small constituent. Furthermore, fluoride is a reduced form of fluorine and diesel combustion is an oxidizing process. Therefore, it is unlikely that it would exist as a combustion bi-product and should be a negligible emission from the project.

Hydrogen Sulfide, Total Reduced Sulfur, Reduced Sulfur Compounds

TRS	Formula
Dimethyl disulfide (DMDS)	$(CH_3)_2S_2$
Dimethyl sulfide (DMS)	$(CH_3)_2S$
Hydrogen sulfide	H_2S
Methyl mercaptan (MeSH)	CH_4S

RSC	Formula
Carbon disulfide	CS_2
Carbonyl sulfide	COS
Hydrogen sulfide	H_2S

Pollutant	MW
SO_2	64 g/g-mol
H_2S	34.081 g/g-mol

0.53 weight conversion of SO_2 to H_2S

Source	SO_2 EF		SO_2 ton/year	H_2S EF [a]		H_2S ton/year
Kulluk & Associated Fleet	0.0105	lb/MMBtu	4.26	5.60E-03	lb/MMBtu	2.27
All Incinerators	2.5	lb/ton	0.91	1.33E+00	lb/ton	0.48
			5.16			2.75

[a] It is assumed that all SO_2 is transformed to H_2S

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
ENGINEERING CALCULATIONS	PROJECT NO: 180-20-6	PAGE: 1	OF: 4	SHEET: 3
	SUBJECT: Model Emission Summary	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group
MLC Case

STACK	NO_X g/s	$PM_{2.5}$ g/s	PM_{10} g/s	CO g/s	SO_2 g/s	NH_3 g/s
Kulluk						
MAINENGS	2.395	0.374	0.374	1.08	6.70E-02	0.09
MLCHPU_A	2.330	0.093	0.093	0.13	6.95E-03	0.00
MLCHPU_B	2.330	0.093	0.093	0.13	6.95E-03	0.00
AIRCMP_A	1.864	0.039	0.039	0.11	6.95E-03	0.00
AIRCMP_B	1.864	0.039	0.039	0.11	6.95E-03	0.00
CRANE_A	0.112	0.004	0.004	0.01	3.34E-04	0.00
CRANE_B	0.112	0.004	0.004	0.01	3.34E-04	0.00
CRANE_C	0.112	0.004	0.004	0.01	3.34E-04	0.00
HEATBOIL	0.112	0.018	0.018	0.03	7.94E-03	0.00
INCIN_K	0.052	0.243	0.285	5.22	0.04	0.00
SELDOML (no egen.)	0.047	0.004	0.004	0.01	1.41E-04	0.00
SELDOMH (egen.)	2.307	0.185	0.185	0.62	6.88E-03	0.00
Primary Ice Management						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Secondary Ice Management / Anchor Handler						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Model ID: ICEMGMT; ICE MGMT/AH AREAPOLY [1, 2]	*2.51E-06*	*4.21E-07*	*4.27E-07*	*1.79E-06*	*7.71E-08*	*4.63E-08*
Resupply Ship - DP mode						
Propulsion & Generation	9.588	0.399	0.399	2.89	3.57E-02	0.00
Seldom-used units	0.007	0.001	0.001	0.00	2.13E-05	0.00
Model ID: RESUP_DP	*9.59*	*0.40*	*0.40*	*2.89*	*0.04*	*0.00*
Resupply Ship - transport mode						
Propulsion & Generation	0.000	0.000	0.000	0.00	0.00E+00	0.00
Seldom-used units	0.000	0.000	0.000	0.00	0.00E+00	0.00
OSR vessel						
Propulsion & Generation	5.593	0.233	0.233	1.69	2.09E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_MAIN; OSR Vessel AREAPOLY [1, 3]	*1.41E-06*	*8.66E-08*	*9.13E-08*	*1.02E-06*	*1.02E-08*	*0.00E+00*
Quartering vessel						
Propulsion & Generation	7.191	0.060	0.060	0.29	3.57E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_QTR; Quartering Vessel AREAPOLY [1,	*1.81E-06*	*4.33E-08*	*4.80E-08*	*6.66E-07*	*1.39E-08*	*0.00E+00*
OSR work boats						
Work boats	1.352	0.108	0.108	0.36	4.03E-03	0.00
Model ID: OSR_WORK; OSR Work Boats AREAPOLY [1]	*3.38E-07*	*2.70E-08*	*2.70E-08*	*9.12E-08*	*1.01E-09*	*0.00E+00*

[1] AREAPOLY units = $g/s/m^2$

[2] Ice Mngt/AH divide by area of the AREAPOLY = 8,718,385 sq. meters

[3] OSR divide by area of the AREAPOLY = 3,997,350 sq. meters

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 2	OF: 4	SHEET: 3
ENGINEERING CALCULATIONS	SUBJECT: Model Emission Summary	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group
Drill Case

STACK	NO_X g/s	$PM_{2.5}$ g/s	PM_{10} g/s	CO g/s	SO_2 g/s	NH_3 g/s
Kulluk						
MAINENGS	2.395	0.374	0.374	1.08	6.70E-02	0.09
MLCHPU_A	0.000	0.000	0.000	0.00	0.00E+00	0.00
MLCHPU_B	0.000	0.000	0.000	0.00	0.00E+00	0.00
AIRCMP_A	0.000	0.000	0.000	0.00	0.00E+00	0.00
AIRCMP_B	0.000	0.000	0.000	0.00	0.00E+00	0.00
CRANE_A	0.112	0.004	0.004	0.01	3.34E-04	0.00
CRANE_B	0.112	0.004	0.004	0.01	3.34E-04	0.00
CRANE_C	0.112	0.004	0.004	0.01	3.34E-04	0.00
HEATBOIL	0.112	0.018	0.018	0.03	7.94E-03	0.00
INCIN_K	0.052	0.243	0.285	5.22	0.04	0.00
SELDOML (no egen.)	0.047	0.004	0.004	0.01	1.41E-04	0.00
SELDOMH (egen.)	2.307	0.185	0.185	0.62	6.88E-03	0.00
Primary Ice Management						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Secondary Ice Management / Anchor Handler						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Model ID: ICEMGMT; ICE MGMT/AH AREAPOLY [1, 2]	*2.51E-06*	*4.21E-07*	*4.27E-07*	*1.79E-06*	*7.71E-08*	*4.63E-08*
Resupply Ship - DP mode						
Propulsion & Generation	9.588	0.399	0.399	2.89	3.57E-02	0.00
Seldom-used units	0.007	0.001	0.001	0.00	2.13E-05	0.00
Model ID: RESUP_DP	*9.59*	*0.40*	*0.40*	*2.89*	*0.04*	*0.00*
Resupply Ship - transport mode						
Propulsion & Generation	0.000	0.000	0.000	0.00	0.00E+00	0.00
Seldom-used units	0.000	0.000	0.000	0.00	0.00E+00	0.00
OSR vessel						
Propulsion & Generation	5.593	0.233	0.233	1.69	2.09E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_MAIN; OSR Vessel AREAPOLY [1, 3]	*1.41E-06*	*8.66E-08*	*9.13E-08*	*1.02E-06*	*1.02E-08*	*0.00E+00*
Quartering vessel						
Propulsion & Generation	7.191	0.060	0.060	0.29	3.57E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_QTR; Quartering Vessel AREAPOLY [1,	*1.81E-06*	*4.33E-08*	*4.80E-08*	*6.66E-07*	*1.39E-08*	*0.00E+00*
OSR work boats						
Work boats	1.352	0.108	0.108	0.36	4.03E-03	0.00
Model ID: OSR_WORK; OSR Work Boats AREAPOLY [1]	*3.38E-07*	*2.70E-08*	*2.70E-08*	*9.12E-08*	*1.01E-09*	*0.00E+00*

[1] AREAPOLY units = $g/s/m^2$

[2] Ice Mngt/AH divide by area of the AREAPOLY = 8,718,385 sq. meters

[3] OSR divide by area of the AREAPOLY = 3,997,350 sq. meters

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
ENGINEERING CALCULATIONS	PROJECT NO: 180-20-6	PAGE: 3	OF: 4	SHEET: 3
	SUBJECT: Model Emission Summary	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group
Cementing/Logging Case

STACK	NO_X g/s	$PM_{2.5}$ g/s	PM_{10} g/s	CO g/s	SO_2 g/s	NH_3 g/s
Kulluk						
MAINENGS	1.690	0.264	0.264	0.76	4.73E-02	0.09
MLCHPU_A	0.000	0.000	0.000	0.00	0.00E+00	0.00
MLCHPU_B	0.000	0.000	0.000	0.00	0.00E+00	0.00
AIRCMP_A	0.000	0.000	0.000	0.00	0.00E+00	0.00
AIRCMP_B	0.000	0.000	0.000	0.00	0.00E+00	0.00
CRANE_A	0.186	0.007	0.007	0.01	5.56E-04	0.00
CRANE_B	0.186	0.007	0.007	0.01	5.56E-04	0.00
CRANE_C	0.186	0.007	0.007	0.01	5.56E-04	0.00
HEATBOIL	0.112	0.018	0.018	0.03	7.94E-03	0.00
INCIN_K	0.052	0.243	0.285	5.22	0.04	0.00
SELDOML (no egen.)	0.047	0.004	0.004	0.01	1.41E-04	0.00
SELDOMH (egen.)	2.307	0.185	0.185	0.62	6.88E-03	0.00
Primary Ice Management						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Secondary Ice Management / Anchor Handler						
Propulsion & Generation	10.672	1.667	1.667	4.83	2.98E-01	0.20
Heaters & Boilers	0.187	0.031	0.031	0.05	1.32E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.029	0.136	0.159	2.91	0.02	0.00
Model ID: ICEMGMT; ICE MGMT/AH AREAPOLY [1, 2]	*2.51E-06*	*4.21E-07*	*4.27E-07*	*1.79E-06*	*7.71E-08*	*4.63E-08*
Resupply Ship - DP mode						
Propulsion & Generation	9.588	0.399	0.399	2.89	3.57E-02	0.00
Seldom-used units	0.007	0.001	0.001	0.00	2.13E-05	0.00
Model ID: RESUP_DP	*9.59*	*0.40*	*0.40*	*2.89*	*0.04*	*0.00*
Resupply Ship - transport mode						
Propulsion & Generation	0.000	0.000	0.000	0.00	0.00E+00	0.00
Seldom-used units	0.000	0.000	0.000	0.00	0.00E+00	0.00
OSR vessel						
Propulsion & Generation	5.593	0.233	0.233	1.69	2.09E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_MAIN; OSR Vessel AREAPOLY [1, 3]	*1.41E-06*	*8.66E-08*	*9.13E-08*	*1.02E-06*	*1.02E-08*	*0.00E+00*
Quartering vessel						
Propulsion & Generation	7.191	0.060	0.060	0.29	3.57E-02	0.00
Seldom-used units	0.036	0.003	0.003	0.01	1.06E-04	0.00
Incinerator	0.024	0.110	0.129	2.36	0.02	0.00
Model ID: OSR_QTR; Quartering Vessel AREAPOLY [1,	*1.81E-06*	*4.33E-08*	*4.80E-08*	*6.66E-07*	*1.39E-08*	*0.00E+00*
OSR work boats						
Work boats	1.352	0.108	0.108	0.36	4.03E-03	0.00
Model ID: OSR_WORK; OSR Work Boats AREAPOLY [1]	*3.38E-07*	*2.70E-08*	*2.70E-08*	*9.12E-08*	*1.01E-09*	*0.00E+00*

[1] AREAPOLY units = $g/s/m^2$

[2] Ice Mngt/AH divide by area of the AREAPOLY = 8,718,385 sq. meters

[3] OSR divide by area of the AREAPOLY = 3,997,350 sq. meters

Air Sciences Inc.	PROJECT TITLE: Shell OCS Permit	BY: S. Pryor		
	PROJECT NO: 180-20-6	PAGE: 4	OF: 4	SHEET: 3
ENGINEERING CALCULATIONS	SUBJECT: Model Emission Summary	DATE: March 28, 2011		

Conical Drilling Unit Kulluk OCS Source - Daily Maximum Emissions for each source group
Maximum

STACK	CO g/s	SO_2 g/s	NH_3 g/s
Kulluk			
MAINENGS	1.08	6.70E-02	0.09
MLCHPU_A	0.13	6.95E-03	0.00
MLCHPU_B	0.13	6.95E-03	0.00
AIRCMP_A	0.11	6.95E-03	0.00
AIRCMP_B	0.11	6.95E-03	0.00
CRANE_A	0.01	5.56E-04	0.00
CRANE_B	0.01	5.56E-04	0.00
CRANE_C	0.01	5.56E-04	0.00
HEATBOIL	0.03	7.94E-03	0.00
INCIN_K	5.22	0.04	0.00
SELDOML (no egen.)	0.0127	1.41E-04	0.00
SELDOMH (egen.)	0.6221	6.88E-03	0.00
Primary Ice Management			
Propulsion & Generation	4.83	2.98E-01	0.20
Heaters & Boilers	0.05	1.32E-02	0.00
Seldom-used units	0.01	1.06E-04	0.00
Incinerator	2.91	0.02	0.00
Secondary Ice Management / Anchor Handler			
Propulsion & Generation	4.83	2.98E-01	0.20
Heaters & Boilers	0.05	1.32E-02	0.00
Seldom-used units	0.01	1.06E-04	0.00
Incinerator	2.91	0.02	0.00
Model ID: ICEMGMT; ICE MGMT/AH AREAPOLY [1, 2]	*1.79E-06*	*7.71E-08*	*4.63E-08*
Resupply Ship - DP mode			
Propulsion & Generation	2.89	3.57E-02	0.00
Seldom-used units	0.00	2.13E-05	0.00
Model ID: RESUP_DP	*2.89*	*0.04*	*0.00*
Resupply Ship - transport mode			
Propulsion & Generation	0.00	0.00	0.00
Seldom-used units	0.00	0.00	0.00
OSR vessel			
Propulsion & Generation	1.69	2.09E-02	0.00
Seldom-used units	0.01	1.06E-04	0.00
Incinerator	2.36	0.02	0.00
Model ID: OSR_MAIN; OSR Vessel AREAPOLY [1, 3]	*1.02E-06*	*1.02E-08*	*0.00E+00*
Quartering vessel			
Propulsion & Generation	0.29	3.57E-02	0.00
Seldom-used units	0.01	1.06E-04	0.00
Incinerator	2.36	0.02	0.00
Model ID: OSR_QTR; Quartering Vessel AREAPOLY [1,	*6.66E-07*	*1.39E-08*	*0.00E+00*
OSR work boats			
Work boats	0.36	4.03E-03	0.00
Model ID: OSR_WORK; OSR Work Boats AREAPOLY [1]	*9.12E-08*	*1.01E-09*	*0.00E+00*

[1] AREAPOLY units = $g/s/m^2$

[2] Ice Mngt/AH divide by area of the AREAPOLY = 8,718,385 sq. meters

[3] OSR divide by area of the AREAPOLY = 3,997,350 sq. meters

ALASKA OP-APPENDIX E

Title V Operating Permit Application Completeness Checklist

TITLE V OPERATING PERMIT APPLICATION COMPLETENESS CHECKLIST

State of Alaska
Department of Environmental Conservation
Air Permits Program

Application: Conical Drilling Unit Kulluk

Applicant: Shell Offshore Inc.

Date of Submittal: March 29, 2011

Date Received: _____

Reviewed by: _____

Date Review Completed: _____

Based on information supplied

THIS APPLICATION IS DEEMED:

COMPLETE ☐ **INCOMPLETE** ☐

40 CFR 71.5(c) Standard Application Form and Required Information

☛ 71.5(c)(1) Identifying Information

☛ 71.5(c)(2) Description of Source's processes

Comp	Incomp	N/A	
☒	☐	☐	Company name and address included? _____
☐	☐	☒	Plant name and address if different from the company included? _____
☒	☐	☐	Owner's name and agent included? _____
☒	☐	☐	Names of plant site manager/contact person included? _____
☐	☐	☒	Telephone number of plant site manager/contact person included? _____.
☒	☐	☐	Description of the source's processes and products (by SIC Code). SIC codes included? [SIC lookup and DOC/ED listed SIC internet links below, or phone 269-8140]

Internet links for SIC lookup and DOC/ED listed SIC - http://www.osha.gov/oshstats/sicser.html
http://www.commerce.state.ak.us/com/owa/comdata.bus

☐	☐	☐	Alternate scenario of operation included? *[Only modes that change the requirements that are applicable to the facility need to be included.]*

☛ 71.5(c)(3) Emissions-Related Information

Comp	Incomp	N/A		
☒	☐	☐	**(i)**	All emissions of pollutants for which the source is major, and all emissions of regulated air pollutants included? A permit application shall describe all emissions of regulated air pollutants emitted from any emissions unit, except where such units are exempted under this paragraph (c). The permitting authority shall require additional information related to the emissions of air pollutants sufficient to verify which requirements are applicable to the source, and other information necessary to collect any permit fees owed under the fee schedule established pursuant to Sec. 71.9(b).
☒	☐	☐	**(ii)**	Identification and description of all points of emissions described in paragraph (c)(3)(i) of this section in sufficient detail to establish the basis for fees and applicability of requirements of the Act included?
☒	☐	☐	**(iii)**	Emissions rates in tpy and in such terms as are necessary to establish compliance consistent with the applicable standard reference test method included?
☒	☐	☐	**(iv)**	The following information to the extent it is needed to determine or regulate emissions: fuels, fuel use, raw materials, production rates, and operating schedules included?
☒	☐	☐	**(v)**	Identification and description of air pollution control equipment and compliance monitoring devices or activities included?
☒	☐	☐	**(vi)**	Limitations on source operation affecting emissions included?
☒	☐	☐	**(vii)**	Other information required by any applicable requirement (including information related to stack height limitations developed pursuant to section 123 of the Act)?
☒	☐	☐	**(viii)**	Calculations on which the information in paragraphs (c)(3)(i) through (vii) of this section is based?

☛ 71.5(c)(4)Air Pollution Control Requirements:

Yes	No	N/A		
☒	☐	☐	**(i)**	Citation and description of all applicable requirements; and
☒	☐	☐	**(ii)**	Description of or reference to any applicable test method for determining compliance with each applicable requirement included?

Comments:

☛ 71.5(c)(5) Other specific information

Comp	Incomp	N/A	
☒	☐	☐	that may be necessary to implement and enforce other applicable requirements of the Act or of this part or to determine the applicability of such requirements included?

Comments:

☛ 71.5(c)(6) Exemptions

Comp	Incomp	N/A	
☐	☐	☒	An explanation of any proposed exemptions from otherwise applicable requirements included?

☛ 71.5(c)(7) Additional Information

Comp	Incomp	N/A	
☒	☐	☐	Additional information as determined to be necessary by the permitting authority to define alternative operating scenarios identified by the source pursuant to Sec. 71.6(a)(9) or to define permit terms and conditions implementing Sec 71.6(a)(10) or Sec. 71.6(a)(13) included?

Comments:

☛ 71.5(c)(8) Compliance Plan

A compliance plan for all part 71 sources that contains all the following:

Comp	Incomp	N/A		
☒	☐	☐	**(i)**	A description of the compliance status of the source with respect to all applicable requirements included?
			(ii)	A description as follows:
☒	☐	☐	**(A)**	For applicable requirements with which the source is in compliance, is a statement that the source will continue to comply with such requirements included?
☒	☐	☐	**(B)**	For applicable requirements that will become effective during the permit term, is a statement that the source will meet such requirements on a timely basis included?
☐	☐	☒	**(C)**	For requirements for which the source is not in compliance at the time of permit issuance, is a narrative description of how the source will achieve compliance with such requirements included?

Comments:

☒	☐	☐	**(iii)**	Is a compliance schedule as follows included?
☒	☐	☐	**(A)**	For applicable requirements with which the source is in compliance, a statement that the source will continue to comply with such requirements.
☒	☐	☐	**(B)**	For applicable requirements that will become effective during the permit term, a statement that the source will meet such requirements on a timely basis. A statement that the source will meet in a timely manner applicable requirements that become effective during the permit term shall satisfy this provision, unless a more detailed schedule is expressly required by the applicable requirement.
☐	☐	☒	**(C)**	A schedule of compliance for sources that are not in compliance with all applicable requirements at the time of permit issuance. Such a schedule shall include a schedule of remedial measures, including an enforceable sequence of actions with milestone, leading to compliance with any applicable requirements for which the source will be in noncompliance at the time of permit issuance. This compliance schedule shall resemble and be at least as stringent as that contained in any judicial consent decree or administrative order to which the source is subject. Any such schedule of compliance shall be supplemental to, and shall not sanction noncompliance with, the applicable requirements on which it is based.
☐	☐	☒	**(iv)**	Is a schedule for submission of certified progress reports no less frequently than every 6 months for sources required to have a schedule of compliance to remedy a violation included?
☐	☐	☒	**(v)**	The compliance plan content requirements specified in this paragraph shall apply and be included in the acid rain portion of a compliance plan for an affected source, except as specifically superseded by regulations promulgated under parts 72 through 78 of this chapter with regard to the schedule and method(s) the source will use to achieve compliance with the acid rain emissions limitations.

☛ 71.5(c)(9) Compliance Certification

Comp	Incomp	N/A		
☒	☐	☐	**(i)**	Is a certification of compliance with all applicable requirements by a responsible official consistent with 18 AAC 50.205 and 18 AAC 50.326 included?
☒	☐	☐	**(ii)**	Is a statement of methods used for determining compliance, including a description of monitoring, recordkeeping, and reporting requirements and test methods included?
☒	☐	☐	**(iii)**	Is a schedule for submission of compliance certifications during the permit term, to be submitted no less frequently than annually, or more frequently if specified by the underlying applicable requirement or by the permitting authority? and
☐	☐	☒	**(iv)**	Is a statement indicating the source's compliance status with any applicable enhanced monitoring and compliance certification requirements of the Act included?

Comments:

☛ 71.5(c)(10) Acid Rain Forms

Comp	Incomp	N/A	
☐	☐	☒	Are the use of nationally-standardized forms for acid rain portions of permit applications and compliance plans, as required by regulations promulgated under parts 72 through 78 of this chapter included?

Comments:

☛ 18 AAC 50.326(c) and AS 46.14.150 Timely Application

Comp	Incomp	N/A		
☒	☐	☐	**(a)**	The owner and operator of a stationery source required to have an operating permit under this chapter shall submit the required application and other information required by the department by regulation no later than 12 months after the date on which the stationary source becomes subject to AS 46.12.120. Is the application timely?
☒	☐	☐	**(b)**	The department may accept and begin processing applications filed earlier than the submission date. Applications filed earlier may be given priority for permit issuance. Filed early?

☛ 18 AAC 50.326(c) and 18 AAC 50.400-18 AAC 50.430 Fees

Comp	Incomp	N/A	
☒	☐	☐	Correct retainer fee submitted with application?

Comments:

☛ 18 AAC 50.326(c) and AS 46.14.520 Confidentiality of Information

Comp	Incomp	N/A	
☐	☐	☒	Has the Permittee requested confidentiality? Records, report, and information, and parts of records, reports, and information, other than emission data, in the department's possession or control are considered confidential records and shall be kept confidential and in separate files if the owner and operator have certified under oath to the department or authorized local program that (1) public disclosure would tend to affect adversely the owner's and operator's competitive position; and (2) the records, reports or information, or parts of the records, reports, or information, would divulge production figures, sales figures, processes, production techniques, or financial data of the owner and operator that are entitled to protection as trade secrets under AS 45.50.910 – 45.50-945. Except as provided in AS 46.14.520, permits, permit application, emissions and monitoring reports compliance reports, certifications, and monitoring, reporting, and qualify assurance plans in the department's possession or control are available to the public for inspection and copying.

☛ 18 AAC 50.326(c) and 18 AAC 50.205. Certification

Comp	Incomp	N/A		
☒	☐	☐	**(a)**	Does the application include the following statement? Any permit application, report affirmation, or compliance certification required by the department under a permit program established under AS 46.14 or this chapter must include the signature of a responsible official for the permitted stationary source following the statement: "Based on information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate, and complete."

☒ ☐ ☐ **(b)** The department may accept an electronic signature on an electronic application or other electronic record required by the department under a permit program established under AS 46.14 or this chapter if

(1) a certifying authority reregistered under AS 09.25.510 verifies that the electronic signature I authentic; and

(2) the person providing the electronic signature has made an agreement, with the certifying authority described in (1) of this subsection, that the person accepts or agrees to be bound by an electronic record executed or adopted with t hat signature.

Comments:

☛ 18 AAC 50.326(d) Insignificant emission units

Comp	Incomp	N/A		
☒	☐	☐	**(1)**	All sources listed as insignificant must not be subject to: (A) a federal requirement adopted by reference in 18 AAC 50.040(a) - (d); (B) a source-specific requirement established under an ambient air quality investigation *[18 AAC 50.201]*, a construction permit, or an operating permit issued before January 18, 1997; (C) a stationary source-specific or emission unit-specific emission limitation.

Comments:

☒	☐	☐	**(2)**	Does the application list all requirements of 18 AAC 50.040(e) [40 C.F.R. 52.70 - 40 C.F.R. 52.96]; 18 AAC 50.050-075 [incinerators, municipal landfills, industrial processes and fuel-burning equipment; pulp mills, open burning, marine vessels and wood-fired heating device standards; and Volatile liquid storage tank emission standards and Volatile liquid loading rack and delivery tank requirements *[18 AAC 50.085 - 18 AAC 50.090]* that apply to insignificant sources at the facility?

Comments:

☒	☐	☐	**(3)**	Does the application lists all emission units at the stationary source that are identified as insignificant on an emission rate basis *[18 AAC 50.326(e)* or a size or production rate basis *[18 AAC 50.325(g)]*; sufficient documentation has been provided to determine whether a source has been appropriately listed as insignificant *[check facility operating reports]*?

Comments:

☒	☐	☐	**(4)**	Has all information been provided to evaluate the fee required under 18 AAC 50.410?

Comments:

☒	☐	☐	**(5)**	application includes compliance certification based on reasonable inquiry for insignificant emission units; a compliance certification made during the permit term according to the schedule proposed to satisfy 40 CFR 71.5(c)(9) must include insignificant emission units.

Comments:

☒	☐	☐	**(6)**	the applicant proposes conditions for monitoring, record keeping, and reporting if the conditions are necessary to assure compliance with requirements identified in (2) of this subsection.

Comments:

☛ 18 AAC 50.326(e) Insignificant emission units: Emission Rate Basis

Comp	Incomp	NA	
☒	☐	☐	If requested by the department, applicant has demonstrated that *actual* emissions of listed insignificant sources are less than the specified rate *[for example, a source is listed as "standby" or "emergency," but no operational limit is proposed]*.

Comments:

☛ 18 AAC 50.326(f) Insignificant emission unit: Category Basis

NOT A COMPLETENESS ITEM

☛ 18 AAC 50.326(g) Insignificant emission unit: Size or Production Rate Basis

Comp	Incomp	N/A	
☒	☐	☐	Has Applicant has demonstrated that **actual** emissions of listed insignificant sources are less than the specified rates shown in 18 AAC 50.326(e) *[a "combustion source" listed in 18 AAC 50.326 (g)(5) - (9) does **not** include diesel-fired electric generators; gasoline has a true vapor pressure greater than 80 mm Hg and gasoline storage tanks are **not** insignificant sources under 18 AAC 50.326(g)(3)]?*

Comments:

☛ 18 AAC 50.326(h) Insignificant Sources: Case-by-Case Basis

Comp	Incomp	N/A	
☒	☐	☐	The department has exercised its discretion in this case to determine that NPDES permitted ponds and lagoons, or small coffee roasters at this facility are insignificant sources.

☛ 18 AAC 50.326(i) Administratively Insignificant emission units

Comp	Incomp	N/A	
☐	☐	☒	Emissions from 1) the propulsion of mobile sources, 2) general vehicle maintenance (including vehicle exhaust), and 3) agricultural activities are considered Administratively Insignificant ***[Fugitive dust generated from operation of mobile sources or agricultural activities shall not be listed as insignificant]***

Comments: