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Exploration Plan
2010 Exploration Drilling Program
Posey Blocks 6713, 6714, 6763, 6764, and 6912
Karo Blocks 6864 and 7007
Burger, Crackerjack, and SW Shoebill Prospects
OCS Lease Sale 193
Chukchi Sea, Alaska

July 2009

Submitted to:

U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region

Submitted by:

Shell Gulf of Mexico Inc.
3601 C Street, Suite 1000
Anchorage, AK 99503

Exhibit 6
AEWC & ICAS

ER854

SECTION 1.0 EXPLORATION PLAN CONTENTS

a) Description, Objectives, and Schedule

This 2010 Exploration Plan (EP) with appendices, including an Environmental Impact Analysis (EIA) (Section 16 and Appendix F) describe the exploration drilling activities Shell Gulf of Mexico Inc. (Shell) plans to conduct in 2010 in the Chukchi Sea Outer Continental Shelf (OCS), Alaska. Shell has identified seven lease blocks within three prospects known as Burger, Crackerjack, and Southwest Shoebill (SW Shoebill) for its 2010 Chukchi Sea EP (Table 1.a-1). Shell has identified a single potential drill site within five of these lease blocks for 2010. These five possible drill sites for exploration are addressed in this EP.

TABLE 1.a-1
Shell Lease Blocks Identified in the 2010 EP for the Chukchi Sea

Shell Prospect	Area	Protraction	Lease Block	Shell Lease
Burger	Posey	NR03-02	6713	OCS-Y-2266
Burger	Posey	NR03-02	6714	OCS-Y-2267
Burger	Posey	NR03-02	6763	OCS-Y-2279
Burger	Posey	NR03-02	6764	OCS-Y-2280
Burger	Posey	NR03-02	6912	OCS-Y-2321
Crackerjack	Karo	NR03-01	6864	OCS-Y- 2111
SW Shoebill	Karo	NR03-01	7007	OCS-Y- 2142

Three possible drill sites (one per block) are located on three different blocks (6714, 6764 and 6912) in the Burger Prospect, one is on a single block (6864) in the Crackerjack Prospect, and one is on a single block (7007) in the SW Shoebill Prospect. Shell plans to drill exploration wells to total depth (TD) at three of these five possible drill sites in 2010 given favorable ice conditions, weather, sea state, and any other pertinent factors. Shallow hazards data have been collected at each of these drill sites, and each drill site has been reviewed for potential shallow hazards and archaeological evidence. Formal reports for each of these drill sites have been submitted to the U.S. Department of the Interior, Minerals Management Service (MMS) under separate cover. Each of these five drill sites will be permitted for drilling in 2010 to allow for operational flexibility in the event sea ice conditions prevent access to one or more locations. Shell will only drill a maximum of three (3) wells in 2010. Applications for Permits to Drill will be submitted to MMS prior to the 2010 drilling season.

The actual order of drilling activities will be controlled by a complex interplay between actual ice conditions immediately prior to a rig move, ice forecasts, any regulatory restrictions with respect to the dates of allowed operating windows, whether the planned drilling activity involves only drilling the shallow non-objective section or penetrating potential hydrocarbon zones, the availability of permitted sites having approved shallow hazards clearance, the anticipated duration of each contemplated drilling activity, and the results of preceding wells. Any of these factors, individually or in combination, may cause a predicted annual activity plan to be altered at short notice.

Given favorable conditions, it is anticipated that the initial drilling activity will begin at the Burger Prospect. If Burger is not accessible, then the next preferred location to begin the exploration drilling, if favorable conditions exist, is at the SW Shoebill Prospect. If neither the Burger nor SW Shoebill Prospects are accessible, then the Crackerjack Prospect, if open, will be the site of initial exploration drilling well. It should be noted that focus of the 2010 drilling program will be shifted immediately to the Burger Prospect as soon as it becomes safe to anchor and operate the drillship on that Prospect. Given favorable drilling performance and subsurface results at the initial Burger drill site, another of the permitted drill sites in the Burger Prospect may be the next well drilled.

The number of actual wells that will be drilled will depend on ice conditions and the length of time available for the 2010 drilling season. The predicted "average" drilling season, constrained by prevailing ice conditions and regulatory restrictions, is long enough for two to three typical exploration wells to be drilled from spud to TD.

The ice reinforced drillship M/V *Frontier Discoverer* (*Discoverer*) will move into the Chukchi Sea on or about July 1 and onto the prospects when ice allows on or about July 4. Drilling will be curtailed on or before October 31 as per existing Alaska Department of Environmental Conservation (ADEC) regulations. The drillship and support vessels will exit the Chukchi Sea at the conclusion of the drilling season.

Based on past experience and current planning, Shell expects to drill up to three exploration wells during the 2010 timeframe of this EP, but the actual number may be less. The exploration wells will be plugged and abandoned in compliance with MMS regulations after drilling operations have been completed. It is likely that during the period covered by this EP that a well may be started, temporarily abandoned due to ice conditions and finished later in the same drilling season. This was an operational reality during the 1989 – 1991 Chukchi drilling campaign.

Resupply will be from Dutch Harbor, Wainwright or Barrow using a coastwise qualified vessel. Aviation operations will be conducted from Barrow and Wainwright to minimize flying time over water. These are the plans only for the 2010 exploration drilling campaign and do not reflect Shell's longer term commitments for shorebases or other facilities needed to support future exploration drilling plans or development of any of its Chukchi Sea prospects.

b) <u>Location</u>

OCS Lease Sale 193 was held in February 2008 and Shell was subsequently awarded 275 leases (blocks) through a competitive bidding process. The locations of these lease blocks are depicted in Figure 1.b-1. The seven blocks identified for the three prospects (Burger, Crackerjack and SW Shoebill) contained in this exploration plan are described above in Table 1.a-1, and their locations are indicated on Figure 1.b-1. Locations of the five drill sites are indicated in Figure 1.b-2 and Figure 1.b-3 for the three prospects included in this EP. Coordinates of the surface locations of these drill sites are presented below in Table 1.b-1. Surface and bottomhole coordinates, OCS Area name and block number, lease number, distance from block line, and other information for each of the drill sites are provided on the respective OCS Plan Information Forms (MMS Form-137) in Appendix A.

TABLE 1.b-1
Proposed Drill Sites – Burger, Crackerjack, and SW Shoebill Prospects, Chukchi Sea

Prospect	Well	Area	Block	Lease Number	[1]Coordinates, m X	Y	Latitude	Longitude
Burger	C	Posey	6764	OCS-Y-2280	563929.70	7912335.98	N71° 18' 17.2739"	W163° 12' 45.9891"
Burger	F	Posey	6714	OCS-Y-2267	564063.30	7915956.94	N71° 20' 13.9640"	W163° 12' 21.7460"
Burger	J	Posey	6912	OCS-Y-2321	555036.01	7897424.42	N71° 10' 24.0292"	W163° 28' 18.5219"
Crackerjack	C	Karo	6864	OCS-Y-2111	455609.48	7903840.77	N71° 13' 58.9211"	W166° 14' 10.7889"
SW Shoebill	C	Karo	7007	OCS-Y-2142	419386.88	7887070.89	N71° 04' 24.4163"	W167° 13' 38.0886"

Notes:
[1] Coordinate system is NAD 83 UTM Zone 3

incorporating increased greenhouse gas concentrations, have not been realized by 20th century observations of the AO/NAO patterns (Fyfe 2003). Recent studies at the Woods Hole Oceanographic Institution (WHOI) using measurements from a brain coral have indicated that anthropogenic warming does not seem to alter the polarity of oscillation phase on a multi-decadal timescale. However, the variability of phase changes appears to be increasing, which could increase the severity of storms and droughts (WHOI 2009).

The Council on Environmental Quality has issued draft guidance under NEPA indicating that climate change is a reasonably foreseeable impact of greenhouse gas (GHG) emissions. [Memorandum] In 2005, the total GHG emission from all state-wide Alaska sources was estimated to be 53 million metric tons (MMt) of carbon dioxide equivalent (CO2eq). Large industrial sources in Alaska accounted for 20.6 MMt CO2eq; total industrial sources accounted for 24.6 MMt CO2eq. The Alaska oil and gas industry accounted for 15.3 MMt CO2 of the industrial source total. For comparison the Alaska total transportation sector accounted for almost 19 MMt CO2eq (ADEC 2008a). Preliminary estimates of GHG emissions for the Shell operations are 20,000 tons CO_2 from the *Discoverer* itself and about 55,000 tons CO_2 from the *Discoverer* and its support vessels.

There are few historic data for establishing climatic trends in the Arctic; the meteorological station density in Alaska is one station per 38,600 mi^2 (100,000 km^2). The overall temperature trend increased during the 20th century; however, a period of decreasing temperatures occurred between the mid-1940s and mid-1960s. Between 1900 and 2003, data from the Global Historical Climatology Network database (Peterson and Vose 1997) and Climate Research Unit database (Jones and Moberg 2003) dataset indicate a warming trend of 0.16 degrees Fahrenheit (°F) (0.09 degrees Celsius[°C]) per decade (ACIA 2005).

In Northwestern North America, between 1966 and 2003, arctic temperatures increased 1.8 – 2.6 °F (1-2 °C). In Alaska, the average temperature change between 1947 and 2008 was 3.1 °F (1.7 °C); individual stations in Kodiak and Barrow recorded the lowest and highest temperature changes of 1.0 °F (0.5 °C) and 4.3 °F (2.4 °C), respectively. The most dramatic temperature change for Alaska is during the winter when the average temperature increase has been 6.0 °F (3.3°C). The increase is not linear and reflects the polarity of the PDO. A cooling stage from 1949 to 1976 abruptly changed as the PDO moved into a positive phase. Since that time, there has been very little temperature change in most of Alaska except in Barrow and Talkeetna with increases of 4.0 °F (2.2 °C) and 2.2 °F (1.2 °C), respectively, and a decrease of 2.3 °F (1.3 °C) in Kodiak (Alaska Climate Research Center 2009).

Climate models project more warming in the Arctic compared with the rest of the world (IPCC 2007). At this time there is no definitive evidence of an anthropogenic signal in the Arctic causing this warming. Data are fewer and natural fluctuations are greater in the Arctic than the rest of the world, making it challenging to detect any anthropomorphic signal (ACIA 2005). Temperature variations in Eurasian and North American regional studies are probably not due to natural variability alone (Karoly et al. 2003, Zwiers and Zhang 2003 and Stott et al. 2003) and tend to support the conclusion that temperature variations in North America and Eurasia probably are not due to natural variability alone.

Traditional knowledge can provide additional insight to arctic climate changes. Alaskan Natives who live within coastal communities along the Bering, Chukchi, and Beaufort Seas have noticed changes in the weather, oceans, and resources. Over the last 20 years, extreme weather such as strong winds and storms are increasing from Elim to Barrow (ACIA 2005). "Weather temperatures have been warmer in recent years than they have been in the past." (Shell 2008). Warming conditions have affected sea ice as well. Increased temperatures and winds prevent the sea ice from setting up in the fall delaying the freezing season; early spring melting decreases the

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2010 Outer Continental Shelf Lease Exploration Plan Camden Bay, Alaska

June 2009

Submitted to:

U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region

Prepared by:

Shell Offshore Inc.
3601 C Street, Suite 1000
Anchorage, AK 99503

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SECTION 1.0 PLAN CONTENTS

a) Description, Objectives and Schedule

Shell Offshore Inc. (Shell) is proposing to conduct an exploration drilling program on U.S. Department of the Interior, Minerals Management Service (MMS) Alaska Outer Continental Shelf (OCS) leases located north of Point Thomson near Camden Bay in the Beaufort Sea during the 2010 drilling season (*Camden Bay 2010 Exploration Plan*, hereinafter, "*Camden Bay 2010 EP*," or simply, "*EP*") (Figure 1-1).

The leases were acquired during the Beaufort Sea Oil and Gas Lease Sales 195 (March 2005) and 202 (April 2007). In this EP Shell plans to drill two wells, one each on the Torpedo prospect (NR06-04 Flaxman Island lease block 6610, OCS-Y-1941 [Flaxman Island 6610]) and the Sivulliq prospect (NR06-04 Flaxman Island lease block 6658, OCS-Y 1805 [Flaxman Island 6658]). The planned drill site locations are: Torpedo H – latitude 70º 27' 01.6193" N and longitude 145º 49' 32.0650" W; and Sivulliq N – latitude 70º 23' 29.5814" N and longitude 145º 58' 52.5284" W. All drilling is planned to be vertical; therefore bottomhole locations will have the same latitude and longitude as surface locations.

Shell plans to drill the Torpedo H drill site first, followed by Sivulliq N, unless adverse surface conditions or other factors dictate a reversal of drilling sequence. In that case, Shell will mobilize to the Sivulliq N drill site and drill this well first.

The ice reinforced drillship Motor Vessel (M/V) *Frontier Discoverer* (*Discoverer*) will be used to drill the wells. Drillship specifications for the *Discoverer* are located at the end of this section. While on location at the drill sites, the *Discoverer* will be affixed to the seafloor using eight 7-ton Stevpris anchors arranged in a radial array.

During the 2010 drilling season, the *Discoverer* will be attended by a minimum of six vessels that will be used for ice management, anchor handling, oil spill response (OSR), refueling, resupply, and servicing of the drilling operations (see Section 13.0). The ice management vessels will consist of an icebreaker and an anchor handler.

Resupply will be from West Dock to the drill sites and use a coastwise qualified vessel. An ice-capable OSR barge (OSRB), with an associated tug will be located nearby during the planned drilling program. The OSRB will be supported by a berthing vessel for the OSR crew. An OSR tanker also will be nearby for its storage capability of recovered liquids. A vessel will support the Marine Mammal Monitoring and Mitigation Plan (4MP) activities associated with the drilling program.

The *Discoverer* and associated support vessels will transit through the Bering Strait into the Chukchi Sea on or about July 1, arriving on location near Camden Bay approximately July 10. Exploration drilling activities at the Sivulliq or Torpedo drill sites are planned to begin on or about July 10 and run through October 31, 2010, with a suspension of all operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. The *Discoverer* and support vessels will either leave the Camden Bay project area and will return to resume activities after the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts conclude or will leave the Beaufort Sea entirely. Activities will extend through October 31, depending on ice and weather.

Helicopters are planned to provide support for crew change, provision resupply, and search-and-rescue operations during the drilling season. The aircraft operations will principally be based in Deadhorse, Alaska. See Section 13.0 for additional information.

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URL: http://yosemite.epa.gov/R10/airpage.nsf/Permits/beaufortap
Last updated on Saturday, May 8th, 2010.

Region 10: the Pacific Northwest

You are here: EPA Home Region 10 Air Page Permits beaufortap

Shell Offshore Inc. Beaufort Sea Air Permit Application

Final Decision to Issue an OCS/PSD Permit to Shell Offshore Inc., for Exploration Drilling Operations in the Beaufort Sea

On this page:

- Summary
- Permit Documents
  - Final Permit
  - Public Comments
  - Public Hearing Testimony
  - Proposed Permit
  - Permit Application Materials
  - EPA Responses
  - NPDES Notices of Intent
- Other Location to Review Documents
- Arctic NPDES General Permit
- Contacts

OCS/PSD Permits

- Outer Continental Shelf (OCS) Air Permits
- Shell's Chukchi Sea OCS/PSD Permit
- New Source Review (NSR)/Prevention of Significant Deterioration (PSD) Construction Permits
- Terminated Shell Kulluk Vessel Drilling Permit

Contact Us:

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You will need Adobe Reader to view some of the files on this page. See EPA's PDF page to learn more.

Summary

On February 17, 2010, the Region 10 office of the United States Environmental Protection Agency (EPA) requested public comment on a proposal to issue an Outer Continental Shelf (OCS)/Prevention of Significant Deterioration (PSD) permit to Shell Offshore, Inc. (Shell). The proposed permit would authorize Shell to conduct a multi-year exploratory oil and gas drilling program with the Frontier Discoverer drillship and support fleet on Shell's current leases in Lease Sales 195 and 202 on the Beaufort Sea OCS, within and beyond 25 miles of the State of Alaska's seaward boundary.

During the public comment period on the proposed permit, which ended on March 22, 2010, EPA received numerous written and oral comments regarding the project. EPA has carefully reviewed each of the comments submitted and, after consideration of the expressed view of all interested persons, the pertinent federal statues and regulations, and additional material relevant to the application and contained in the administrative record, EPA has made a decision in accordance with 40 CFR 52.21 and 40 CFR Part 55 to issue a final OCS/PSD permit to Shell. Challenges to this permit must be filed with the Environmental Appeals Board by May 12, 2010.

Permit Documents:

Final Permit:

- Final Shell Beaufort OCS/PSD Permit (PDF) (92pp., 454KB) - April 9, 2010
  - Redlined version of Shell Beaufort OCS/PSD Permit (PDF) (92 pp, 1.1MB) Note: This redlined version is a reference tool for comparison only. Please refer to the final permit to ensure accuracy.
- Shell Beaufort Sea OCS/PSD permit Response to Comments (PDF) (83pp, 419K) - April 9, 2010
  - Shell Chukchi Sea OCS/PSD Permit Response to Comments (PDF) (155pp, 686k) - March 31, 2010

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- Final Beaufort Permit Announcement (PDF) (3pp., 21KB)

Public Comments:

Date Received:	Document Received:
February 24, 2010	North Slope Borough's Request for Comment Period Extension of 15 days (PDF) (2 pp, 73K)
March 1, 2010	EPA's Response Denying North Slope Borough's Request for Comment Period Extension (PDF) (2 pp, 18K)
March 10, 2010	Ukpeagvik Inupiat Corporation Comments on the Proposed Shell Beaufort Air Permit (PDF) (2 pp, 335K)
March 17, 2010	Leah Frankson's Comments on the Proposed Shell Beaufort Air Permit (PDF) (1 page, 30K)
March 18, 2010	Alaska Department of Environmental Conservation's comments on the Proposed Beaufort Sea OCS Air Permit (PDF) (2 pp, 44K)
March 18, 2010	Delbert Rexford Public Hearing Comments on the Proposed Shell Beaufort Air Permit (PDF) (2 pp, 46K)
March 18, 2010	Minerals Management Service Comments on the Proposed Shell Beaufort Air Permit (PDF) (6 pp, 346K)
March 22, 2010	Statoil Comments Shell Beaufort air permit (PDF) (5pp., 2.9MB)
March 22, 2010	Anadarko Petroleum Corporation Comments on the Proposed Shell Beaufort Air Permit (PDF) (5 pp, 158K)
March 22, 2010	Alaska Eskimo Whaling Commission (AEWC), Inupiat Community of the Arctic Slope (ICAS), and North Slope Borough's (NSB) Comments on the Proposed Shell Beaufort Air Permit (PDF) (72 pp, 1MB) • AEWC, ICAS, and NSB's Public Comment Attachments (PDF) (404 pp, 16.2MB)
March 22, 2010	Center for Biological Diversity Comments on the Proposed Shell Beaufort Air Permit (PDF) (6 pp, 74K)
March 22, 2010	ConocoPhillips Comments on the Proposed Shell Beaufort Air Permit (PDF) (16 pp, 297K)
March 22, 2010	Multiple Conservation Groups Combined Comments on the Proposed Shell Beaufort Air Permit (PDF) (36 pp, 201K)
March 22, 2010	Native Village of Point Hope Comments on the Proposed Shell Beaufort Air Permit (PDF) (4 pp, 86K)
March 22, 2010	Shell Offshore Inc Comments on the Proposed Shell Beaufort Air Permit (PDF) (18 pp, 594K)
March 23, 2010	City of Nuiqsut Comments on the Proposed Shell Beaufort Air Permit (PDF) (7 pp, 239K)
March 23, 2010	The Wilderness Society Comments on the Proposed Shell Beaufort Air Permit (PDF) (1 pp, 30K)

Public Hearing Testimony:

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Date:	Document:
March 16, 2010	Kaktovik, Alaska - Shell Offshore Inc., Public Hearing Testimonials (PDF) (14pp., 63KB)
March 17, 2010	Nuiqsut, Alaska - Shell Offshore Inc., Public Hearing Testimonials (PDF) (18pp., 63KB)
March 18, 2010	Barrow, Alaska - Shell Offshore Inc., Public Hearing Testimonials (PDF) (12pp., 58KB)

Proposed Permit:

Date:	Document:
February 17, 2010	EPA Public Notice/Information Sheet (PDF) (4 pp, 279K)
February 17, 2010	EPA Shell Beaufort Proposed OCS/PSD Permit (PDF) (85 pp, 469K)
February 17, 2010	EPA Statement of Basis for the Shell Beaufort Proposed OCS/PSD Permit (PDF) (141 pp, 1.3MB)
February 17, 2010	EPA Statement of Basis Appendix A Criteria Pollutant Emissions Inventory (PDF) (44pp., 374KB)

Permit Application Materials:

Date Received:	Document Received:
January 18, 2010	Shell Offshore Inc. - Revised Permit Application (PDF) (444 pp, 4.8MB)

EPA Responses:

Date:	Document:
February 11, 2010	EPA Letter to Shell RE: Beaufort Completeness (PDF) (1 pp, 39K)

NPDES Notices of Intent

Date:	Document:
May 5, 2009	NOI for Lease #OCS-Y-1941 Block #6610 (Torpedo) [Beaufort Sea] (PDF) (9 pp, 444K)
May 5, 2009	NOI for Lease #OCS-Y-1805 Block #6658 (Sivulliq) [Beaufort Sea] (PDF) (9 pp, 421K)

Other Location to Review Documents

The permit record includes Shell's application, all documents in the record for the final permit, the response to comments, and statement of basis, and all other materials relied on by EPA. The permit record for the proposed permit is available at the EPA Region 10 Library, 1200 6th Ave, Seattle, Wash., 9 am–12 pm and 1 pm–4 pm Monday-Friday. The final permit and EPA's response to public

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comments will also be available at the locations listed below.

· **Kaktovik City Office,** 2051 Barter Avenue, Kaktovik, Alaska, 907-640-6313

· **Nuiqsut City Office,** 2230 2nd Avenue, Nuiqsut, Alaska, 907-480-6727
· **Barrow City Office,** 2022 Ahkovak Street, Barrow, Alaska, 907-852-4050

· **EPA Alaska Office,** Federal Building, 222 West 7th Ave., #19 Anchorage, Alaska, 907-271-5083

Arctic NPDES General Permit

Shell's proposed drilling activities also include wastewater discharges to the Beaufort Sea, which are regulated under the National Pollutant Discharge Elimination System (NPDES). In 2006, EPA issued the Arctic NPDES General Permit (AKG-28-0000) to authorize discharges from oil and gas exploration activities in state and federal waters on the outer continental shelf in the Beaufort Sea, Chukchi Sea, Hope Basin, and northern Norton Basin, if the facilities meet the permit terms and conditions. This permit expires in 2011.

Shell submitted two notices of intent (NOIs) requesting coverage under the Arctic General Permit for wastewater discharges related to its proposed exploration activities for lease block 6610 [Torpedo] (PDF) (9 pp, 445K) and lease block 6658 [Sivulliq] (PDF) (9 pp, 421K) in the Camden Bay within the Beaufort Sea.

EPA will decide whether to grant coverage for Shell under the Arctic NPDES General Permit following the end of the public and tribal review period. **EPA is accepting public and tribal input on Shell's Beaufort NOIs until March 22, 2010.**

Contacts:

To learn more about the Air Permit:
Natasha Greaves, Alaska, Oil and Gas Sector Lead, (206) 553-7079, fax: (206) 553-0404, or Greaves.Natasha@epa.gov
Suzanne Skadowski, community involvement coordinator for Chukchi and Beaufort air permit applications: (206) 553-6689 or skadowski.suzanne@epa.gov

To learn more about the Arctic NPDES General Permit or to comment on Shell's Beaufort NOIs:
Hanh Shaw - NPDES Permit Writer: (206) 553-0171 or shaw.hanh@epa.gov

If you would like to be added to our **mailing list** to receive future information about this permit or other OCS permitting in Alaska, contact Suzanne Skadowski (skadowski.suzanne@epa.gov) at (206) 553-6689.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
SEATTLE, WASHINGTON

STATEMENT OF BASIS
FOR PROPOSED
OUTER CONTINENTAL SHELF
PREVENTION OF SIGNIFICANT DETERIORATION
PERMIT NO. R10OCS/PSD-AK-09-01

SHELL GULF OF MEXICO INC.
FRONTIER DISCOVERER DRILLSHIP
CHUKCHI SEA EXPLORATION DRILLING PROGRAM

Prepared by: Pat Nair P.E., Senior Environmental Engineer
Herman Wong, Atmospheric Scientist
Paul Boys P.E., Senior Environmental Engineer

Date of Proposed Permit: August 14, 2009

Exhibit 8
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Table 2.1 - Potential to Emit for Regulated NSR Pollutants

Pollutant	Potential to Emit, tpy	Significant Emission Rate, tpy
CO	762	100
NO_x	1965	40
PM	260	25
$PM_{2.5}$ (precursors NO_x and SO_2)	184	10 (40 for NO_x or SO_2)
PM_{10}	210	15
SO_2	181	40
VOC	166	40
Lead	0.14	0.6
Ozone (precursors VOC and NO_x)	NA	40 for VOC or NO_x
Fluorides	0	3
Sulfuric acid mist	0	7
Hydrogen sulfide	0	10
Total reduced sulfur	0	10
Reduced sulfur compounds	0	10
Municipal waste combustor organics	3.66×10^{-7}	3.5×10^{-6}
Municipal waste combustor metals	0.125	15
Municipal waste combustor acid gases	4.45	40
Municipal solid waste landfill emissions	NA	50
Title VI, Class I or II substance	< 1	*

* In 1996, EPA proposed a significant emission rate of 100 tpy for this category of pollutant and received no adverse comments on this issue. EPA subsequently concluded that PSD review is not necessary for this category of pollutants where they would be potentially emitted at substantially less than 100 tpy. (EPA 1998a and b)

Because exploration drilling programs are not included in the list of source categories subject to a 100-tpy applicability threshold, the requirements of the PSD program apply if the project PTE is at least 250 tpy. From Table 2-1, it is evident that Shell's Chukchi exploration drilling program is a major PSD source because emissions of CO, NO_x, and PM exceed the major source applicability threshold of 250 tpy. In addition, emissions of CO, NO_x, PM, $PM_{2.5}$, PM_{10}, SO_2 and VOC exceed the significant emission rate for each such pollutant. Consequently, pursuant to 40 CFR § 52.21(j)(2), Shell is required to apply BACT for each of these pollutants. Section 4 contains a discussion of the BACT analysis for each of these pollutants. Additionally, and consistent with 40 CFR §§ 52.21(k) and (m), Shell is required in its permit application to include an analysis of ambient air quality for each of these pollutants and a demonstration that it will not

5.2.7 Ozone

Because NO_x and VOC net emissions exceed 100 tons per year, Shell is required under the 40 CFR § 52.21(i)(5) to perform an ambient air quality impact analysis, including gathering ambient air measurements, of ozone. Ozone is formed in atmosphere through a chemical reaction that includes NO_x, VOC and CO in the presence of sunlight. The sources of these air pollutants are mainly combustion sources such as power plants, refineries and automobiles. Over the past ten years, monitoring programs have measured ozone and ozone precursors (i.e., NO_x and VOC) on the North Slope in the area where the oil and gas operations are currently located. Ozone levels at these locations are higher than the levels that have been collected at the Wainwright monitoring site. Shell expects to emit approximately 2818 tons per year of NO_x and roughly 107 tons per year of VOC ozone precursor emissions. These precursor emissions and it contribution to the formation of ozone is expected to be small.

5.2.8 Results of NAAQS Demonstration

All of the modeled operating scenarios for the Discoverer and its Associated Fleet resulted in predicted total concentration impacts, including existing background data, below the level of the NAAQS. Tables 11 and 12a through 12c to Appendix B show the predicted and total impacts for the primary operating scenarios and modeled secondary operating scenarios. The levels range from a low of 7.10% of the 3-hour SO_2 NAAQS to a high of 96% of the 24-hour $PM_{2.5}$ NAAQS In addition Table 13 to Appendix B shows the predicted total concentration impacts at Point Lay and Wainwright, the two nearest villages to Shell's leases in Lease Sale 193. In these villages, the total predicted impacts for $SO_{2,}$ NO_x, and CO are less than 11% of their respective NAAQS and the total predicted impacts for PM_{10} and $PM_{2.5}$ are less than 50% of their respective NAAQS. Thus, the modeling demonstrates that emissions associated with the proposed permit are not expected to cause or contribute to a violation of the applicable NAAQS.

5.2.9 Results of Increment Demonstration

All of the modeled operating scenarios for the Discoverer and its Associated Fleet resulted in predicted concentration impacts below the Class II increments. Table 5-1 below shows the predicted concentration impact for Primary Operating Scenario 1 as compared to the PSD increments for Class II areas:

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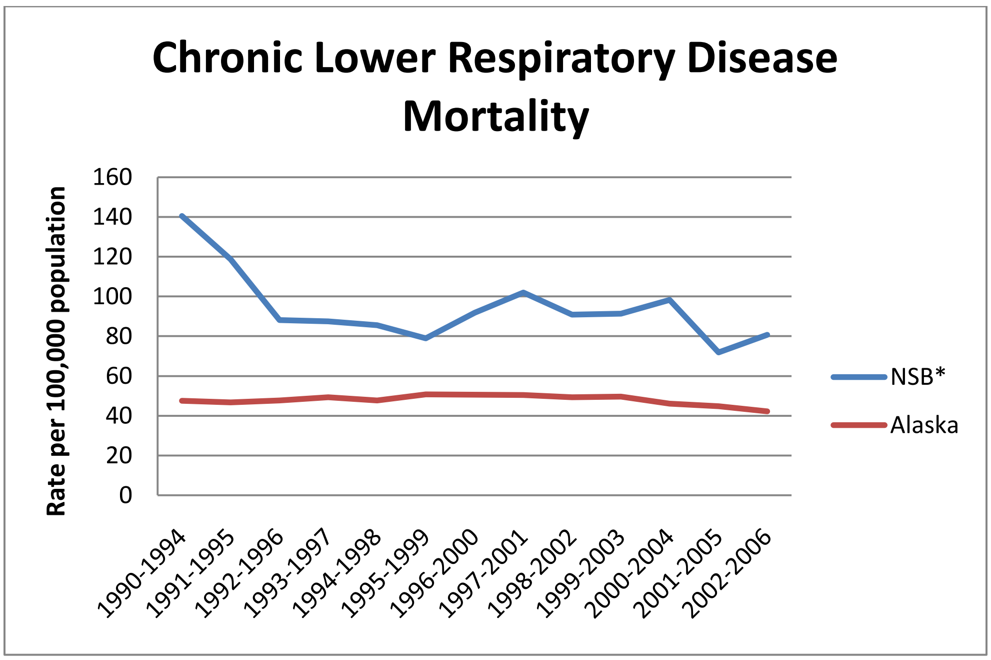
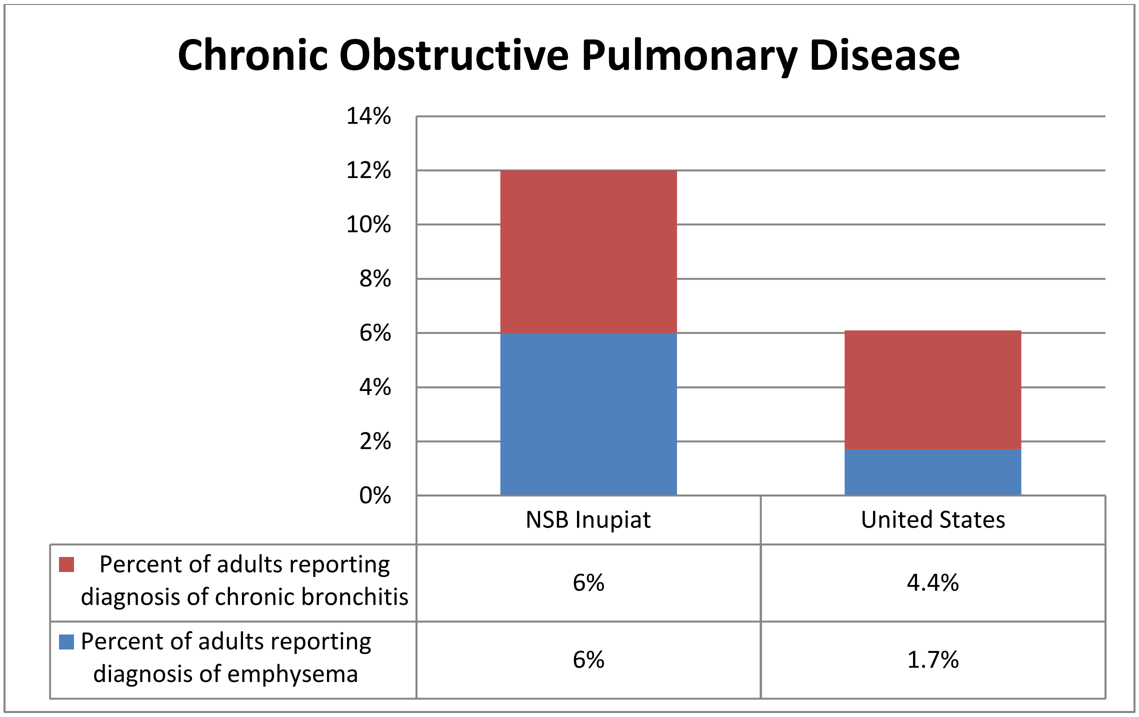
Chronic lower respiratory disease: Chronic lower respiratory disease (CLRD) and chronic lung disease are general terms that describe a number of respiratory ailments that involve irreversible damage to the lungs and reduced lung function. The most common form in adults is chronic obstructive pulmonary disease (COPD), a disease which includes both emphysema and chronic bronchitis. In this country, COPD is primarily due to cigarette smoking, although environmental and genetic factors also play a role. Also included in this general category are less common diseases such as bronchiectasis and cystic fibrosis. Data on chronic respiratory disease are limited in Alaska.

CLRD emerged as a leading cause of death in the NSB in the mid-1980'S and has been the 5th leading cause of death for most years since 1990 in the borough. Mortality rates from CLRD remain almost twice statewide rates. Statewide, COPD death rates are higher among Alaska Natives than among whites.



Source: Alaska Bureau of Vital Statistics
Age-adjusted to 2000 US Census standard population

Inupiat in the NSB appear to report COPD at higher rates than do non-institutionalized U.S. adults. The data from the two surveys illustrated below are not adjusted for age differences in the population, and the survey methodologies were substantially different. These prevalence data are self-reported, thus subject to the biases and inaccuracies inherent in self-reported data. Thus, comparisons must be made with caution. The data do, however, suggest a higher prevalence of COPD in NSB Inupiat, compared with national prevalence estimates.



	NSB Inupiat	United States
Percent of adults reporting diagnosis of chronic bronchitis	6%	4.4%
Percent of adults reporting diagnosis of emphysema	6%	1.7%

NSB data source: Survey of Living Conditions in the Arctic (Inupiat aged 16 and over, told by a health professional that they have emphysema, chronic bronchitis)
US data source: Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2008 (non-institutionalized adults, ever diagnosed with emphysema, diagnosed with chronic bronchitis in the past year)

In the statewide analysis of CHAP practice, chronic lung disease accounted for 25% of all lung problems assessed in NSB village clinics. Overall, the pattern of lung problems seen in NSB villages was similar to statewide data within the Alaska Native rural health system. (Golnick, 2009)

Hospitalization for pneumonia is far more common among those with chronic lung disease than among those without. At Samuel Simmonds Memorial Hospital, pneumonia and exacerbation of COPD were the first and second most common admitting diagnosis (other than childbirth) (NPIRS).

Chronic lower respiratory disease among children: Chronic lower respiratory disease in rural Alaskan children and has been studied primarily in the Yukon-Kuskokwim Delta. In one study, an estimated 21.5% of Alaska Native children in the Yukon-Kuskokwim Delta region experienced chronic productive cough without asthma diagnosis or symptoms. Similar studies have not been conducted in the NSB.

NSB census data

FACTORS INFLUENCING ASTHMA AND OTHER LOWER RESPIRATORY PROBLEMS:

Asthma: The causes of asthma are not completely understood. Children who have had a severe viral pneumonia as infants, particularly from respiratory syncitial virus (RSV), are more likely to experience asthma (Thomsen, 2009) during childhood. Children living in poverty are more likely to experience asthma than children who are not poor. This increased risk is likely conferred by a number of factors associated with poverty. Numerous environmental factors are known to trigger asthma symptoms:

- Indoor air quality: Exposures to tobacco and other types of smoke are known triggers for exacerbations of asthma symptoms, and they are associated with other forms of chronic lung disease, particularly emphysema.   NSB smoking in household question
- Outdoor air quality: Children living in proximity to roadways have more symptoms, decreased lung function, more hospitalizations, increased incidence of asthma (Asthma in Alaska 2007 Report). This association with traffic density is thought to be due to increased exposure to a number of components of vehicle exhaust, as well as increased aeresolization of dust and silt. Evidence suggests that course particulate matter such as dust is associated with increased outpatient visits and quick-relief asthma medication use among children. (Chimonas 2006) See physical environment section
- Viral respiratory infections, such as colds and flu, are frequent triggers of asthma exacerbations
- Molds, pollen, animal dander, and other allergens can trigger asthma symptoms in susceptible persons

Chronic lung disease: By far the most important risk factor for chronic lower respiratory disease in the US is smoking. In the US, COPD is associated with history of cigarette smoking in 80-90% of cases (Wise 2007). Thus, the high rates of COPD and mortality from chronic lung disease are not surprising given the high rates of tobacco smoking in the NSB, discussed earlier.

Recurrent and severe lower respiratory infections during infancy and childhood also increase the risk of developing certain types of chronic lung disease and reduced lung function. Indoor and outdoor air pollution, dust and chemicals in the workplace, and second-hand tobacco smoke also play a role in the development of chronic lung disease. In more developed countries, these environmental factors may contribute between 10 and 30% of the disease burden of COPD (Pruss-Ustun 2006). Air quality data are very limited in the NSB.

Alaska Bureau of Vital Statistics (ABVS):   http://www.hss.state.ak.us/dph/bvs/data/default.htm

Survey of Living Conditions in the Arctic (SLiCA): http://www.iser.uaa.alaska.edu/projects/Living_Conditions/index.htm

Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2008. Data accessed on-line through DCD Faststats A to Z at http://www.cdc.gov/nchs/fastats

Golnick CL. Alaska Community Health Aide/Practitioner Clinical Practice Description
http://www.akchap.org/Essential%20CHAP%20Docs/Temp_docs/CHAP%20Clinical%20Practice%201209Golnick.pdf

Asthma in Alaska 2007 Report: A Report on the Burden of Asthma in Alaska. Mary Ellen Gordian and Brian Saylor. Institute for Circumpolar Health Studies, University of Anchorage. Accessed on-line at http://www.ichs.uaa.alaska.edu/research/reports/asthma_burden_2007.pdf

Chimonas MR, Gessner BD. "Airborne particulate matter from primarily geologic, non-industrial sources at levels below national Ambient Air Quality Standards is associated with outpatient visits for asthma and quick-relief medication prescriptions among children less than 20 years old enrolled in Medicaid in Anchorage, Alaska." *Environmental Research* 102 (2007) 397-404.

Pruss-Ustun A, Corvalan C, "Preventing Disease through Healthy Environments: Towards an estimate of the environmental burden of disease.": World Health Organization, 2006.
http://www.who.int/quantifying_ehimpacts/publications/preventingdisease/en/

Indian Health Service National Patient Information and Reporting System/National Data Warehouse (NPIRS/NDW), Department of Health and Human Services, Indian Health Services:
http://www.ihs.gov/CIO/DataQuality/warehouse/

Wise RA, Tashkin DP. Preventing chronic obstructive pulmonary disease: what is known and what needs to be done to make a difference to the patient? Am J Med 2007;120:S14–S22.

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Volume 112, Issue 1, Pages 7-13
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Alaska Native Cancer epidemiology in the Arctic

RJ Bowerman, Dr

Accepted 5 September 1997.

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Abstract

Cancer incidence and its possible relation to environmental contaminants, including radiation, continues to be a perceived health threat for the arctic-dwelling Alaska Native (Inupiat Eskimo) people despite the lack of a direct link to high-dose exposure. To better understand this concern, all known malignancies diagnosed in this population (n = 177) in three consecutive eight-year periods (1971–1994) were evaluated.

The most recent average incidence rate (age-adjusted to world standard population) of 315 per 100 000 (95% confidence interval, CI = 248–382) represents a 33% surge (albeit non-significant) in Alaska Native cancer incidence over the initial period studied. The male rate 366 (95% CI = 266–466) for the same period exceeds the female rate 258 (95% CI = 169–347) by 42%. Two patterns of cancer incidence are seen at the village level. One, a 24 y upward trend found in the villages of Barrow, Point Hope and Kaktovik (combined rate of increase significant [P = 0.047]) associated with lung cancer; and the other, a stable trend over the past 16 y, associated with colon and rectal cancer. Lung cancer is the predominant cancer by site and is primarily a male disease. The recent male lung cancer incidence rate of 137 (95% CI = 73–201) exceeds the female rate by greater than five times. Total lung cancer cases are primarily confined to four villages where the incidence significantly (P = 0.0043) exceeds the remaining population. The major female cancers are colon/rectal and breast with cancer of the cervix virtually eliminated. Breast cancer is found primarily in two villages where its excess is significant (P = 0.025).

Inupiat Eskimo cancer epidemiology is unique, differing from both the Alaska Native and other Circumpolar populations. At present, this uniqueness cannot be explained by an overt environmental contaminant exposure. Although tobacco very likely plays a central role, it by itself cannot fully explain the extremely high male lung cancer rate and why only specific villages are affected. Genetic predisposition and environmental factors may play a synergistic role as cofactors. A cooperative investigative effort with the Inupiat population is indicated and may go a long way in reducing cancer concern in the region.

Keywords: Alaska, arctic regions, cancer epidemiology, environmental pollution, lung cancer, native Americans

No full text is available. To read the body of this article, please view the PDF online.

Department of Health and Social Services, North Slope Borough, PO Box 69, Barrow, Alaska, 99723, USA

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PII: S0033-3506(98)00199-1

doi:10.1038/sj.ph.1900423

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Chronic Lower Respiratory Disease Mortality

	1990-1994	1991-1995	1992-1996	1993-1997	1994-1998	1995-1999	1996-2000	1997-2001	1998-2002	1999-2003	2000-2004	2001-2005	2002-2006
NSB*	140.4	118.7	88.2	87.4	85.6	78.9	91.8	101.9	90.9	91.4	98.3	71.9	80.7
Alaska	47.5	46.7	47.7	49.3	47.7	50.8	50.6	50.4	49.3	49.7	46.1	44.8	42.2

Rates are age-adjusted to 2000 Census US standard population, expressed per 100,000 population

Source: Alaska Bureau of Vital Statistics

*NSB rates calculated based on fewer than 20 events and must be interpreted with caution

Health Profiles for North Slope[1], Alaska, and the U.S.

2002-2004

	Number of Events	Rate[3]	Alaska Events	Alaska Rate	U.S. Rate[6]
Mortality Statistics[2]					
All Causes	109	1029.0	9261	792.9	801.0
Cancer (C00-C97)	25	251.9	2167	186.8	184.6
Lung Cancer (C33-C34)	11	110.0*	638	55.1	52.9
Diseases of the Heart (I00-I09, I11, I13, I20-I51)	15	185.8*	1842	174.0	217.5
Coronary Heart Disease (Ischemic) (I20-I25)	5	**	1225	112.7	150.5
Cerebrovascular Disease (Stroke) (I60-I69)	6	**	512	55.8	50.0
Chronic Lower Respiratory Disease (J40-J47)	8	**	426	44.2	41.8
Diabetes (E10-E14)	0	0.0	280	23.9	24.4
Homicide (U01-U02, X85-Y09, Y871)	4	**	131	6.5	5.6
Suicide (U03, X60-X84, Y870)	8	**	410	21.6	10.7
Teen Suicides (15-19)	2	**	55	34.2	
Unintentional Injuries (V01-X59, Y85-Y86)	12	83.8*	982	56.5	36.6
Motor Vehicle Accidents[4]	8	**	346	18.9	14.8
Birth Statistics					
Births to Residents	499	23.0	30366	15.6	14.0
Fertility (15-44)	499	109.5	30366	72.1	66.3
Teen Births (15-19)	97	88.1	3193	41.1	41.2
Young Teen Births (15-17)	32	45.5	923	19.1	22.1
Prenatal Care Statistics[5]					
First Trimester Care	318	66.9	23270	80.6	83.9
Adequate Prenatal Care	165	35.3	17398	64.9	
Birth Outcomes[5]					
Pre-term Delivery	72	14.5	3160	10.5	12.5
Low Birth Weight	27	5.5	1787	5.9	8.1
Infant Statistics					
Infant Mortality	5	**	194	6.4	6.8

[1] Borough or Census Area

[2] Age-Adjusted rates are per 100,000 U.S. year 2000 standard population.

[3] Rates based on fewer than 10 occurrences are not reported.

[4] V02-V04,V090,V092,V12-V14,V190-V192,V194-V196,V20-V79,V803-V805,V810-V811,V820-V821,V83-V86,V870-V878,V880-V888

[5] Birth statistics for these outcomes are percents, not rates.

[6] US year 2004 rates are preliminary.

* Rates based on fewer than 20 occurrences are statistically unreliable and should be used with caution.

** Rates based on fewer than 10 occurrences are not reported.

The Alaska Bureau of Vital Statistics

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EcoHealth 4, 500–513, 2007
DOI: 10.1007/s10393-007-0132-2

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Special Feature: Indigenous Perspectives

Original Contribution

Inupiat Health and Proposed Alaskan Oil Development: Results of the First Integrated Health Impact Assessment/ Environmental Impact Statement for Proposed Oil Development on Alaska's North Slope

Aaron Wernham

Alaska Inter-Tribal Council, Columbia University Institute on Medicine as a Profession, 2050 Cripple Creek Rd., Fairbanks, AK 99709, US

Abstract: We report on the first Health Impact Assessment (HIA) for proposed oil and gas development in Alaska's North Slope region. Public health is not generally analyzed in the Environmental Impact Statement (EIS) process in the U.S. We conducted an HIA for proposed oil development within the National Petroleum Reserve - Alaska in response to growing concerns among North Slope Inupiat communities regarding the potential impacts of regional industrial expansion on their health and culture. We employed a qualitative HIA methodology, involving a combination of stakeholder input, literature review, and qualitative analysis, through which we identified potential health effects. The possible health outcomes identified include increases in diabetes and related metabolic conditions as a result of dietary change; rising rates of substance abuse, domestic violence, and suicide; increased injury rates; more frequent asthma exacerbations; and increased exposure to organic pollutant, including carcinogens and endocrine disruptors. There are also potential benefits, including funding for infrastructure and health care; increased employment and income; and continued funding of existing infrastructure. Based on these findings, we recommend a series of public health mitigation measures. This project represents the first formal effort to include a systematic assessment of public health within the U.S. EIS process. The inclusion of public health concerns within an EIS may offer an important and underutilized avenue through which to argue for environmental management strategies that focus on public health, and may offer communities a stronger voice in the EIS process.

Keywords: Inuit, Environmental Impact Statement, Health Impact Assessment, National Environmental Policy Act, human health

Introduction

This article describes the initial results of the first Health Impact Assessment (HIA) undertaken for oil and gas development on Alaska's North Slope. This work also represents the first formal effort to undertake an HIA within the legal framework of the National Environmental Policy Act (NEPA), the statute that established the Environmental Impact Statement (EIS) process and which forms the foundation of environmental regulation in the U.S. The inclusion of a broad, systematic analysis of health within a

Published online: October 11, 2007
Correspondence to: Aaron Wernham, e-mail: aawernham@pol.net

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Research Project Search

NCER Research Project Search

Risks to Northern Alaskan Inupiat: Assessing Potential Effects of Oil Contamination on Subsistence Lifestyles, Health, and Nutrition

EPA Grant Number: R831045
Title: Risks to Northern Alaskan Inupiat: Assessing Potential Effects of Oil Contamination on Subsistence Lifestyles, Health, and Nutrition
Investigators: Wetzel, Dana L. , Hepa, Taqulik , O'Hara, Todd M. , Reynolds, John E. , Willetto, Carla
Institution: **Mote Marine Laboratory**
EPA Project Officer: Fields, Nigel
Project Period: August 1, 2003 through July 1, 2006
Project Amount: $437,399
RFA: Lifestyle and Cultural Practices of Tribal Populations and Risks from Toxic Substances in the Environment (2002)
Research Category: Health Effects , Environmental Justice

Description:

Scientists have focused on potential effects of toxic substances on Native populations with subsistence lifestyles in the Arctic. Risks from toxicant exposures range from direct health hazards to changes in lifestyle that may impair nutrition and health. Petroleum hydrocarbons may enter the Arctic environment in a variety of ways. Oil and gas production in the Arctic occurs at a high level and may increase. Petroleum can enter humans through species that form a major part of the Inupiat diet in northern Alaska. In Barrow, 75% of Inupiat households consume bowhead whale (*Balaena mysticetus*), and nearly 50% consume bearded seals (*Erignathus barbatus*). Marine mammals are exposed to petroleum directly or through their diet and may metabolically transform petroleum-related compounds. Based on toxicological properties, polycyclic aromatic hydrocarbons (PAHs) in the human diet should be investigated. Limited information is available on the extent to which: a) species eaten by the Inupiat are exposed to and contaminated by petroleum; b) contamination may cause Inupiat households to avoid eating traditional foods; and c) handling and preparation of foods affect levels of ingested PAHs.

Objective:

Our proposal involves Inupiat leaders and diverse scientists to: a) characterize levels of PAHs in a range of tissues from bowhead whales and bearded seals; b) characterize PAH levels in meat and other food items following their handling and preparation for consumption; c) document "traditional biomarkers" (e.g., odors) that Native hunters and field scientists use to accept or reject tissues for consumption following harvest; d) assess chemical or histological assays that could serve as low cost biomarkers of exposure; e) use published information and results of this study to develop a risk assessment model incorporating *both* health risks associated with ingestion of petroleum-related compounds and cultural and nutritional risks related to avoidance of certain foods; and f) develop outreach and public awareness programs to inform residents in northern Alaska of issues, potential consequences, and options.

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Approach:

We will acquire specimen materials from bowhead whales and bearded seals taken during the subsistence harvest. At harvest, traditional observations and traditional knowledge will be recorded regarding perceptions of the quality of the meat and organs. Samples will be analyzed using gas chromatography-mass spectrometry for various PAHs. In addition, samples of meat and blubber will be marked and re-analyzed following a six-month storage period and preparation in traditional ways. Biochemical, metabolic, and histological assays will assess exposure of free-ranging whales and seals. Once a risk assessment model is developed and evaluated, appropriate Native spokespersons will work with the scientists to develop and disseminate information to towns and villages about risks associated with oil-related pollution and consumption of whale and seal meat.

Expected Results:

The unusual combination of traditional knowledge, powerful scientific analyses, and integrative modeling, will permit our development of outreach tools and messages, delivered by appropriate Native spokespersons, to empower Alaskan Inupiats with insights and information that will allow them to choose options to reduce their risk from PAH exposure and to maintain good nutrition and health.

Supplemental Keywords:

human health; indicators; community-based; environmental chemistry; zoology; toxicology; North Slope, AK; food processing. , HUMAN HEALTH, Geographic Area, Scientific Discipline, Health, Risk Assessments, Health Risk Assessment, Exposure, Ecology and Ecosystems, State, toxic environmental contaminants, human health risk, biomarker based exposure inference, dietary exposure, petroleum waste, PAH, Inupiat, human exposure

Last updated on Thursday, December 11, 2003.
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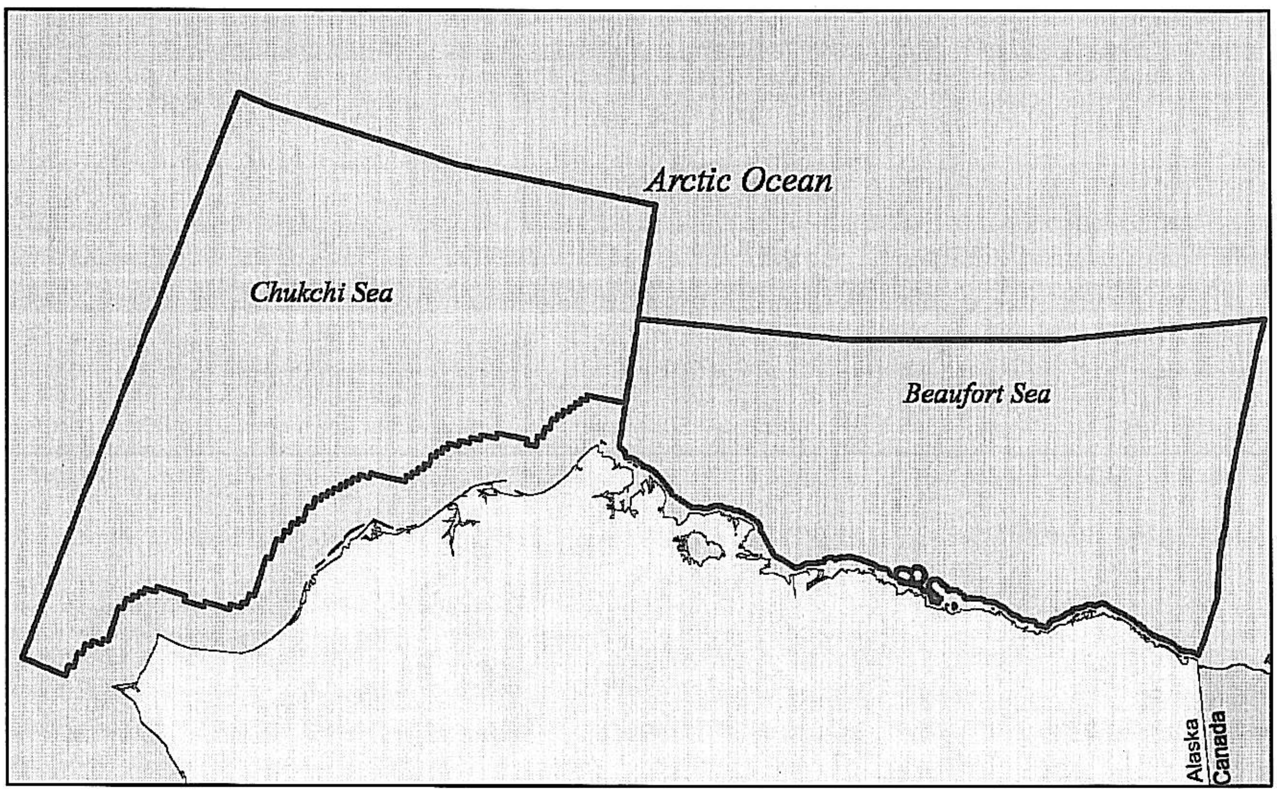

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Food insecurity is defined by the U.S. Department of Agriculture (USDA) as not having "enough food to fully meet basic needs at all times" (Rosso and Weill, 2006). The basic definition of food insecurity used by the USDA does not refer to the source of food (Lambden et al., 2006). A more severe form of food insecurity is "food insecurity with hunger (defined by the USDA as "the uneasy or painful sensation caused by lack of food") (Rosso and Weill, 2006). The prevalence of food insecurity in the NSB or specific villages is not known. Because of the importance of subsistence foods to the nutritional system of North Slope communities, food security depends on access to traditional foods as well as economic resources. The estimation of food insecurity rates in Arctic subsistence communities is complicated by the fact that most standardized measures are not designed to account for subsistence harvests and food sharing. On the other hand, data from Canadian Inuit communities found extraordinarily high rates of food insecurity, up to 84% in one study (Boult, 2004). An ADF&G survey of selected villages in the NWAB, on the other hand, found that 60 % of residents in villages surveyed were food-secure, and 12% were food insecure (roughly 25% were classified as "marginal" (Magdanz 2008, unpublished data). A recent survey under the BRFSS program found that over 20% of rural Alaskans are food insecure, as compared with 12% in urban areas.

Food insecurity is associated with a wide range of health problems. Because food-insecure families typically restrict the range of foods purchased to only the most affordable sources of calories, nutritional deficiencies are more common. Because inexpensive foods often are higher in saturated fats and simple sugars, several studies have found, somewhat paradoxically, a higher prevalence of obesity and diabetes in food-insecure people. Studies also have demonstrated that food-insecure individuals are more likely to report poor overall health and to have psychological symptoms such as depression and anxiety (Lambden et al., 2006; Vozoris and Tarasuk, 2003).

3.4.5.2.5. Noncommunicable and Chronic Disease. This is a large category of diseases, many of which are increasing in prevalence in Alaskan Native communities. Diseases in this category that will be discussed here include diabetes, high blood pressure, and related metabolic disorders (a group of disorders that often share related pathophysiology and are termed "metabolic syndrome"); vascular disease; chronic lung diseases; endocrine disorders such as thyroid disease, and cancer.

Diabetes, Hypertension, and Metabolic Syndrome. Type II diabetes, high blood pressure (hypertension), dyslipidemia (often referred to as "high cholesterol"), and obesity are increasingly prevalent in Arctic indigenous people, including Alaskan Natives (Naylor et al., 2003; Murphy et al., 1997). These disorders are among the most important risk factors for a number of leading causes of disability and mortality nationwide, including cardiovascular disease, strokes, renal failure, and peripheral vascular disease. These problems frequently coexist in individuals, and likely share similar pathophysiologic origins.

These problems represent a new phenomenon in Arctic indigenous populations. Based on incomplete data, it appears that they were extremely rare prior to the 1960s (Naylor et al., 2003), but they are now increasing quite rapidly (Alaska Native Medical Center, 2008). The subsistence diet is the most important protective factor against these problems; numerous studies have demonstrated that this transition has been caused by a transition to market foods and an increasingly sedentary lifestyle (Adler et al 1996; Murphy et al., 1995; Ebbesson et al., 1999; Bjerregaard et al., 2004).

In the NSB, rates of diabetes in Alaska Natives are still low compared with other regions of the state, but have begun to increase rapidly. The diabetes program at ANTHC tracks regional rates of diabetes; the current prevalence of diabetes in NSB Alaskan Natives (BSU) as of 2006 was 22/1,000 (compared with 40/1,000 for all Alaskan Natives, and 78/1,000 for the general U.S. population). Between 1990 and 2006, however, diabetes rates in the BSU increased by 126%, compared with 114% for all Alaskan Natives (Alaska Native Medical Center, 2008). The regional prevalence of high blood pressure and dyslipidemias

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has not been calculated, although these rates could potentially be calculated through the ASNA RPMS electronic database.

Cardiovascular and Cerebrovascular Disease. Cardiovascular disease and cerebrovascular disease (strokes) are among the most important causes of death and disability in the U.S. Risk factors include diabetes, high blood pressure, dyslipidemias, smoking, depression, and family history (genetic predisposition). While rates in the NSB are somewhat lower than U.S. and Alaska Statewide rates, cardiovascular disease is still the third leading cause of death in the North Slope region. Rates of cardiovascular disease mortality have been decreasing in the NSB, mirroring Statewide and national trends. The explanation for this is not known but could correlate with improvements in risk-factor modification through medical and public health efforts (Cooper et al., 2000).

Chronic Lung Disease. Chronic lung disease is a spectrum of disorders including chronic obstructive pulmonary disease (COPD), asthma, and chronic bronchitis. Risk factors for these problems include smoking, air pollution, poor indoor air quality, and possibly severe pulmonary infections in early childhood; numerous studies have also demonstrated that "socioeconomic position," as measured by factors such as income level and educational attainment, has a direct effect on severity of and mortality from pulmonary disease (O'Neill et al., 2003).

There was a 192% increase in mortality rates for COPD between 1979 and 2003; between 1999 and 2003, the BSU had the highest mortality rate COPD of any region in the State (130/100,000 compared 68.8/100,000 for all Alaskan Natives (Day, Provost, and Lanier, 2006). Rates of pediatric asthma in the NSB reported in one paper (by asthma diagnosis or medication use) was 6.6%, compared with 3.5% in the Nome area, 12 % in the Bethel service area, and 7.0% in the NWAB service area (Gessner and Neeno, 2005).

Residents in Nuiqsut have complained that local gas flaring at the Alpine facility has led to increased respiratory problems in the village. One brief unpublished review examined rates of asthma and other lung problems including lower respiratory tract infections (such as pneumonia) in Nuiqsut compared with a control village, and found differences only in the 10-19 age group and in the number of clinic visits for asthma (Serstad and Jenkerson, 2003). Health care providers interviewed for this study noted that an apparent increase in respiratory problems may have correlated with increased traffic on the roads leading to increased dust, although the study findings did not support nor conclusively refute this hypothesis.

Smoking rates in the NSB are high. According to a regional analysis of BRFSS data from 2005-2007, 44% of North Slope residents currently reported being smokers, compared to a Statewide rate of 23% (ADHHS, unpublished data). In the SLiCA North Slope sample, 61% reported smoking daily (Poppel et al., 2007).

Historical data are not available for comparison, but accounts suggest that the high smoking rates in rural Alaskan Native communities are a long-standing problem. Income and educational status are strong predictors of smoking rates. Lower income and less education are two of the most powerful risk factors for smoking in the U.S. (Centers for Disease Control and Prevention, 2007).

Indoor air quality also has been suspected as a cause of increasing rates of chronic lung disease in the Arctic. An unanticipated consequence of modern, highly insulated housing in remote Iñupiat villages has been decreased ventilation. One recent study in Canadian Inuit villages noted that ventilation in these houses was poor, and CO_2 levels were higher than recommended (Kovesi et al., 2007). It is not known whether these study results can be generalized to NSB housing.

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Air pollution is another important cause of and exacerbating factor for chronic pulmonary disease (EPA, 2006a; Ostro et al., 2006). One study traced emissions from Prudhoe Bay as far west as Barrow (Jaffe et al., 1995). On the other hand, at present the Beaufort and Chukchi sea areas are classified as attainment areas under the Clean Air Act. However, current information on air quality in the North Slope is based primarily on modeling, and is limited by the scarcity of monitoring sites (2 sites on land in the entire region), lack of monitoring data for fine particulates (PM 2.5), and lack of monitoring for HAP because of reporting exemptions for oil and gas producers. According to ADEC (2007):

> Currently no data has been collected to document if the substantial amount of pollution emitted on the North Slope, although not in violation of air standards, may be having a significant cumulative effect on this area.

ADEC (2007) further notes that:

> Air monitoring data is limited on the North Slope, especially in the NPR-A. Existing air monitoring data is collected by the oil companies as part of their air permit requirements and monitoring is not performed at locations several hundred miles downwind of the facilities. While North Slope air quality data has not shown violations of the National Ambient Air Quality Standards (NAAQS) near the facilities, concerns exist about the ability of older air quality models to predict deposition given the North Slope's strong atmospheric stability, complex high latitude atmospheric chemistry, the secondary formation of pollutants trapped in mid to long distance transport, and deposition of air pollutants which can accumulate in the soil and vegetation.

Because of the current data gaps, it is not possible to determine with confidence the potential contribution of existing oil and gas emissions to baseline levels of respiratory illness in the NSB region, although it is certain that air pollution would be only one of several important contributors.

Cancer. Cancer is now the leading cause of death in the NSB and BSU (and for Alaskan Natives Statewide), and it has become a matter of great concern to NSB communities. Residents have testified to increasingly common tumors in fish and game and have voiced strong concerns regarding the possibility that subsistence resources have been or will be contaminated by local activities. Exacerbating these concerns, the rate of cancer in the BSU has increased over recent decades. Cancer mortality increased from 273/100,000 in 1979-1983, to 362/100,000 in 1999-2003, a 33% increase. By comparison, cancer mortality in U.S. whites decreased from 203/100,000 to 193/100,000 over the same time period, whereas rates in the NWAB and Norton Sound also increased. The BSU had the highest incidence of cancer of any region (579/100,000, compared with 554 in the Anchorage Service Unit, 425 in the Kotzebue Service Unit, and 479/100,000 in the Norton Sound Service Unit. than (Lanier et al., 2006). Lung cancer is the most common type of cancer (41%), followed by colorectal (32%), breast (15%), stomach (10%), and prostate (7%). Each type of cancer has somewhat different known risk factors (discussed below).

Lung cancer of the variety most commonly seen in Alaskan Natives is highly associated with tobacco smoke. Thus, the high rates of smoking documented on the North Slope are one identified risk factor for lung cancer. Radon gas exposure also is a risk factor in some areas of Alaska and, nationwide, it is thought to be the second leading cause of lung cancer behind smoking tobacco (EPA, 1993). Radon levels in Alaska generally are low, although elevated levels have been measured during EPA surveys of homes in some parts of the Interior, Southcentral, and Southeast, Alaska. Permafrost and some Arctic building construction practices, such as pilings, effectively eliminate the radon risk in some areas (AMAP, 1998). Other risk factors for lung cancer include industrial exposure to asbestos, uranium, arsenic, nickel, and chromium.

Colorectal cancer has known genetic risk factors, in addition to family history. The prevalence of the genetic risk factors in Alaskan Natives is not known. Cigarette smoking is a known risk factor, and recent studies have

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suggested that increased insulin levels associated with sedentary lifestyle and consumption of high sugar diets also are risk factors for colon cancer.

Breast cancer has several known risk factors, including genetics, use of estrogen-progesterone hormone-replacement therapy, obesity, and consumption of four or more alcoholic drinks daily.

Prostate cancer has increased in Alaskan Native men but remains less frequent than the general U.S. population. Known risk factors include age and possibly a diet high in animal fat.

Stomach cancer is far more frequent in Alaskan Natives and, unlike the U.S. population in whom the incidence is decreasing, the rate among Alaskan Natives has remained stable. The major known risk factor for this cancer is infection with the bacteria *Helicobacter pylori,* which causes a chronic infection in the lining of the stomach. This infection is present in 85% of Alaskan Native adults who live in rural Alaska (Parkinson et al., 2000), and may contribute to the disparity in this cancer.

Evaluation of the question of whether and to what degree environmental contaminants produced by oil and gas activities in the region may contribute to the high cancer rates on the North Slope is complicated by reporting exemptions that limit the availability of data on the types and amounts of carcinogens produced by North Slope oil and gas activities; by the lack of routine and ongoing monitoring of locally-produced carcinogens in air, water, and subsistence foods; by the concentration of some pollutants in the Arctic from worldwide sources; and by a lack of dietary data to allow a more quantitative evaluation of exposure to various dietary sources of contaminants. The NSB has maintained an extensive program of monitoring and testing subsistence resources for contaminants. The results have been encouraging, in that to date, the levels of contaminants such as PCBs (organic pollutants not typically associated in high quantities with modern oil and gas operations) in subsistence foods have been substantially lower than those reported in similar resources in Canada and Greenland. One study compared PCBs in subsistence foods harvested on the North Slope to levels of PCBs in foods purchased in local stores, and made the point that there is no available food source that prevents exposure to organic pollutants altogether (O'Hara et al., 2005). The Alaska Department of Health also has summarized data on PCBs and mercury in subsistence foods, and concluded with a strong recommendation that people continue eating subsistence foods because, given the relatively low levels of contaminants present, the health benefits clearly outweigh the risks (ADHSS, 2004a,b). A 1999 report by the Alaska Native Health Board, *Alaska Pollution Issues*, assessed the risks from radionuclides, persistent organic pollutants, heavy metals, PCBs, dioxins, and furans, and concluded that the "benefits of a traditional food diet far outweigh the relative risks posed by the consumption of small amounts of contaminants in traditional foods" (Alaska Native Health Board, 1999). To date, there has been no risk assessment completed to evaluate cancer risk from contaminants produced by oil and gas operations on the North Slope. The ATSDR completed a risk assessment for exposure to PCBs and DDT (not contaminants generally associated with contemporary oil and gas operations) in fish in the Colville River, and found no evidence of a significant health risk (ATSDR, 2003), but this report is not generalizable to other contaminants and sources throughout the region. Thus, although there are data available suggesting that for certain organic pollutants the risks to human health from consuming wild foods harvested in the region remain low, the data are not exhaustive in terms of the subsistence species tested and the spectrum of contaminants that might be present.

3.4.5.2.6. Infectious Diseases.

Respiratory Infections. Respiratory infections are highly prevalent in the NSB and certain other rural regions of Alaska, as compared with the general Alaska and U.S. populations. Respiratory infections were the leading outpatient diagnosis and the third leading hospital discharge diagnosis for Alaskan Natives in the region between 2001 and 2004; the second leading hospital discharge diagnosis was COPD and, in general, a large proportion of hospitalizations for this diagnosis are associated with respiratory

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infections (Alaska Area Indian Health Service, 2008). The hospital discharge rate for NSB residents hospitalized in a major referral center (Anchorage or Fairbanks) for respiratory infections in 2001-2005 was 51/10,000, compared with 24.8/10,000 for Norton Sound residents, and 24.7/10,000 for NWAB residents.

The high prevalence of respiratory infections in Alaskan Natives has been the subject of several studies. Two recent studies found a significantly higher prevalence of respiratory infections in villages without access to an adequate supply of running water (Hennessey et al., 2008; Gessner, 2008). Other studies have shown particularly high rates of lower respiratory infections in infants and children in at least one rural Alaska region (Singleton et al., 2006).

The high rate of chronic lung problems (COPD, asthma) is important to consider when evaluating the effect of respiratory infections, because people with chronic lung disease are more likely to develop severe complications of respiratory infections than the general population.

The contribution of existing oil and gas operations to rates of respiratory infections has not been studied. In theory, exposure to a wider range of infections could occur in areas where there is widespread mixing of nonresident workers from outside the region and village residents. There are no data available regarding the frequency of respiratory illnesses among nonresident workers.

Gastrointestinal. No data are available regarding the prevalence of severe diarrheal infections in the NSB.

Skin Infections. Serious skin infections (cellulitis, abscesses) are caused by bacteria, most commonly *Staph. aureus* and *Strep pyogenes*. There is an increasing prevalence of antibiotic-resistant staph infections (MRSA) in Alaska, a very concerning problem. The prevalence of MRSA infection in the NSB has not been calculated. As in the case of respiratory illness, adequate water supply and sanitation are documented as important determinants of the rate of serious skin infections (Hennessey et al., 2008).

Bloodborne and Sexually Transmitted Infections. This group of infections includes HIV, Hepatitis B, Hepatitis C, gonorrhea, Chlamydia, and syphilis. These are diseases transmitted either through blood or sexual contact. The prevalence of Hepatitis B and C in Alaska are not known with certainty (ADHSS, 2003). The prevalence of HIV in the Northern Region of Alaska appears to be substantially lower than prevalence in the general U.S. population (ADHSS, Section of Epidemiology, 2002, 2007).

Gonorrhea and Chlamydia are highly prevalent in rural Alaska. On the North Slope, the rate of Chlamydia was calculated to be 1,317/100,000, compared with 2,052/100,000 in the Statewide Alaskan Native population and 332/100,000 in the U.S. Gonorrhea rates in the North Slope are relatively low, 20/100,000, compared with 305/100,000 in Alaskan Natives Statewide, and 115/100,000 in the U.S.

The prevalence of blood-borne and sexually transmitted infections is related to rates of intravenous drug use, high-risk sexual behavior, number of sexual partners, and use of appropriate barrier contraceptives. An influx of nonresidents has the potential to change incidence and prevalence patterns of blood-borne and sexually transmitted infections through the mixing of high and low prevalence populations (International Finance Corp., 2007).

3.4.5.2.7. Maternal-Child Health. Important health disparities include an elevated rate of teen pregnancies and premature deliveries compared with the Alaska population. Premature birth has complex causes, which are incompletely understood. A number of potentially modifiable risk factors have been

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 98101-3140

January 16, 2009

Reply To: AWT-107

Ms. Susan Childs
Regulatory Affairs Manager, Alaska Venture
Shell Offshore Inc.
3601 C Street, Suite 1314
Anchorage, Alaska 99503

Re: Application Incompleteness Determination for Frontier Discoverer Drill Vessel in Chukchi Sea

Dear Ms. Childs:

On December 19, 2008, U.S. EPA Region 10 received Shell Offshore Inc.'s (SOI) Prevention of Significant Deterioration (PSD) permit application for the Frontier Discoverer Drill Vessel in the Chukchi Sea. Our understanding is that all operations of this vessel will occur beyond 25 miles from Alaska's seaward boundary.

Our preference, as Pat Nair of my staff communicated to you, was for SOI to wait for us to complete our review of SOI's modeling protocol, and to incorporate the appropriate responses and changes into the permit application. We understand, however, your interest in getting the permitting process initiated as soon as possible. Because the modeling protocol is no longer relevant we will not be providing comments separately on the modeling protocol for the Chukchi Sea drilling program.

Our completeness is based solely on the application received on December 19, 2008 and on the electronic modeling files sent under separate cover. Based on our review of these documents, we have determined SOI's application to be incomplete. Pursuant to 40 CFR 124.3(c), we are listing the information necessary to make the application complete: please refer to Attachments A and B for further details. By January 30, please provide us with an estimate of when we should expect to receive all the information identified.

If you have any questions, please contact Nancy Helm at 206-553-6908.

Sincerely

for
Richard Albright, Director
Office of Air, Waste and Toxics

cc Mark Schindler, Octane, LLC
Jeff Walker, MMS-Alaska Region

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Attachment A

Air Quality Impact Analysis Comments to
Outer Continental Shelf Pre-Construction Air Permit Application
Frontier Discoverer Chukchi Sea Exploratory Drilling Program
Dated 11 December 2008 and Received by EPA on December 19, 2008

I. General Comments

A. Besides the comments listed below, please include any engineering related comments that could change the modeling assumptions and/or inputs prior to revising any analysis.

B. Statements are made in the application that should identify a reference. A few have been identified below. Please review the application and identify references where necessary. A list of references should be included in the application

C. Please incorporate any changes, additions and/or deletions in a revised permit application. Any revised modeling runs and air quality data should be provided on a CD-ROM.

II. Specific Comments

A. Section 1, Introduction

Shell has requested the flexibility to drill anywhere within Lease Sale Area 193 including lease blocks that it currently holds and future lease blocks in the Chukchi Sea. Additional discussion should be provided by Shell of the legality of this request.

B. Section 2, Project Description

1. Table 2-1, Discoverer and Associated Vessel Emission Units with Hourly Emissions, identify FD-8 (Emergency Generator) with no hourly emission rates. Please indicate if FD-8 will ever be tested during the exploratory drilling season. If yes, please provide its duration, frequency, hourly emission rates, and potential air quality impacts.

2. Either in the text and/or as a footnote, please identify the operating load of the hourly emission rates for each emission unit.

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3. Please provide a table similar to Table 2-1 that breaks out the hazardous air pollutants (HAPS) emission rates.

4. According to the application, Shell identifies a large and a small ice management vessel. In the same paragraph, Shell indicates that the ice management fleet could consist of "more or less that two vessels."

   a. Please be more specific as that number of vessels will have a direct impact on the modeling analysis.

   b. Because there is no guarantee by Shell that the same vessels will be used for ice management and oil spill response, what assurances are available that the vessels will have similar stack parameters and emission rates so as not to contribute or violate National Ambient Air Quality Standards (NAAQS), air quality increments, and permit conditions.

5. The Oil Spill Response (OSR) fleet will consist of several 37-foot long boats aboard a management vessel.

   a. Please identify the exact number of these boats.

   b. Please identify the number, duration and frequency of the water drill exercises for these boats.

   c. If feasible, please quantify the emission rates of each boat during each exercise.

6. During the 12-hour period that it takes to replenish the Discoverer, the resupply ship will be running one propulsion engine to power the ship. Please quantify the propulsion engine emissions and model these emissions with the concurrent drilling operation emission to determine compliance with NAAQS and air quality increments.

7. In the application, Shell based its vessel emission rates and stack parameters on actual ice management vessels and OSR fleets. Please provide documents detailing this data including the operating conditions and fuels.

8. Please discuss and if applicable, quantify the emissions, during the repositioning the of Discoverer, anchor adjustments, well blow out, flaring, venting…etc.

9. Please confirm the annual calculations in Table 2-2. For example and using Table 2.1

Generator PM_{10}: (0.297 lb/dy)(168 dy/yr)(1/2000 lb/tn) = 0.225 tn/yr

Generator NO_x: (0.90 lb/dy)(168 dy/yr)(1/2000 lb/tn) = 0.075 tn/yr

10. Please include in Table 2-1 and Table 2-2, the potential emissions for $PM_{2.5}$.

11. Please provide a table comparing project concentration impacts with significant monitoring concentration thresholds.

12. Based on the annual potential emissions for NO_x and VOC detailed in Table 2-2, Shell is required to conduct an ambient air quality analysis and data gathering for ozone.

13. Please describe the ice management process including how, when and where it will control the ice floe.

14. Please discuss the possibility of ice management vessels operating at less than 1- and 5-kilmeters.

C. Section 3, Regulatory Applicability

1. When the first anchor is laid, the Discoverer is considered a stationary source. However, seven additional anchors are dropped to correctly station and stabilize the location of the Discoverer.

   a. Please discuss and quantify any emissions associated with the positioning of the Discoverer/anchors by the smaller OSR vessel.

   b. Please include the smaller OSR vessel emissions in the modeling analysis to determine compliance with NAAQS.

2. During those occasions when the smaller OSR vessel is needed to reposition the Discoverer, please estimate the frequency, duration and associated emissions. In addition, please model the air quality impacts during these occurrences.

3. Please discuss the inclusion of the smaller OSR vessel emissions during anchoring and repositioning in the PSD applicability determination and other related thresholds.

4. Shell shows an annual $PM_{2.5}$ emission rate in Table 3-1 based on the use of condensable and PM_{10} emission factors. The emission factors ratio is “E.” Please provide justification that the use of “E” rated emission factors will not underestimate particulate matter emissions.

D. Section 5, Ambient Impacts

1. Shell is using a 1000-m radius centered on the Discoverer to define ambient air with respect to public access and compliance with NAAQS and air quality increments. This radius is currently being reviewed and has not been accepted at this time for use in the air quality modeling analysis.

2. Please explain the necessity of the Discoverer orientation into the wind and how Shell intends to maintain this orientation.

3. Please provide a reference for the persistence factors.

4. Please provide justification for distributing two-thirds of the emissions to the primary ice management vessel and one-third of the emissions to the secondary ice management vessel.

5. Shell states in Section 2 that the exact number of ice management vessels is uncertain. Please justify the modeling of only a primary and secondary ice management vessel when the fleet “could consist of more or less than two vessels depending on availability of vessels and ice conditions.”

6. Please discuss the consequence if there are no ice management vessels available.

7. If the ice management vessels are controlling the ice floes, what is the expected minimum and maximum travel distance of the vessels in one hour? Please explain.

8. It is not clear in the application how the effective emission heights for the volume sources were obtained other than it was based on applying the SCREEN3 model. Please provide specific details on the derivation of the effective emission height for each vessel including the plume rise used, the calculation of the height and initial sigmas, and the hourly meteorology associated with the plume rise used.

Region 10 expects the lowest plume rise was used and would be associated wake effects with a wind speed of 20 m/sec using screening meteorology. If not, please explain.

9. Figure 5-1 shows the receptor locations used to obtain the maximum ground level concentration impacts. It is recommended that the downwind receptors be a mirror image of the upwind receptors to insure that the maximum concentration impacts are quantified.

10. Since the OSR and ice management fleets could include different vessels each year, how will Shell insure that the emissions from the vessels will not violate NAAQS or air quality increments each year?

11. As a courtesy, Shell should inform the applicable Federal Land Manager of the proposed project and obtain their concurrence that the impacts at Denali will be insignificant.

12. Provide a footnote to Table 5-3 which identifies a reference for the scaling factors.

13. Table 5-4 identifies which applicable criteria air pollutants will have a significant impact. Please provide the modeling input and output files supporting the predicted results, particularly the significant impact area radius.

14. Because its existing lease blocks are at least 90 kilometers from the Alaska shoreline, Shell has concluded that the NAAQS analysis will not include any nearby sources. Please confirm this conclusion with the State of Alaska.

15. Please confirm that the number and spacing between volume sources conform to Section 1.2 in the User's Guide for the Industrial Source Complex (ISC3) Dispersion Models, Volume II - Description of Model Algorithms, EPA-454/95-003b dated September 1995.

16. Please explain how a "plume thickness of 10 meters" was derived and where it is used.

E. Section 6, Baseline Concentrations

1. Region 10 disagrees with Shell that the air quality data collected at Badami and Kuparuk are representative. The basic concern is that

the two data sets were collected in 1999 at Badami and in 2001 to 2002 at Kuparuk.

Region 10 is aware that more recent air quality data sets are available from the State of Alaska and suggests that Shell use these data to represent background air quality level. The use of conservative air quality measurements in lieu of site specific data is acceptable to Region 10.

2. Region 10 urges Shell to use the air quality data collected at Wainwright as it is quality assured. This data should also be provided to Region 10.

   Shell has the option to use the Wainwright data if they demonstrate the collected air quality data is representative of its drilling season (i.e., June to December). Any and all available Wainwright data should be assessed for conformance with assumptions in the analysis about background air quality.

3. Please explain the two "??" in the second paragraph, fourth sentence of this section. Provide reference for this sentence.

4. Shell derives the $PM_{2.5}$ background by using particulate matter data measured at Denali National Park. Please provide the technical justification that the particulate matter data (i.e., $PM_{2.5}$ and PM_{10}) measured at Denali is representative of the Chukchi Sea. The justification should include sources contributing to the measurements at Denali during the June to December drilling season.

5. Table 6-1 should include a footnote that carbon monoxide data is from the Kuparuk monitoring station.

F. Section 7, Impact Results

1. Table 7-1 lists the predicted concentration impacts during drilling operations. This implies that only FD-1 to FD-6, FD21-22, OSR fleet and ice management emissions were modeled. If this is incorrect, please add text to clarify this point.

2. At the point of maximum impact, please identify and discuss individual source contributions at the point of maximum impact.

3. Please provide a table showing the maximum concentration impacts from each of the two fleets and its locations.

4. Figure 5-2 shows two annual concentration impact modeling configurations while Tables 7-1 to 7-3 list the maximum annual impacts. Which configuration resulted in the greatest annual concentration impact?

5. Please indicate in the application that the short term maximum concentration impacts shown in Tables 7-1 and 7-1 include all the emission units identified in Table 2-1.

6. Because NO_x and VOC emission exceed 100 tn/yr, please provide a qualitative discussion on ozone impacts. For example, discuss the existing background ozone levels and the expected contributions of ozone from the Shell OCS sources.

7. Please conduct a Class II area visibility analysis in accordance with Section II.D in the October 1990 New Source Review Workshop Manual, Prevention of Significant Deterioration and Nonattainment Area Permitting.

8. For the shortest distance between a Shell awarded lease block and the State of Alaska coastline, quantify the air quality impacts and determine its compliance with NAAQS and air quality increments.

9. Shell used the same emission rate for each volume source in its modeling. Ship emissions can be normally distributed over the line of volume sources with the spread of the distribution based on the hourly standard deviation of wind direction. This suggestion was provided to Region 10 by ENVIRON representatives during our 8 January 2009 meeting.

G. Appendix A

1. Page 3-10 shows the Discoverer representative stack parameters for each emission unit.

   a. Please provide the stack parameters at 100 percent load for each emission unit.

   b. For each of the eight representative stack groups, please indicate the separation distance between the individual stacks.

   c. Please confirm that stacks parameters are representative of the actual operating loads and not 100 percent load.

   d. Please provide a reference for the stack parameters.

2. Page 3-10 shows the stack parameters for the vessels used in the determining the release height for the volume sources.

   a. Please provide a reference for the stack data.

   b. Please explain how the 60.9-m and 43.4-m were obtained and subsequently used to determine volume source release height.

H. CD ROM, Air Quality Modeling Files

Three SCREEN3 runs were performed to obtain final plume for the purpose of obtain an effective emission height for each volume source. Wake effects should have been considered in the model runs. Please rerun SCREEN and account for building wake effects.

Attachment B

Additional Comments to
Outer Continental Shelf Pre-Construction Air Permit Application
Frontier Discoverer Chukchi Sea Exploratory Drilling Program
Dated December 11, 2008 and Received by EPA on December 19, 2008

I. General Comments

Please provide copies of the Exploration Plan(s) and Drilling Plan(s) for the Chukchi Sea proposed operations.

II. Specific Comments

A. Section 1, Introduction

1. Please provide three color copies of a large-scale map (at least 24" x 36") of Figure 1-1.

2. Please provide complete details of Stipulations 4, 5 and 7 described in Figure 1-1.

3. Please provide complete details on the activities to be conducted at the shorebase locations identified in Figure 1-1.

4. Please provide complete details on any other secondary emissions potentially related to this project.

5. Please provide complete details on any associated growth potentially related to this project.

B. Section 2, Project Description

1. This section does not adequately describe the function of each emission unit. Describe how each piece of equipment is operated and how operation is related to operation of other equipment.

2. Please provide a detailed description of the critical, non-drilling loads that will be powered by the emergency generator when the main power supply is not operating, including a discussion of what other emission units will be operational when the emergency generator.

3. Page 4 of the application indicates that tables 2-1 and 2-2 only contain a summary of volatile HAPs. Please revise these tables to include emissions of all HAPs.

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4. Tables 2-1 and 2-2 do not include all the pollutant-emitting activities associated with the project, e.g. drilling of relief wells, use of diverters, well control events, flares, well testing, fuel tanks etc. Please provide detailed descriptions, emissions quantification and include these emissions in the ambient air analysis, as appropriate.

5. Pages 4 and 5 indicate that emissions calculations are not based on maximum emissions possible from the project. In some instances, emissions of some pollutants are greater at lower loads. Please provide a list of each emissions unit and pollutant emitting activity addressed in no. 3, above, and the following information: maximum physical rated capacity, minimum operating load/rate, normal operating load/rate, maximum operating load/rate, fuel/material usage at each of the three loads, and for each pollutant, the maximum emission rate at each rate. For each emissions calculation method, please provide detailed references.

6. Table 2-3 does not provide adequate detail on exactly how the various limits will be documented. Please describe in greater detail exactly how each reading will be taken and the frequency and method of data recording. For example, will the day tank fuel consumption be monitored via a totalizing, nonresettable, fuel meter. Please also address the precision of each monitoring method.

7. Please explain how SOI proposes to demonstrate compliance with the restrictions proposed Table 2-4.

C. Section 3, Regulatory Applicability

1. The discussion in this section implies that the application does not reflect the requirements of 40 CFR 55.13(b) and (e) and of 40 CFR 55.21 (l), (n), (q) and (r). Please provide information that satisfies these requirements.

2. As has previously been communicated to SOI, and contrary to the discussion on page 14 of the application, in determining whether the project emits pollutants in significant amounts, emissions from vessels must also be considered. Please provide any information withheld as a result of the incorrect regulatory interpretation.

D. Section 4, Emission Control Technology Review

1. As has previously been noted, in determining whether the project emits pollutants in significant amounts, emissions from vessels must also be considered. As a result, this application should contain BACT analyses for CO, NOx, $PM_{2.5}$, PM_{10}, SO_2 and VOC.

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2. Section 4.1 of the application provides SOI's conclusions in the BACT review, yet does not provide enough information on the BACT analysis process. For each pollutant and emission unit, please provide the full details on each step of the 5-step, top-down BACT process. For each emission unit/pollutant scenario, please list the available control technologies identified, justification on how available technologies were deemed infeasible, how the feasible technologies were ranked, and the economic analyses. Please include all assumptions made in conducting the review.

3. Section 4.3 of the application addresses major source MACTs. As noted earlier, it appears that the HAP emissions calculations only account for volatile HAPs and not for all HAPs emitted. Please update the HAP PTE to confirm that the project is not a major HAP source. In addition, please indicate whether any area-source MACTs might apply to this project.

E. Section 5, Ambient Impacts

1. Please provide a description of the legal authority for the ambient air boundary proposed by SOI.

2. Please provide a description of how SOI proposes to monitor the ambient air boundary and ensure that public access is prevented.

F. Appendix A, Emission Calculations

1. Please label all columns on tables.

2. Please describe the ratings presented in the fifth and sixth columns of page 1 – are these instantaneous maximum physical ratings?

3. How were the maximum fuel consumption values determined?

4. For each emission unit, please list the minimum, normal and maximum loads during the project. List separately any usage that SOI believes is outside a "normal" operating scenario.

5. For each emission unit/pollutant combination, please list the emission factor or emission rate at each of the minimum, normal and maximum loads during the project. List separately any usage that is of an unpredicted emergency basis.

6. Please confirm that the emergency generator will never be operated while any of the other emission units are in use. Otherwise, please describe scenarios and related emissions and analyses for occasions when the generator may be in operation.

7. Please list logging winch emissions separately from cementing unit emissions.

8. Please ensure that emission unit and stack nomenclature is consistent across all pages of Appendix A – currently nomenclature can change from page to page.

9. Show detail of all assumptions in the calculation, e.g. catalyst reduction efficiencies, operating capacity restrictions.

10. Please update the appendix to include all other pollutant-emitting activities addressed earlier in these comments.

11. Please confirm that the logging winches will never be operated while any of the other emission units are in use. Otherwise, please describe scenarios and related emissions and analyses for occasions when these winches may be in operation.

11. Please describe how the incinerator will be operated: batch vs. continuous operation, duration of each run, no. of runs per day etc.

13. Please explain how ship utilities will be powered during drilling operations, e.g. heat for quarters, lighting etc.

14. Please describe the bases for reduction in certain pollutants for small engines (other than Tier 3 engines).

15. Please provide a copy of the density and heat content analyses for the liquid fuels to be used on this project.

16. Please provide a list of all source tests performed on the emission units currently on the Discoverer. Include copies of all test reports.

17. As has been documented in the record for recent OCS permits (see Kulluk permit in Beaufort Sea) AP-42 does not provide a worst case assessment of emissions from the equipment associated with this project. The introduction to AP-42 cautions against using these values for permitting. SOI should contact manufacturers to determine worst case emission factors at each load (please provide copies of such communications) and conduct a review of other emission factors/rates to identify worst case emission factors and use those values in its analyses.

18. Please provide emission factors and calculation methodology for all HAPs.

19. Please include emissions of PM2.5 in this appendix. Please also address the impact of ammonia emissions on PM2.5 and PM10.

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20. Please explain why certain ICE meet Tier II requirements while others do not.

21. Please provide a copy of the operational parameters transmitted to DEC Marine.

22. Please provide more information on the complexity of VOC exhausted from the D399s and an expected VOC destruction rate as BACT.

23. Please address whether an hourly reading of engine emissions by the SCR control is adequate to control emissions from the engines if loads are expected to vary.

24. Please describe how ammonia slip will be minimized.

25. Please provide schematics showing how the SCR system will be installed into the Discoverer.

G. Appendix B, Emission Control Technology Review

The information presented in this Appendix is not clear:

1. It appears that Section II is missing.

2. Cost analyses should be presented separately for each emission unit.

3. Please provide emissions performance/guarantees from the vendor rather than generic estimates from older EPA literature.

4. For each cost category, please describe in greater detail, e.g. for labor explain the basis for the $1600/day expense.

5. Please provide vendor quotes and shipping quotes for the filters.

6. Please explain how the 7-year filter life was arrived at.

7. Cost analyses should be provided for all other emission unit/pollutant combinations.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 98101-3140

OUTER CONTINENTAL SHELF
PREVENTION OF SIGNIFICANT DETERIORATION
PERMIT TO CONSTRUCT

Permit Number:	R10OCS/PSD-AK-09-01	Issuance Date:	*Draft - TBD*
		Effective Date:	*Draft - TBD*

In accordance with the provisions of Clean Air Act (CAA) Section 328 and Code of Federal Regulations (CFR) Title 40, Part 55, and the provisions of Part C to Title I of the CAA and 40 CFR § 52.21,

Shell Gulf of Mexico Inc.
3601 C Street, Suite 1000
Anchorage, AK 99503

is authorized to construct and operate the Frontier Discoverer drillship and its air emission units and to conduct other air pollutant emitting activities in accordance with the permit conditions listed in this permit, and only at the following lease blocks from the Chukchi Sea lease sale 193:

<u>NR02-02:</u> 6819 6820 6821 6822 6868 6869 6870 6871 6872 6918 6919 6920 6921 6922 6968 6969 6970 6971 6972 7018 7019 7020 7021 7022 7023 7068 7069 7072

<u>NR03-01:</u> 6105 6106 6155 6156 6161 6162 6211 6212 6261 6363 6364 6413 6414 6415 6418 6419 6462 6463 6464 6465 6467 6468 6469 6512 6513 6514 6515 6516 6517 6518 6519 6562 6563 6564 6565 6567 6568 6569 6612 6613 6614 6615 6616 6617 6618 6665 6666 6667 6668 6705 6706 6712 6715 6716 6717 6753 6754 6755 6756 6761 6762 6765 6766 6767 6803 6804 6805 6810 6811 6812 6813 6814 6815 6816 6817 6853 6854 6855 6860 6861 6862 6863 6864 6865 6866 6903 6904 6905 6908 6909 6910 6911 6912 6913 6914 6915 6916 6953 6954 6955 6956 6957 6958 6959 6960 6961 6962 6963 6964 6965 7006 7007 7008 7009 7010 7011 7012 7013 7014 7056 7057 7058 7059 7060 7061 7062 7063 7106 7107 7108 7109 7110 7119

<u>NR03-02:</u> 6114 6115 6161 6163 6164 6165 6213 6214 6215 6220 6259 6261 6263 6264 6265 6270 6271 6321 6322 6359 6360 6371 6372 6409 6410 6422 6423 6459 6508 6558 6608 6658 6671 6672 6708 6713 6714 6715 6721 6722 6757 6761 6762 6763 6764 6765 6766 6771 6807 6811 6812 6813 6814 6815 6816 6817 6856 6862 6863 6864 6865 6866 6905 6912 6913 6914 6915 6916 6962 6963 6964 6965

<u>NR04-01:</u> 6352 6401 6402 6452 6453 6503 6504 6554 6604

<u>NR03-03:</u> 6007 6008 6009 6010 6017 6018 6020 6056 6057 6058 6059 6067 6068 6070 6108 6219 6560 6561 6609 6610 6611 6658 6659 6660 6709 6721 6722 6723 6759 6771 6772 6773 6823

Terms not otherwise defined in this permit have the meaning assigned to them in the referenced statutes and regulations. All terms and conditions of the permit are enforceable by the United States Environmental Protection Agency and citizens under the Clean Air Act.

____________________	____________________
Richard Albright	Date
Director, Office of Air, Waste and Toxics	

Exhibit 12
AEWC & ICAS

K-4 – 5	Propulsion Engines	Cummins QSB	300 hp
K-6	Generator Engines	Various	12 hp
Oil Spill Response Work Boat - Kvichak 34-foot No. 3			
K-7 - 8	Propulsion Engines	Cummins QSB	300 hp
K-9	Generator Engines	Various	12 hp

[a] Permit conditions may limit operation to less than rated capacity.

Effective Date. This permit becomes effective 30 days after the service of notice of the final permit decision, unless review of the permit decision is requested pursuant to 40 CFR § 124.19.

OCS Source. Permit Conditions contained in Sections A through R, except for those conditions addressing notification, reporting and testing, apply only during the time that the Frontier Discoverer drillship (Discoverer) is an OCS Source. Permit Conditions addressing notification, reporting and testing apply at all times as specified. For the purpose of this permit, the Discoverer is an "OCS Source" during all times between placement of the first anchor on the seabed to removal of the last anchor from the seabed at a drill site.

A. GENERALLY APPLICABLE REQUIREMENTS

1. **Construction and Operation.** The permittee shall construct and operate the OCS Source and the Associated Fleet in accordance with the application and supporting materials submitted by the permittee and in accordance with this permit. For purposes of this permit, Icebreaker #1, Icebreaker #2, the supply ship, the Nanuq and Kvichaks No. 1-3 shall collectively be referred to as the "Associated Fleet."

2. **Compliance Required.** The permittee shall comply with all requirements of 40 CFR § 52.21, Part 55, and this permit. Failure to do so shall be considered a violation of Section 111(e) and 165 of the CAA. All enforcement provisions of the CAA, including but not limited to, Section 113, 114, 120, 167, 303, and 304 apply to the permittee.

3. **Compliance with Other Requirements**. This permit does not relieve the permittee of the responsibility to comply fully with applicable provisions of any other requirements under federal law.

4. **Notification to Owners, Operators, and Contractors.** The permittee must notify all other owners or operators, contractors, and the subsequent owners or operators associated with emissions from the source of the conditions of this permit.

5. **Expiration of Approval to Construct.** As provided in 40 CFR § 52.21(f)(4), this approval shall become invalid if: construction is not commenced within 18 months after the effective date of this permit, construction is discontinued for a period of 18 months, or construction is not completed within a reasonable time. EPA may extend the 18-month period upon a satisfactory showing that an extension is justified.

6. **Permit Revision, Termination and Reissuance.** This permit may be revised, terminated, or revoked and reissued by EPA for cause. Cause exists to revise, terminate, or revoke and reissue this permit under the following circumstances:

   6.1 This permit contains a material mistake;

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
SEATTLE, WASHINGTON

STATEMENT OF BASIS FOR PROPOSED OUTER CONTINENTAL SHELF PREVENTION OF SIGNIFICANT DETERIORATION PERMIT NO. R10OCS/PSD-AK-09-01

SHELL GULF OF MEXICO INC. FRONTIER DISCOVERER DRILLSHIP CHUKCHI SEA EXPLORATION DRILLING PROGRAM

Date of Proposed Permit: January 8, 2010

Exhibit 13
AEWC & ICAS

Drill ships, drill rigs, and drilling platforms used for oil exploration and production vary greatly in configuration. In the August 2009 proposed permit, EPA proposed that the Discoverer be considered an "OCS source" within the meaning of 40 C.F.R. § 55.2 from the time between the placement of the first anchor on the seabed to the removal of the last anchor from the seabed at a drill site. The initial proposed permit also prohibited operation of the propulsion engine while the Discoverer is an OCS source, that is, after placement of the first anchor on the seabed.

During the public comment period on the August 2009 proposed permit, the Mineral Management Services (MMS) expressed concern with the prohibition on operation of the propulsion engine after anchoring and requested that the permit clarify and accommodate the use of the propulsion engine in emergency situations. (MMS 10/20/09). Other commenters also questioned whether the Discoverer could safely anchor without using the propulsion engines.

Shell commented that it believed the Discoverer was not an OCS source within the meaning of Section 328 of the CAA and 40 C.F.R. § 55.2 until the Discoverer is stabilized and the anchoring process is complete. Shell also said it would attempt to meet the requirements to shut down the propulsion engines during the anchoring process but that if that proved to be unsafe, Shell would request a permit change. (Shell 10/20/09 Comments). A December 16, 2009 letter from MMS to EPA states that the Alaska Region of MMS does not consider the Discoverer to be an OCS permanently or temporarily attached to the seabed until all anchors have been set because until that time, the Discoverer is operated under, controlled by, and subject to maritime laws and practices (MMS 12/16/09).

EPA has reviewed the definition of OCS source in the CAA and the OCS implementing regulations in light of the specific configuration of the Discoverer and its mooring and drilling system. EPA's definition of "OCS source" provides that a vessel be considered an OCS source "*only* when [it is]: (1) Permanently or temporarily attached to the seabed *and* erected thereon *and* used for the purpose of exploring, developing or producing resources therefrom...." 40 C.F.R. § 55.2 (emphasis added). The Discoverer could be considered to be "attached to the seabed" when it is connected to the seabed by a single anchor. After attachment of an anchor at the drill site, the Discoverer begins the process of moving onto location at the drill site through the anchoring and tensioning process discussed above. However, it is not clear that the ship is "erected" on the seabed for the purposes of exploring, developing or producing resources at that time. The question is whether the Discoverer is an OCS source during this anchoring and tensioning process.

In light of the regulatory definition of the OCS source, the application of that definition for specific permitted activity as provided in the initial August 2009 proposal, and the comments and additional information received on that issue since the August 2009 proposed permit, EPA is proposing two options for defining when the Discoverer becomes an OCS source in this permit. EPA is specifically requesting comment on which of the following definitions to include in the final permit:[6]

[6] We note that the choice of either definition below does not effect any other permit conditions or analyses.

Table 5.3 – Major Source Baseline Dates

Air Pollutant	Major Stationary Source	Trigger Date
Sulfur Dioxide	June 5, 1975	August 7, 1977
Nitrogen Dioxide	February 8, 1988	February 8, 2008
Particulate Matter	June 5, 1975	August 7, 1977

The minor source baseline date is established in an area when the first complete PSD application is submitted to EPA after the trigger date. See 40 C.F.R. § 52.21(b)(14)(i). EPA deemed the Shell OCS/PSD application for exploratory drilling in the Chukchi Sea complete on July 31, 2009 (EPA 7/31/09 Completeness Letter), which effectively establishes July 31, 2009 as the minor source baseline date for SO_2, NO_2, and PM_{10} in the Chukchi Sea/Beaufort Sea baseline area. As a result, Shell is required to consider increment consuming emissions increases and decreases after July 31, 2009 from other sources in the area in its analysis of compliance with air quality increments. In this case, however, there are no existing major or minor stationary sources in any of the applicable air pollutant significant impact areas impacted by this permitting action. Because this is the first complete PSD permit application that has been submitted in the baseline area and there are no existing sources, Shell only needs to address its own emissions in conducting the air quality impact analysis. See 40 C.F.R. § 52.21(b)(13), 40 C.F.R. § 52.21(k)(1) and EPA 10/90 Draft NSR Manual.

As discussed in section 5.2.4 below, Shell anticipates constructing a warehouse which would have an oil fired heater in the existing Northern Alaska Intrastate AQCR. The permitting of this source is the responsibility of the Alaska Department of Environmental Conservation since it is not an OCS source. Nevertheless, the minor source baseline dates have been triggered in this AQCR as shown in Table 5.4 below (Schuler 7/2/09).

Table 5.4 – Minor Source Baseline Date

Air Pollutant	Minor Source Baseline Date
Sulfur Dioxide	June 1, 1979
Nitrogen Dioxide	February 8, 1988
Particulate Matter	November 13, 1978

5.2.3 Air Quality Model

In its air quality analysis, Shell used a non-guideline model called ISC3-Prime (EPA 2004 ISC3-Prime) in order to better predict the maximum concentration immediately downwind of the hulls of the vessels. The ISC3-Prime model has been evaluated under Arctic conditions (EPA 6/03 AERMOD). In the absence of the site-specific, over-ocean meteorological data necessary to run other models, EPA believes ISC3-Prime is an appropriate model for determining the air quality impacts from the Discoverer and the Associated Fleet in Arctic conditions and approved the use

Exhibit 13
AEWC & ICAS

Alaska Eskimo Whaling Commission
P.O. Box 570
Barrow, AK 99723

Inupiat Community of the Arctic Slope
P.O. Box 934
Barrow, AK 99723

North Slope Borough
P.O. Box 69
Barrow, AK 99723

October 20, 2009

Via Electronic Mail

Pat Nair
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Shell Chukchi OCS Air Permit
EPA Region 10
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Seattle, WA 98101
R10ocsairpermits@epa.gov

Re: Shell Gulf of Mexico/Shell Offshore Inc.'s Application for a Chukchi Sea Clean Air Act Permit.

Dear Ms. Helm and Mr. Nair:

Thank you for the opportunity to comment on Shell's Clean Air Act (CAA) permit application materials, EPA's proposed permit and statement of basis for that permit. Because of our unified interest in minimizing the impacts of air pollution and global warming in our Arctic communities and surrounding environment these comments are signed and submitted jointly on behalf of the Alaska Eskimo Whaling Commission (AEWC), the Inupiat Community of the Arctic Slope (ICAS), and the North Slope Borough (NSB).

At the outset, we wish to express our sincere thanks to you and your fellow staff at EPA for visiting the North Slope and meeting with representatives from each of our organizations to discuss this proposed permit. Your efforts demonstrate a good faith effort to meaningfully consider our comments and concerns. We are encouraged by your efforts and submit these comments to assist you in your ongoing review of Shell's proposed action. We hope that you will permit the proposed emissions only when their impact to the health and welfare of our people is minimized to the greatest extent possible and we have provided these unified comments to assist you in doing so.

As you know, the AEWC is a non-profit organization representing Inupiat whaling captains in Northern Alaska. AEWC represents the eleven bowhead whale subsistence hunting villages of Barrow, Nuiqsut, Kaktovik, Pt. Hope, Kivalina, Wales, Savoonga, Gambell, Little Diomede,

Exhibit 14
AEWC & ICAS

EAB flatly rejected Region 8's argument, stating it was at odds with the agency's prior stance on section 821. In doing so, the EAB suggested that CO_2 is subject to regulation under section 821:

> the preamble as a whole augers in favor of a finding that the Agency expressly interpreted 'subject to regulation under this Act' to mean 'any pollutant regulated in Subchapter C of Title 40 of the Code of Federal Regulations for any source type.'[45]

The permitting agencies in *Deseret* and *Northern Michigan* could not provide an adequate explanation why CO_2 is not subject to regulation because there simply is not one. Between section 821 of the CAA and Delaware's emissions limitations on electrical generators, CO_2 is definitively regulated under the CAA and must be subject to a case-by-case BACT analysis for new sources that will emit the pollutant in significant amounts. In the absence of a BACT analysis for Shell's operations, the EPA must provide a legally defensible justification as to why CO_2 is not subject to regulation under the Act.

II. BACT Must Be Applied To All The Vessels And Emission Units That Shell Intends To Use In Order To Ensure Compliance With The Clean Air Act.

The Clean Air Act requires Best Available Control Technology (BACT) for both the Discoverer, an OCS source, and its support vessels. Thus, before issuing a Prevention of Significant Deterioration (PSD) permit to a major new stationary source (source), the EPA must conduct a BACT analysis for each pollutant that the source has the potential to emit in significant quantities.[46]

In the draft PSD permit for Shell's Chukchi operations, BACT has been applied to select emission units on-board the Discoverer and to the support vessel only while it is attached to the Discoverer. BACT has not been required for the Discoverer's propulsion engine or the other numerous vessels that are associated with Shell's proposed operations (hereafter ancillary fleet or ancillary vessels). These vessels include two icebreakers, a resupply ship, and an oil response fleet (composed of one offshore management ship and three 34-foot work boats). This is significant because the ancillary vessels account for at least 97 percent of Shell's overall emissions for five of the criteria air pollutants and the emissions from Discoverer's propulsion engine have yet to be calculated.[47]

The ancillary vessels and Discoverer's propulsion engine must be regulated as part of the emissions from the "OCS source." Issuing a permit that fails to require BACT for these vessels

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[45] *In re: Deseret Power Electric Cooperative,* PSD Appeal No. 07-03, Slip Op. at 3.
[46] 42 U.S.C. § 7475(a)(4).
[47] *See*, Appendix A, EPA Stmt of Basis at A-1: Summary of Annual Emissions for the Discoverer and the Associated Fleets. (*i.e*., the Discoverer is projected to emit 52.34 tons/year of NOx while the associated fleet is projected to emit 1,912.29 tons/year of NOx. Overall, Shell's operations will emit 1964.63 tons/year of NOx, of which the associated fleet is responsible for 97.3%)