PUBLIC INFORMATION

Revised Outer Continental Shelf Lease Exploration Plan Camden Bay, Beaufort Sea, Alaska

Flaxman Island Blocks 6559, 6610 & 6658 Beaufort Sea Lease Sales 195 & 202

May 2011

Submitted to:

U.S. Department of the Interior
Bureau of Ocean Energy Management, Regulation and Enforcement
Alaska OCS Region

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ACRONYMS & ABBREVIATIONS

°	degree(s)
°C	degrees Celsius
°F	degrees Fahrenheit
‘	minute(s)
“	second(s)
#	number
2D	two-dimensional
3D	three-dimensional
4MP	marine mammal monitoring and mitigation plan
AAC	Alaska Administrative Code
AAAQS	Alaska Ambient Air Quality Standards
ac-ft	acres foot (feet)
ACS	Alaska Clean Seas
ACMP	Alaska Costal Management Program
ADEC	Alaska Department of Environmental Conservation
ADNR	State of Alaska, Department of Natural Resources
APD	Application for Permit to Drill
API	American Petroleum Institute
ASRC	Arctic Slope Regional Corporation
BACT	best available control technology
bbl	barrel(s)
BHP	bottom hole pressure
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
BOP	blowout preventer
bopd	barrels of oil per day
CDU	conical drilling unit
CFR	Code of Federal Regulations
C/L	cementing and logging activity
CLO	Community Liaison Officer
cm	centimeter(s)
cm/sec	centimeters per second
CO	carbon monoxide
COCP	Critical Operations and Curtailment Plan
Com Centers	Communications and Call Centers
Cp	centipoise
C-Plan	Oil Discharge Prevention and Contingency Plan
DCOM	Division of Coastal and Ocean Management
dB	decibels
Discoverer	M/V *Noble Discoverer*
DNV	Det Norske Veritas
DP	dynamic positioning
ea	each
EAB	Environmental Appeals Board
EP	Exploration Plan
EPA	US Environmental Protection Agency
ESA	Endangered Species Act
ESE	east-southeast
FBHP 1	Flowing pressure at the uppermost producing interval
FBHP 2	Flowing pressure at the 9-$^{5}/_{8}$” casing shoe

FWHP	Flowing pressure at the top of the BOP stack (8 ft 2-in. below mudline)
FEIS	Final Environmental Impact Statement
FI	Flaxman Island
ft	feet (foot)
FTP	Fuel Transfer Plan
gal	gallon(s)
gal/min	gallons per minute
g/kW-hr	grams per kilowatt-hour
GP	General Permit
H_2S	hydrogen sulfide
HAP	hazardous air pollutants
hp	horsepower
HPU	hydraulic power units
hr(s)	hour(s)
HSSE	Health, Safety, Security and Environment
IHA	Incidental Harassment Authorization
IMP	Ice Management Plan
in.	inch(es)
kg	kilogram(s)
km	kilometer(s)
kro	relative permeability to oil
kVA	1000 volt-ampere
Kulluk	conical drilling unit *Kulluk*
kW	kilowatt(s)
kWe	kilowatt(s) equivalents
lb	pound(s)
LBP	length between perpendiculars
lighting plan	Bird Strike Avoidance and Lighting Plan
LMRP	lower marine riser package
LOA	Letter of Authorization
m	meter(s)
m^2	square meters
m^3	cubic meters
MAWP	maximum anticipated wellhead pressure
max	maximum
mD	millidarcies
mi	mile(s)
min	minute
MLC	mudline cellar
MLT	measured length thickness
mm	millimeter(s)
MMPA	Marine Mammal Protection Act
MMOs	marine mammal observers
MMS	Minerals Management Service
MODU	mobile offshore drilling unit
mph	miles per hour
ms	milliseconds
MSD	Marine Sanitation Device
mt	metric tons
Mud Plan	Drilling/Completion Fluids Proposal
M/V	Motor Vessel

N	North
NAAQS	National Ambient Air Quality Standards
N/A	Not Applicable
NaCl	sodium chloride
NAD	North American Datum 1983
NEI	Northern Economics Inc.
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NOx	nitrogen oxide(s)
NPDES	National Pollution Discharge Elimination System
NSB	North Slope Borough
NSR/PSD	new source review Prevention of Significant Deterioration
NTL	Notice to Lessee
OCS	Outer Continental Shelf
ODPCP	Oil Discharge Prevention and Contingency Plan
OS	offshore
OSR	oil spill response
OSRA	Oil-Spill-Risk Analysis
OSRB	oil spill response barge
OSRP	oil spill response plan
OST	oil spill tanker
OSV	offshore supply vessel
pH	para-hydronium ion concentration
$PM_{2.5}$	particulate matter less than 2.5 microns
PM_{10}	particulate matter less than 10 microns
POC	Plan of Cooperation
ppg	pounds per gallon
ppm	parts per million
ppt	parts per thousand
PSD	Prevention of Significant Deterioration
psi	pounds per square inch
PSIA	pounds per square inch
psig	pounds per square inch (gauge)
PTE	potentials to emit
PTVD	proposed total vertical depth
RB	reservoir barrels
ROV	remotely operated vehicle
rpm	revolutions per minute
RS/FO	Regional Supervisor, Field Operations
SA	Subsistence Advisor
SCF	standard cubic feet
SCR	selective catalytic reduction
sec	second
Shell	Shell Offshore Inc.
SIWAC	Shell Ice and Weather Advisory Center
SO_2	sulfur dioxide
SS	subsea
STB	stock tank barrel
swi	water saturation, initial
TA	temporarily abandon
TBD	To be determined

TDS	Treatment/Disposal Site
TSS	total suspended solids
TVD	true vertical depth
TVT	true vertical thickness
U.S.	United States
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
VGP	*Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels and Version Nov. 2010*
W	West
WBM	water based drilling mud
WCD	worst case discharge
WCP	Well Control Plan
WNW	west-northwest
VOC	volatile organic compound(s)
VOSS	Vessel of Opportunity Skimming System
VSP	Vertical Seismic Profile
YBP	years before present
ZVSP	zero-offset vertical seismic profile

CROSS-REFERENCE TO RELEVANT REGULATIONS

Regulation Section	Regulatory Information	EP Section
Minerals Management Service		
30 CFR 250.211	**What must the EP include**	**Section 1.0, Appendices A, J & K**
(a)	Description, objectives and schedule	Section 1.0 a)
(b)	Location	Section 1.0 b)
(c)	Drilling Unit	Section 1.0 c)
(d)	Service fee	Section 1.0 d)
	OCS Form-137 Information	Appendix A
30 CFR 250.212	**What information must accompany the EP**	**Section 2.0 through 17.0 & Appendices A through M**
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(b)	Geological and geophysical information required by 250.214	**Section 3.0**
(c)	Hydrogen sulfide information required by 250.215	**Section 4.0**
(d)	Biological, physical, and socioeconomic information required by 250.216	**Section 5.0, Appendices F, & H**
(e)	Solid and liquid wastes and discharges information and cooling water intake information required by 250.217	**Section 6.0, Appendices B, & F**
(f)	Air emissions information required by 250.218	**Section 7.0**
(g)	Oil and hazardous substance spills information required by 250.219	**Section 8.0 –** C-Plan Information is submitted under separate cover
(h)	Alaska planning information required by 250.220	**Section 9.0, Appendices J, K, L, & M**
(i)	Environmental monitoring information required by 250.221	**Section 10.0, Appendices C, D, E, F, & I**
(j)	Lease stipulations information required by 250.222	**Section 11.0, Appendices C, D, E, F, H, I, & M**
(k)	Mitigation measures information required by 250.223	**Section 12.0, Appendices C, D, E, I, J, & K**
(l)	Support vessel and aircraft information required by 250.224	**Section 13.0**
(m)	Onshore support facilities information required by 250.225	**Section 14.0**
(n)	Coastal zone management information required by 250.226	**Section 15.0**
(o)	Environmental impact analysis information required by 250.227	**Section 16.0 & Appendix F**
(p)	Administrative information required by 250.228	**Section 17.0 & Appendix A**
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(b)	Drilling fluids	Section 2.0 b) & Section 6.0
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Regulation Section	Regulatory Information	EP Section
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31 CFR 250.224	**Support vessel and aircraft information**	**Section 13.0**
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(b)	Air emissions	Section 13.0 b)

Regulation Section	Regulatory Information	EP Section
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Regulation Section	Regulatory Information	EP Section
U.S. Environmental Protection Agency – NPDES		
40 CFR 122.21	Application for a permit	Section 6.0 & Appendix B
National Marine Fisheries Service		
50 CFR 216.104	Submission of requests	Section 10.0 b)
50 CFR 216.107	Incidental harassment authorization for Arctic waters	Section 10.0 b) & Appendix C
U.S. Fish and Wildlife Service		
50 CFR 18.124	How do I obtain a Letter of Authorization	Section 10.0 b) & Appendix E
U.S. Army Corps of Engineers		
33 CFR 325.1	Applications for permits	Appendix G
State of Alaska		
ACMP	Oil spill response planning	Submitted under separate cover
	Coastal zone management act information	Section 15.0

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SECTION 1.0 PLAN CONTENTS

Introduction

Shell Offshore Inc. (Shell) submitted its initial Outer Continental Shelf (OCS) Camden Bay Exploration Drilling Plan (Camden Bay EP) to the Minerals Management Service (MMS) (now the Bureau of Ocean Energy Management, Regulation and Enforcement and hereinafter collectively referred to as "BOEMRE") in May 2009. BOEMRE conditionally approved the Camden Bay EP on October 16, 2009 following a BOEMRE Environmental Assessment (EA) and Finding of No Significant Impact (FONSI). The initial Camden Bay EP contemplated a single season of operations using the Motor Vessel (M/V) *Noble Discoverer* (*Discoverer*) to drill exploration wells at two drill sites: one at the Sivulliq prospect (Sivulliq N – Flaxman Island Lease Block 6558) and one at the Torpedo prospect (Torpedo H – Flaxman Island Lease Block 6610). Shell planned to initiate exploration drilling activities under the Camden Bay EP in the summer of 2010, but the exploration drilling activities were postponed when BOEMRE suspended all exploration drilling activities in the Arctic following the Deepwater Horizon incident in the Gulf of Mexico.

On October 5, 2010, Shell submitted an update to the Camden Bay EP, along with information in response to Notice to Lessee (NTL) NTL No. 2010-N06, and an Application for Permit to Drill (APD) for the Sivulliq N drill site. Shell submitted that update in anticipation of proceeding with exploration drilling activities in the summer of 2011. However, continued permitting delays required Shell to postpone its planned exploration drilling activities once again.

Pursuant to this revised Camden Bay EP, Shell plans to drill four wells on three OCS lease blocks in the Camden Bay area of the Beaufort Sea (Figure 1a-1) beginning in the summer of 2012. Two of the four wells in this exploration plan (Sivulliq N and Torpedo H) were included in Shell's initial Camden Bay EP, and were specifically reviewed in BOEMRE's October 2009 EA and FONSI. This plan revision includes two additional wells, one each at the same prospects; addresses Shell's agreement with the local communities to collect selected waste streams that, under the initial Camden Bay EP, otherwise would have been discharged pursuant to the current NPDES general discharge permit; and notes the possibility that Shell might ultimately decide to substitute the *Discoverer* for the conical drilling unit (CDU) *Kulluk* (*Kulluk*) to drill the wells contemplated by the Camden Bay EP. Additional plan revisions are noted in Table 1.

Table 1 Comparison of Shell's Initial Camden Bay EP and the Revised Camden Bay EP

Parameter	Initial Camden Bay EP (2010)	Revised Camden Bay EP (2012 planned start)
Drilling seasons	July 10-October 31, 2010.	July 10- October 31 starting in 2012 and each subsequent season through the end of the program.
OCS Lease Blocks	Flaxman Island 6610 and 6658	Flaxman Island 6559, 6610, and 6658
Wells	Two -- Sivulliq N and Torpedo H	Four -- Sivulliq G and N; Torpedo H and J
Drilling unit	Drillship *Discoverer*	CDU *Kulluk* or Drillship *Discoverer*
Drilling Mud, Treated domestic waste, Treated sanitary waste; Uncontaminated ballast water; Bilge water	Discharged to the ocean as permitted under Environmental Protection Agency Arctic General Permit authorization AKG-28-0000	Collected, stored and then transported to an approved treatment/disposal site (TDS) for disposal
Primary Support Fleet	Anchor handler, ice management vessel, offshore supply vessels (OSV), West Dock shuttle	Similar fleet with the following variations: • OSV to collect waste streams from the *Kulluk* • Deck barge and tug and waste barge and

Table 1 Comparison of Shell's Initial Camden Bay EP and the Revised Camden Bay EP

Parameter	Initial Camden Bay EP (2010)	Revised Camden Bay EP (2012 planned start)
		tug to store the waste streams • Additional OSV for offshore supply
Oil Spill Response	Oil Spill Response (OSR) Tug and Barge; OSR Vessel, Arctic Tanker	OSR Tug and Barge; Arctic Tanker, OSR barge carrying containment system
Air permit	*Discoverer* – Prevention of Significant Deterioration (PSD) permit authorization R10OCS/PSD-AK-2010-01	*Discoverer* – PSD permit authorization R10OCS/PSD-AK-2010-01
		Kulluk – Minor Source Permit application for Beaufort Sea submitted February 28, 2011

As required by 30 Code of Federal Regulations (CFR) 250.212-228, details of the planned exploration drilling program are provided in the following sections and accompanying appendix material. While Shell has made this submission as a plan revision, it acknowledges that, pursuant to 30 CFR 250.285(c), the impacts previously identified and evaluated in Shell's initial Camden Bay EP and BOEMRE's October 2009 EA and FONSI are different than the impacts potentially resulting from the plan revision, and that this plan revision is subject to all of the procedures under 30 CFR 250.231 through 30 CFR 250.235.

a) Description, Objectives and Schedule for the Exploration Drilling Program

The leases listed in this revised Camden Bay EP were acquired at Beaufort Sea Oil and Gas Lease Sales 195 (March 2005) and 202 (April 2007). The four drill sites identified in this revised Camden Bay EP are listed below in Table 1.a-1.

Table 1.a-1 Camden Bay Drill Sites

Drill Site	Lease File Number	NR06-04 Flaxman Island Lease Block No.	Surface Location (NAD 83)*		Distance to Mainland Shore mi (km)
			Latitude (N)	Longitude (W)	
Sivulliq G	OCS-Y 1805	6658	70° 23' 46.82"	146° 01' 03.46"	16.6 (26.7)
Sivulliq N**	OCS-Y 1805	6658	70° 23' 29.58"	145° 58' 52.53"	16.2 (26.1)
Torpedo H**	OCS-Y 1941	6610	70° 27' 01.62"	145° 49' 32.07"	20.8 (33.5)
Torpedo J	OCS-Y 1936	6559	70° 28' 56.94"	145° 53' 47.15"	23.1 (37.2)

*North American Datum 1983
**Drill sites from approved Camden Bay EP

Shell plans to drill four wells (Table 1.a-1) to objective depth pursuant to the revised Camden Bay EP. As with any Arctic exploration drilling program, weather and ice conditions, among other factors, will dictate actual sequence in which the wells are drilled. All wells are planned to be vertical. Bottomhole locations will have the same latitude and longitude as surface locations.

This plan also contemplates a situation where a well that is started must be temporarily suspended due to ice, weather, or other conditions, and finished at a later date. Any well on which drilling is suspended will be secured in compliance with BOEMRE regulations and with the approval of the Regional Supervisor/Field Operations (RF/SO), whether it is permanently abandoned (30 CFR 250.1710 through 1717) or temporarily abandoned (30 CFR 250.1721-1723).

Shell may conduct a geophysical survey referred to as zero-offset vertical seismic profile(ZVSP) at each drill site where a well is drilled. Once the objective intervals are fully evaluated, each exploration well will be plugged and abandoned in compliance with BOEMRE regulation.

During exploration drilling operations, the drilling vessel (hereafter drilling vessel refers to either the *Kulluk* or *Discoverer*) will be attended by a minimum of 11 vessels that will be used for ice management, anchor handling/ice management, OSR, refueling, resupply, waste removal, and servicing of the drilling operations (see Table 1.a-2).

Table 1.a-2 Planned Support Vessels for the *Kulluk* or *Discoverer*

Support Vessel(or similar)	*Kulluk or Discoverer*
Primary Ice Management	*Nordica**
Secondary Ice Management / Anchor Handling	Hull 247* (also acts as tow vessel for the *Kulluk* and a berthing vessel for OSR)
Shallow water resupply	*Arctic Seal**
Offshore Resupply Vessel (OSV)	*Harvey Explorer**
Waste Streams Transfer Vessel	*Carol Chouest**
Waste Streams Temporary Storage and Transit to Disposal Facility (deck barge and tug; [deck barge])	*Southeast Provider** and *Ocean Ranger**
Waste storage barge and tug (waste barge)	TBD
Primary Oil Spill Response (OSR)	*Point Oliktok** Tug and *Endeavor* Barge*
OSR Liquid Storage and Refuel Supply Vessel	*Mikhail Ulyanov**
OSR Containment System	Invader Class tug* and barge
Anchor Handler – support for the Containment System Barge	TBD

*or equivalent vessel
TBD = Vessel role is included, vessel not yet named.

By agreement with the local communities, during exploration drilling activities contemplated by the revised Camden Bay EP, Shell will not discharge selected waste streams during routine drilling operations, even though the waste streams are allowable discharges under the current United States (U.S.) Environmental Protection Agency (EPA) administered Arctic National Pollutant Discharge Elimination System (NPDES) General Permit (GP) AKG-28-0000. Shell will not discharge treated sanitary waste (black water), domestic waste (gray water), bilge water and ballast water at any time and drilling mud and cuttings with adhered drilling mud below the depth of the 20-in. conductor shoe. These wastes will be collected and stored on a deck barge and waste barge and transported and disposed of at an approved and licensed facility. The following licensed facilities have been identified as potential sites for disposal of those waste streams collected during exploration drilling operations:

- Waste Management Inc. (Arlington, Oregon) – water based mud, cuttings with adhered mud, non hazardous trash and debris, treated sanitary waste, treated domestic waste, uncontaminated ballast water, treated bilge water, hazardous waste, used oil
- Emerald Services Inc. (Palmer, Alaska and Seattle, Washington) – hazardous waste, used oil

Cuttings generated while drilling the mudline cellar, the 36- and 26-in. hole sections (all drilled with seawater and viscous sweeps only) plus cement discharged while cementing the 30- and 20-in. casing strings will be discharged on the surface of the seafloor under provisions of the previously mentioned NPDES GP.

When transiting to location, the *Kulluk* (under tow) or *Discoverer* (under its own propulsion) and associated support vessels will transit through the Bering Strait into the Chukchi Sea on or after July 1, arriving at location near Camden Bay approximately July 10. Exploration drilling activities at the drill sites are planned to begin on or about July 10 and run through October 31, with a suspension of all operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. During the suspension for the whale hunts the drilling fleet will leave the Camden Bay project area and move to an area north of latitude 71° 25'N and west of longitude 146° 4'W. Shell will return to resume activities after the subsistence bowhead whale hunts conclude. Drilling activities may extend through October 31, depending on ice and weather conditions.

Helicopters will provide support for crew change, provision resupply, and search-and-rescue operations during the drilling season. A fixed wing aircraft will be part of the marine mammal monitoring and mitigation plan (4MP) for exploration drilling, carrying marine mammal observers (MMO) over the Sivulliq and Torpedo prospects to identify marine mammals. The crew change and resupply helicopter and the fixed wing aircraft will be based in Deadhorse, Alaska, with the search-and-rescue helicopter stationed in Barrow, Alaska.

At the end of each drilling season, the *Kulluk* (under tow), or the *Discoverer* (under its own propulsion) and associated support vessels will transit west into and then south through the Chukchi Sea.

b) Location

The locations of prospect lease blocks at which the planned drill sites are located are shown on Figure 1a-1 and -2. See also Table 1.a-1 for additional drill site location information.

Figures 1.a-3 through -10 are mooring location maps showing the planned anchor locations for each drill site.

Other information is provided for each of these planned drill sites in the OCS Plan Information Forms (MMS Form-137) included in Appendix A of the confidential copies of the revised Camden Bay EP.

Figure 1.a-1 Planned EP Drilling Program Area (see also Figure 1.a-2 where 4 drills sites on 3 OCS blocks are shown)

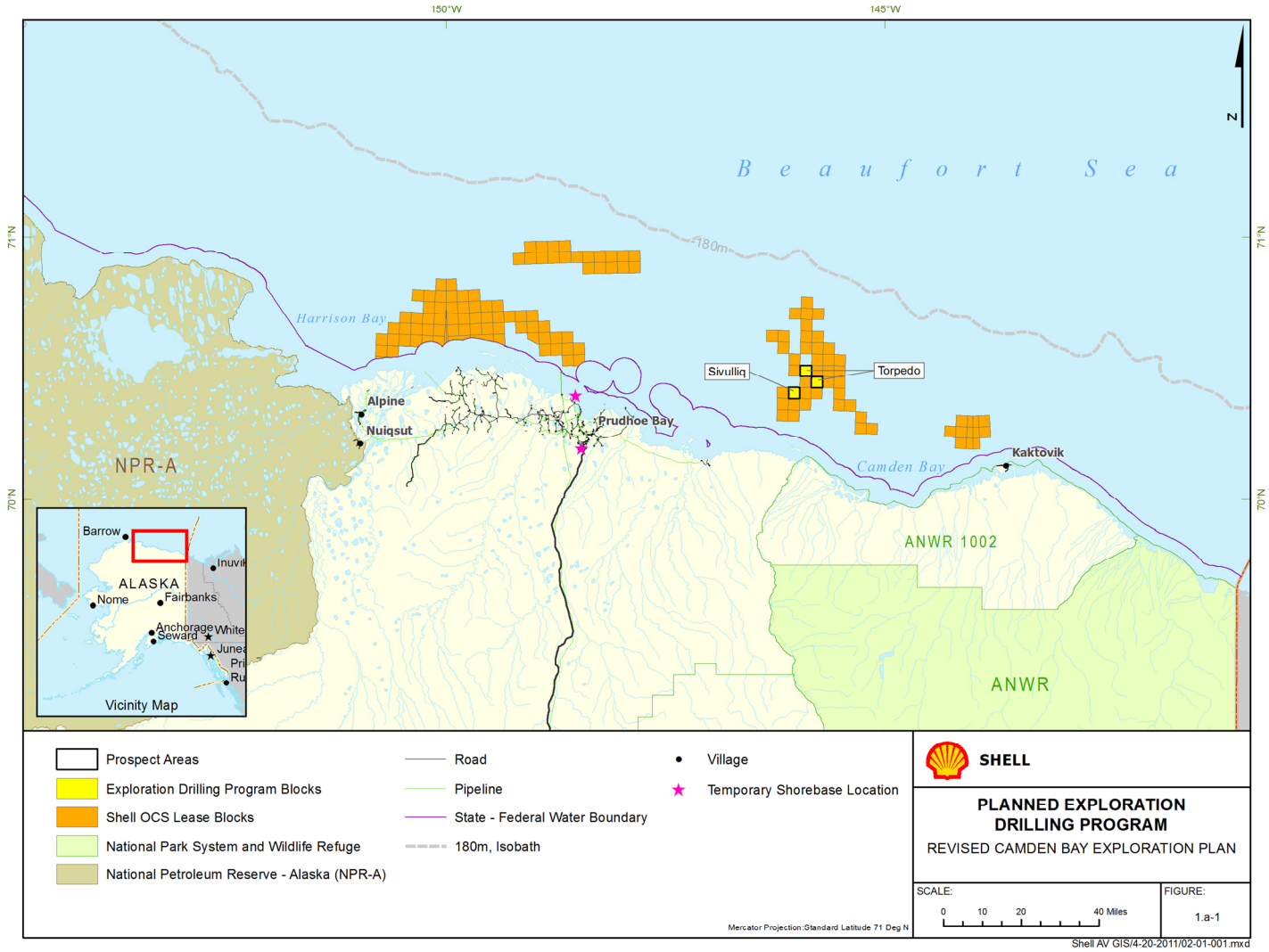


Figure 1.a-2 Location of the Sivulliq and Torpedo Prospects and Respective Drill Sites

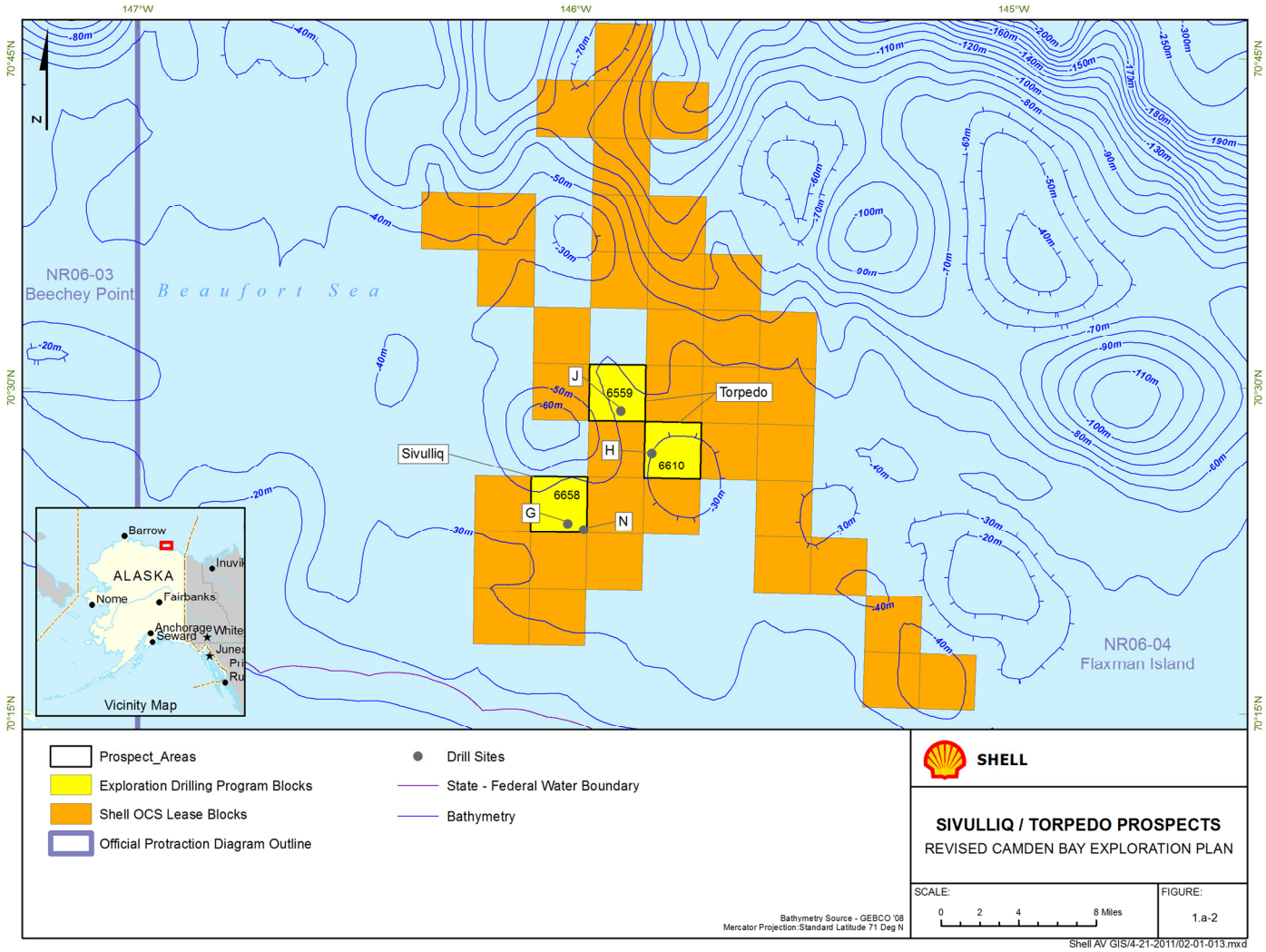


Figure 1.a-3 Bathymetry and Planned *Kulluk* Anchor Locations – Sivulliq G

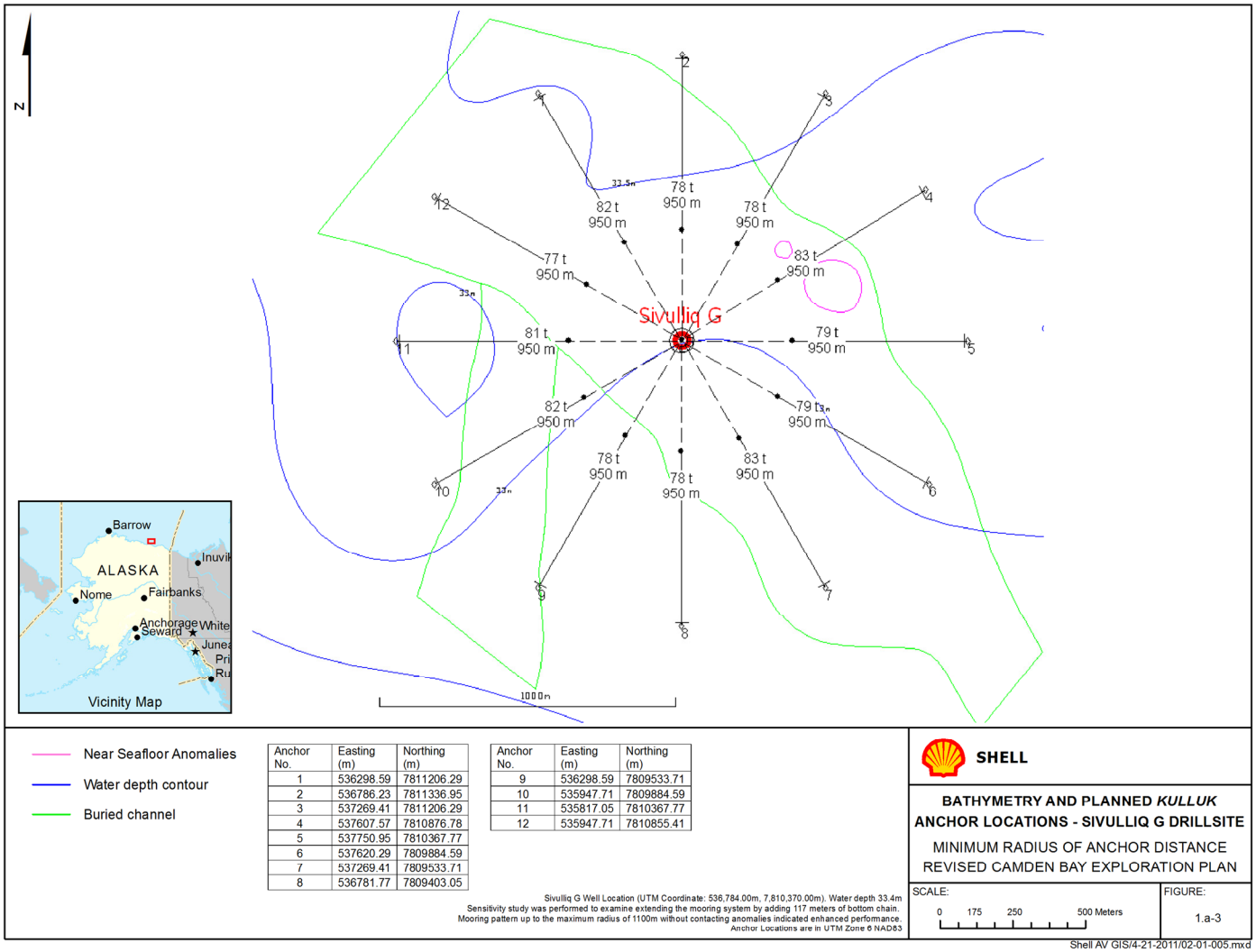
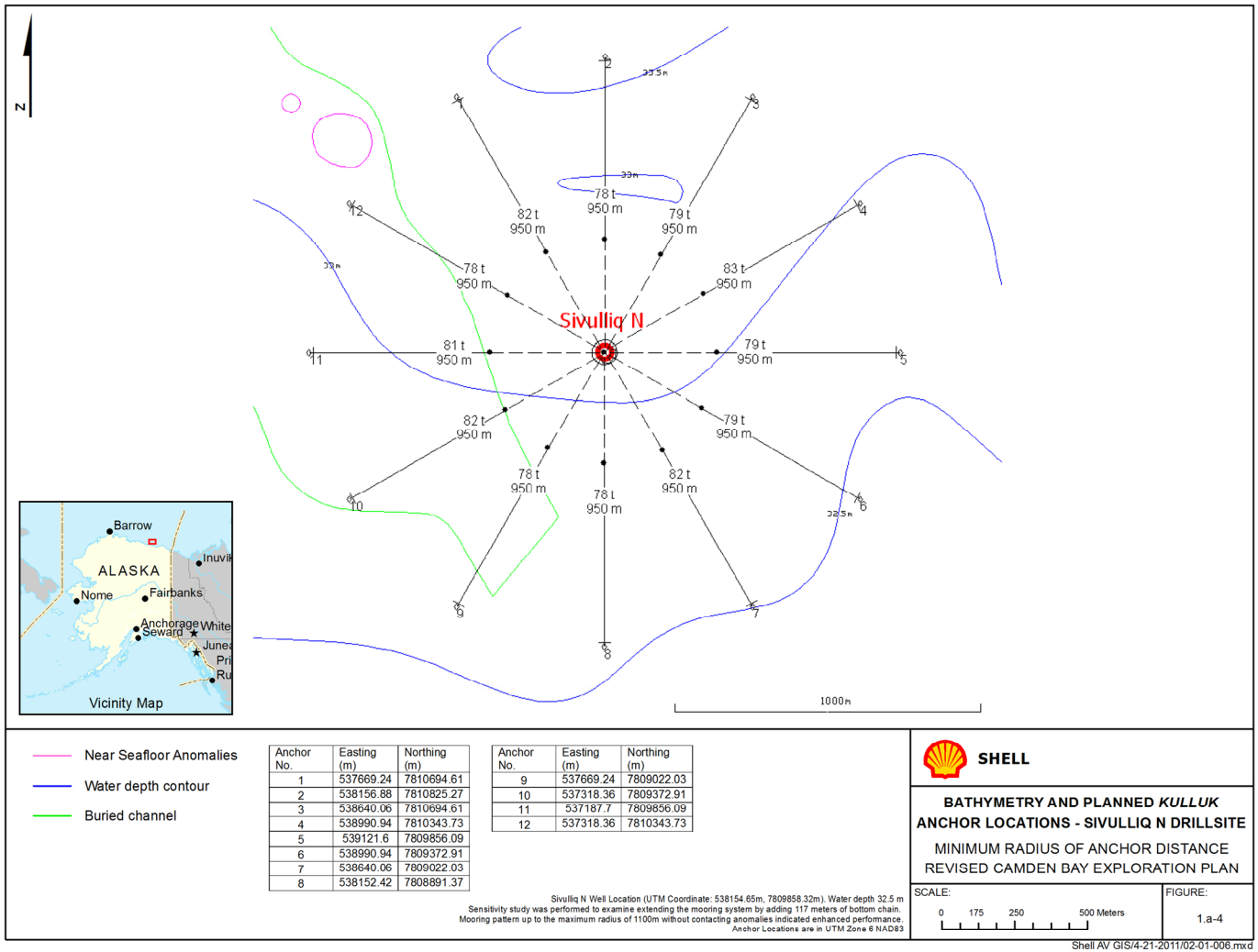


Figure 1.a-4 Bathymetry and Planned *Kulluk* Anchor Locations – Sivulliq N



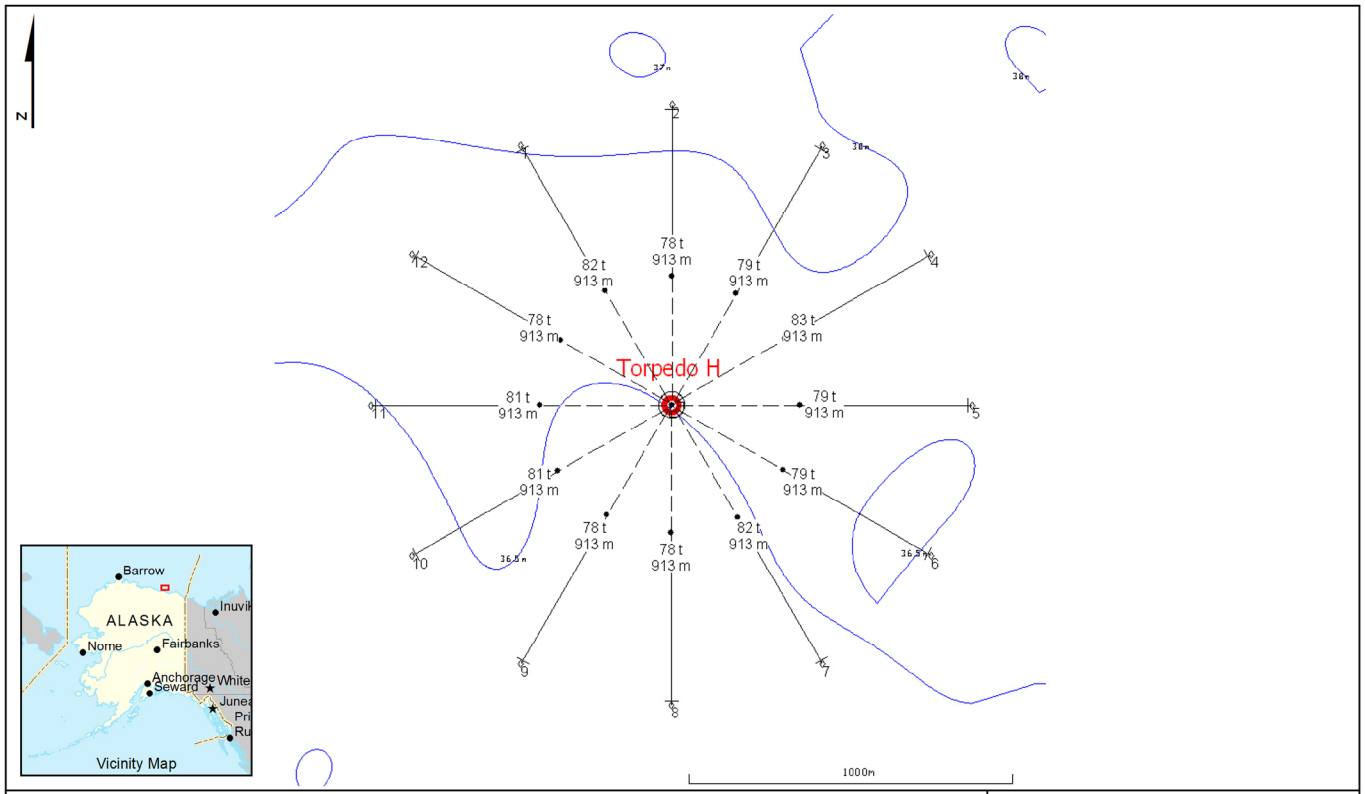
Anchor No.	Easting (m)	Northing (m)
1	537669.24	7810694.61
2	538156.88	7810825.27
3	538640.06	7810694.61
4	538990.94	7810343.73
5	539121.6	7809856.09
6	538990.94	7809372.91
7	538640.06	7809022.03
8	538152.42	7808891.37

Anchor No.	Easting (m)	Northing (m)
9	537669.24	7809022.03
10	537318.36	7809372.91
11	537187.7	7809856.09
12	537318.36	7810343.73

Sivulliq N Well Location (UTM Coordinate: 538154.65m, 7809858.32m). Water depth 32.5 m
Sensitivity study was performed to examine extending the mooring system by adding 117 meters of bottom chain.
Mooring pattern up to the maximum radius of 1100m without contacting anomalies indicated enhanced performance.
Anchor Locations are in UTM Zone 6 NAD83

Shell AV GIS/4-21-2011/02-01-006.mxd

Figure 1.a-5 Bathymetry and Planned *Kulluk* Anchor Locations – Torpedo H



Anchor No.	Easting (m)	Northing (m)
1	543391.09	7817335.25
2	543860.23	7817460.95
3	544324.91	7817335.25
4	544662.25	7816997.91
5	544787.95	7816528.77
6	544662.25	7816064.09
7	544324.91	7815726.75
8	543855.77	7815601.05

Anchor No.	Easting (m)	Northing (m)
9	543391.09	7815726.75
10	543053.75	7816064.09
11	542928.05	7816528.77
12	543053.75	7816997.91

Torpedo H Well Location (UTM Coordinate: 543,858.00m, 7,816,531.00m). Water depth 36.6 m
Sensitivity study was performed to examine extending the mooring system by adding 117 meters of bottom chain.
Mooring pattern up to the maximum radius of 1100m without contacting anomalies indicated enhanced performance.
Anchor Locations are in UTM Zone 6 NAD83

SHELL

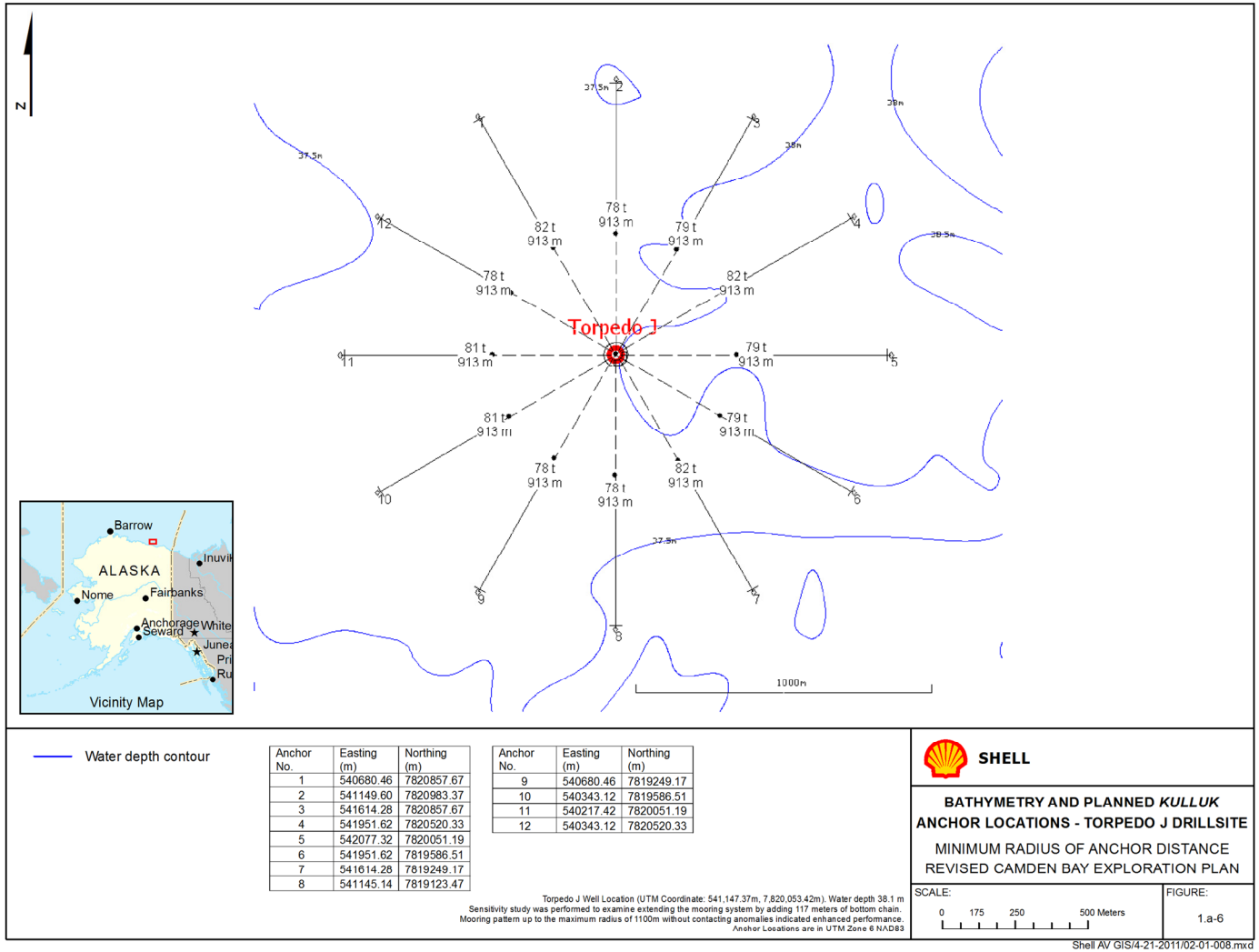
BATHYMETRY AND PLANNED *KULLUK*
ANCHOR LOCATIONS - TORPEDO H DRILLSITE
MINIMUM RADIUS OF ANCHOR DISTANCE
REVISED CAMDEN BAY EXPLORATION PLAN

SCALE: 0 175 250 500 Meters

FIGURE: 1.a-5

Shell AV GIS/4-21-2011/02-01-007.mxd

Figure 1.a-6 Bathymetry and Planned *Kulluk* Anchor Locations – Torpedo J



Anchor No.	Easting (m)	Northing (m)
1	540680.46	7820857.67
2	541149.60	7820983.37
3	541614.28	7820857.67
4	541951.62	7820520.33
5	542077.32	7820051.19
6	541951.62	7819586.51
7	541614.28	7819249.17
8	541145.14	7819123.47

Anchor No.	Easting (m)	Northing (m)
9	540680.46	7819249.17
10	540343.12	7819586.51
11	540217.42	7820051.19
12	540343.12	7820520.33

Torpedo J Well Location (UTM Coordinate: 541,147.37m, 7,820,053.42m). Water depth 38.1 m
Sensitivity study was performed to examine extending the mooring system by adding 117 meters of bottom chain.
Mooring pattern up to the maximum radius of 1100m without contacting anomalies indicated enhanced performance.
Anchor Locations are in UTM Zone 6 NAD83

SHELL

BATHYMETRY AND PLANNED *KULLUK* ANCHOR LOCATIONS - TORPEDO J DRILLSITE

MINIMUM RADIUS OF ANCHOR DISTANCE
REVISED CAMDEN BAY EXPLORATION PLAN

SCALE: 0 175 250 500 Meters

FIGURE: 1.a-6

Shell AV GIS/4-21-2011/02-01-008.mxd

Figure 1.a-7 Bathymetry and Planned *Discoverer* Anchor Locations – Sivulliq G

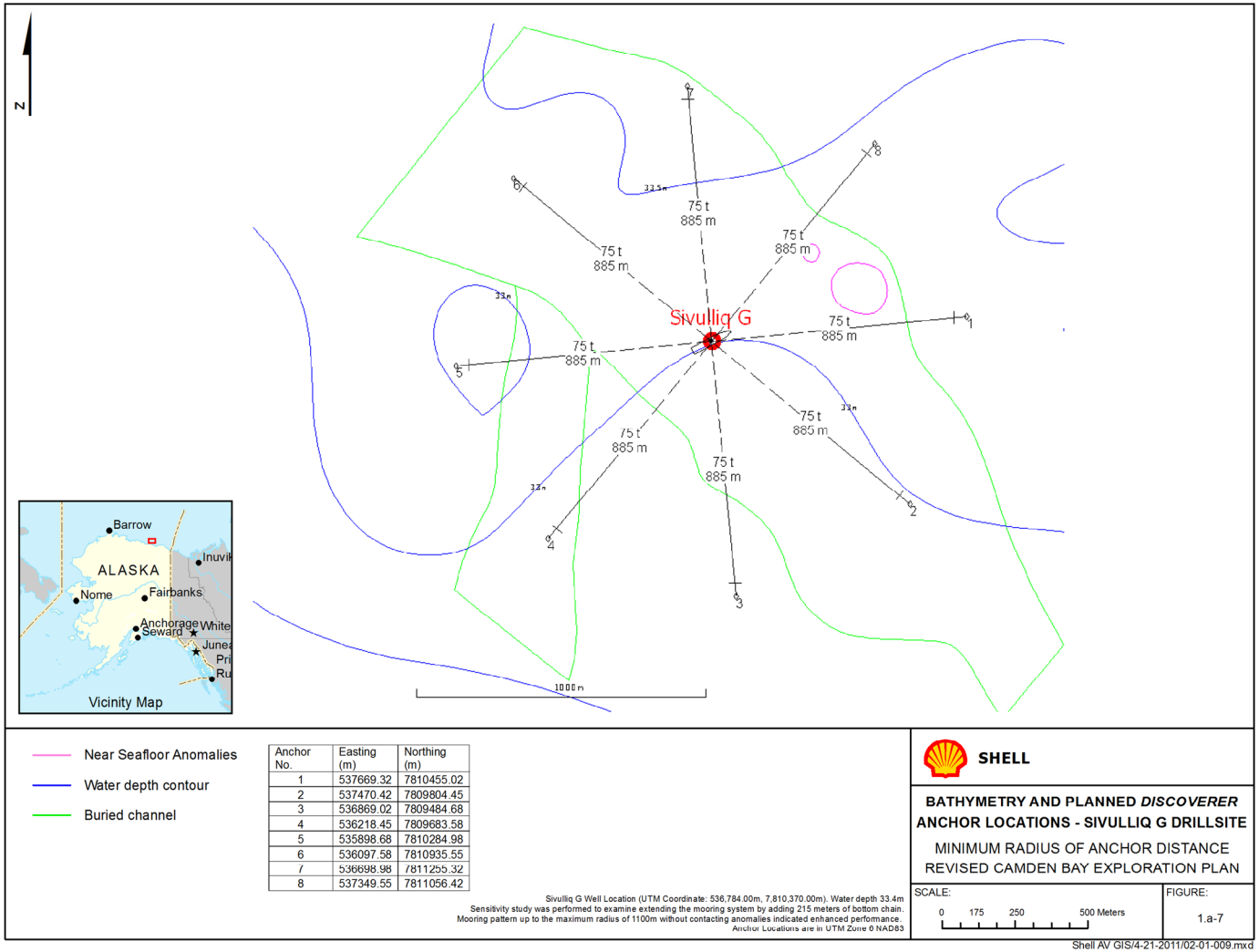


Figure 1.a-8 Bathymetry and Planned *Discoverer* Anchor Locations – Sivulliq N

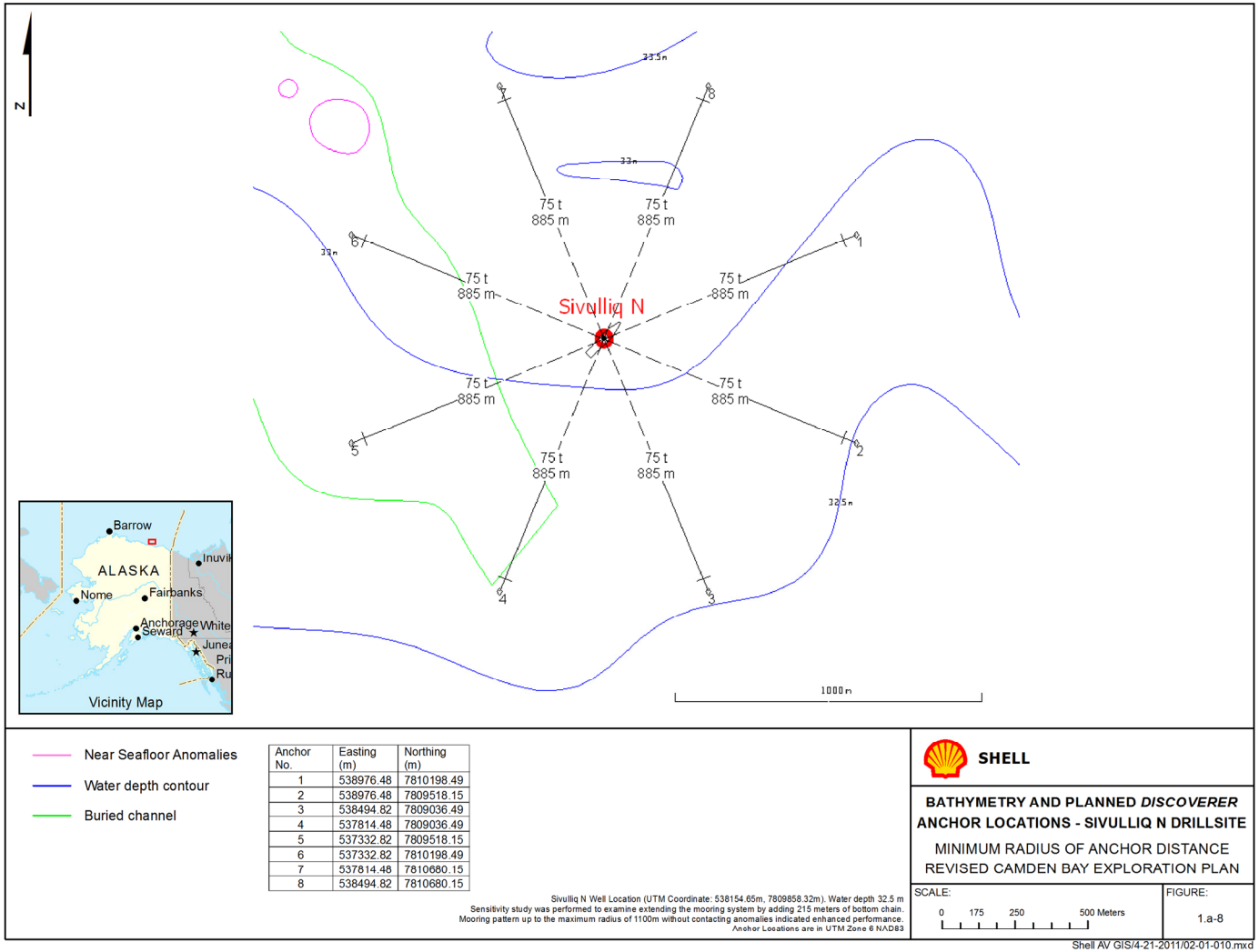
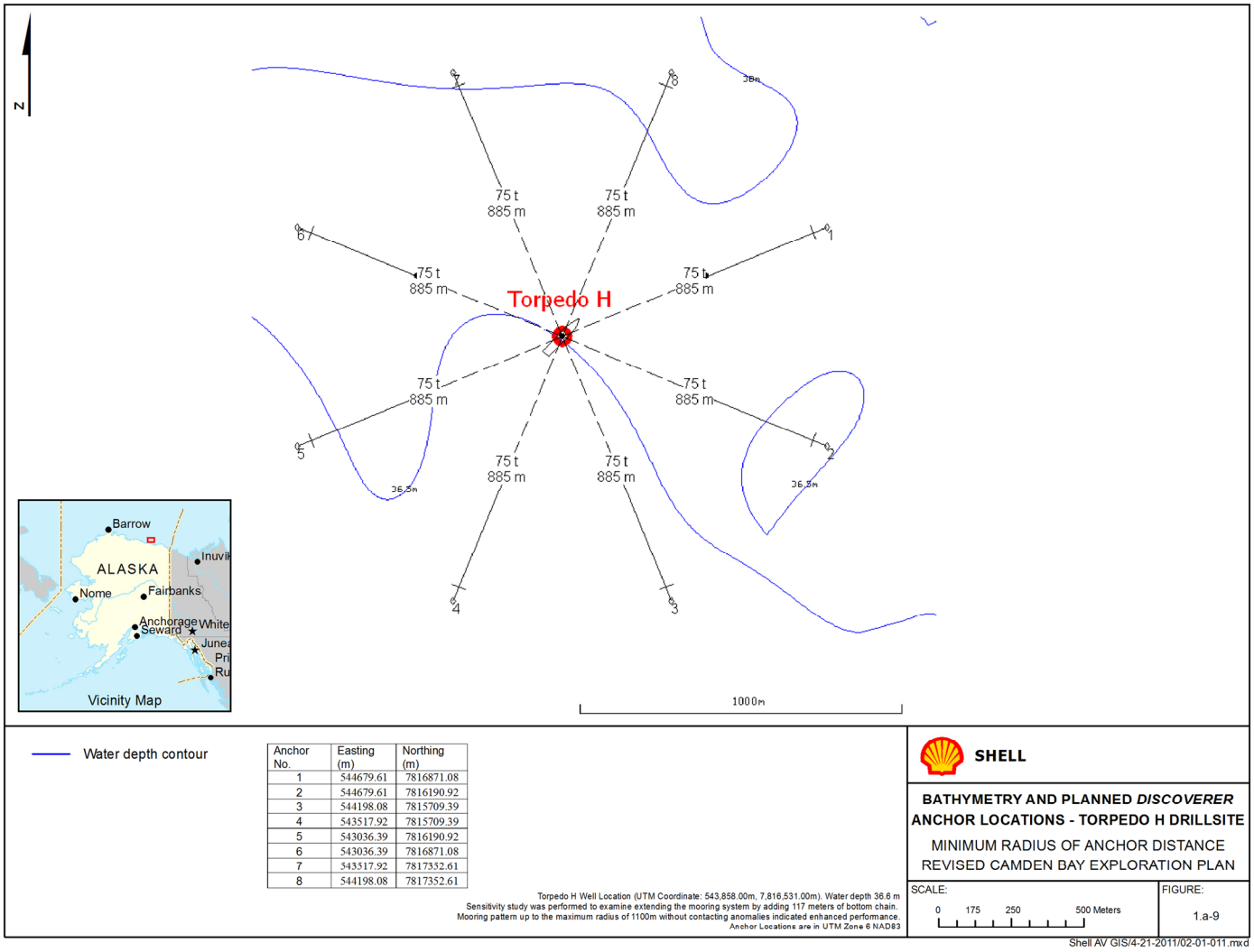


Figure 1.a-9 Bathymetry and Planned *Discoverer* Anchor Locations – Torpedo H

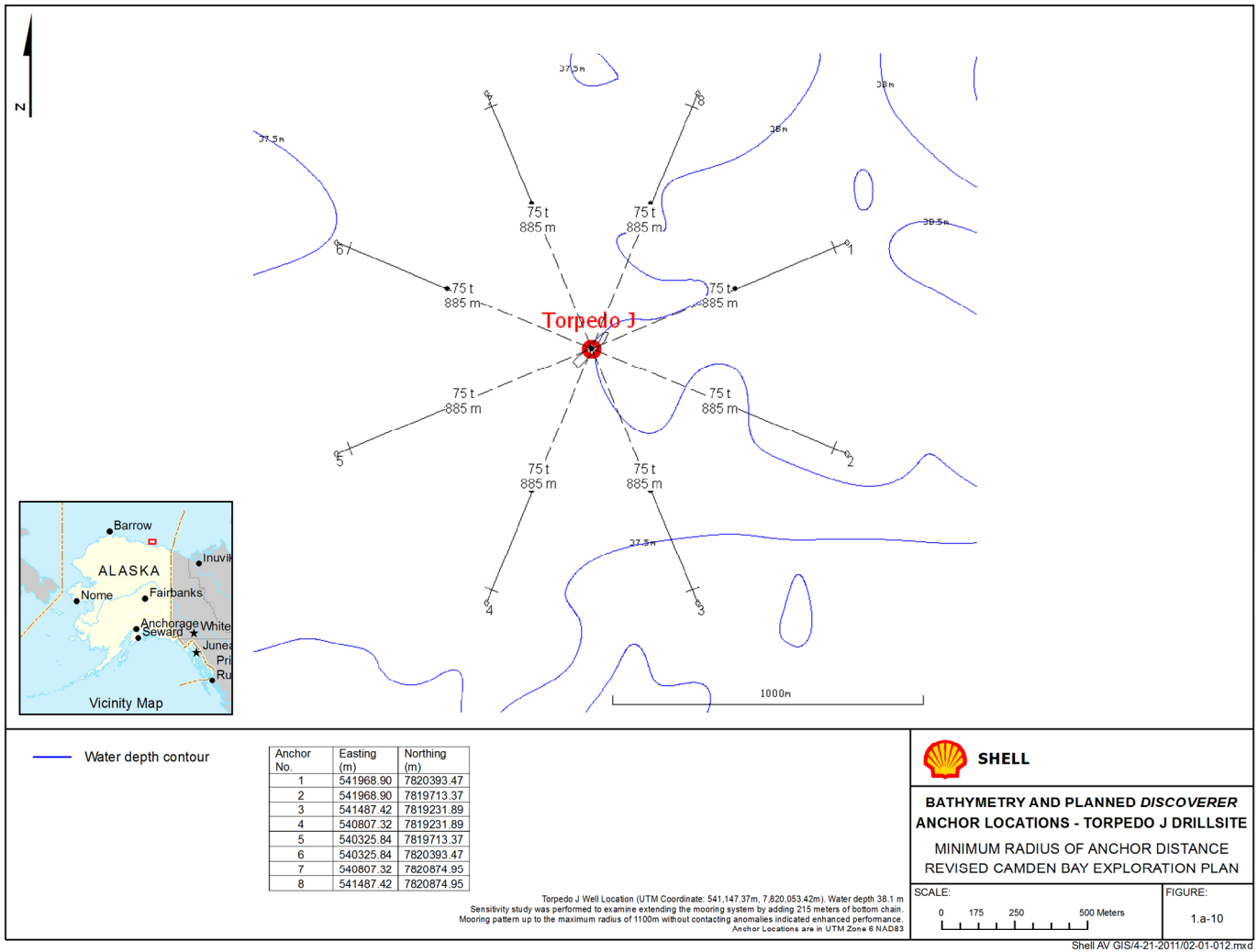


Anchor No.	Easting (m)	Northing (m)
1	544679.61	7816871.08
2	544679.61	7816190.92
3	544198.08	7815709.39
4	543517.92	7815709.39
5	543036.39	7816190.92
6	543036.39	7816871.08
7	543517.92	7817352.61
8	544198.08	7817352.61

Torpedo H Well Location (UTM Coordinate: 543,858.00m, 7,816,531.00m). Water depth 36.6 m
Sensitivity study was performed to examine extending the mooring system by adding 117 meters of bottom chain.
Mooring pattern up to the maximum radius of 1100m without contacting anomalies indicated enhanced performance.
Anchor Locations are in UTM Zone 6 NAD83

Shell AV GIS/4-21-2011/02-01-011.mxd

Figure 1.a-10 Bathymetry and Planned *Discoverer* Anchor Locations – Torpedo J



c) Drilling Vessels

Kulluk

Shell anticipates using the drilling vessel *Kulluk* to drill the wells proposed in the revised Camden Bay EP. The *Kulluk* has an Arctic Class IV hull design, is capable of drilling in up to 600 feet (ft) [182.9 meters (m)]) of water and is moored using a 12-point anchor system. The *Kulluk's* mooring system consists of 12 Hepburn winches located on the outboard side of the main deck, Anchor wires lead off the bottom of each winch drum inboard for approximately 55 ft (16.8 m). The wire is then redirected by a sheave, down through a hawse pipe to an underwater, ice protected, swivel fairlead. The wire travels from the fairlead directly under the hull to the anchor system on the seafloor. The *Kulluk* will have an anchor radius of 3,117 ft (950 m) for the Sivulliq drill sites and 2,995 ft (913 m) for the Torpedo drill sites. Specifications for the *Kulluk* and various diagrams are attached as Table 1.c-1.

The *Kulluk* is designed to maintain its location in drilling mode in moving ice with thickness up to 4 ft (1.2 m) without the aid of any active ice management. With the aid of the ice management vessels, the *Kulluk* would be able to withstand more severe ice conditions. In more open water conditions, the *Kulluk* can maintain its drilling location during storm events with wave heights up to 18 ft (5.5 m) while drilling, and can withstand wave heights of up to 40 ft (12.2 m) when not drilling and disconnected (assuming a storm duration of 24 hours).

The *Kulluk* will comply with the requirements of 30 CFR Part 250.417, the International Maritime Organization (IMO), the U.S. Coast Guard (USCG) and Det Norske Veritas (DNV). All drilling operations will be conducted under the provisions of 30 CFR 250, American Petroleum Institute (API) Recommended Practices (RP) 53, 65 Part 2 and 75, and other applicable regulations and notices, including those regarding the avoidance of potential drilling hazards and safety and pollution prevention control. Primary safety measures include: inflow detection and well control; monitoring for loss of circulation and seepage loss; and casing and cementing program designs. Primary pollution prevention measures consist of contaminated and non-contaminated drain systems, a mud drain system, and oily water processing.

Discoverer

As an alternative to the *Kulluk*, Shell might decide to use the *Discoverer* to drill some or all of the wells proposed in the revised Camden Bay EP. The *Discoverer* is a true, self-contained drillship. The *Discoverer* is an anchored drillship with an 8-point anchored mooring system and will likely have an anchor radius of 2,903 ft (885 m). The hull has been reinforced for ice resistance. Specifications for this drillship are provided below in Table 1.c-2.

The *Discoverer* will comply with the requirements of 30 CFR Part 250.417, the IMO, the USCG and DNV. All drilling operations will be conducted under the provisions of 30 CFR Part 250 Subpart D, API RP 53, 65 Part 2 and 75 and other applicable regulations and notices including those regarding the avoidance of potential drilling hazards and safety and pollution control. Such measures as inflow detection and well control, monitoring for loss of circulation and seepage loss, and casing design will be the primary safety measures. Primary pollution prevention measures are the contaminated and non-contaminated drain systems, the mud drain system, and the oily water processing system.

Procedures for monitoring and reacting to ice in the prospect areas are provided in the Critical Operations and Curtailment Plan (COCP) and the Ice Management Plan (IMP) which are attached as Appendices J and K of this revised Camden Bay EP.

Table 1.c-1 *Kulluk* Specifications

BeauDril

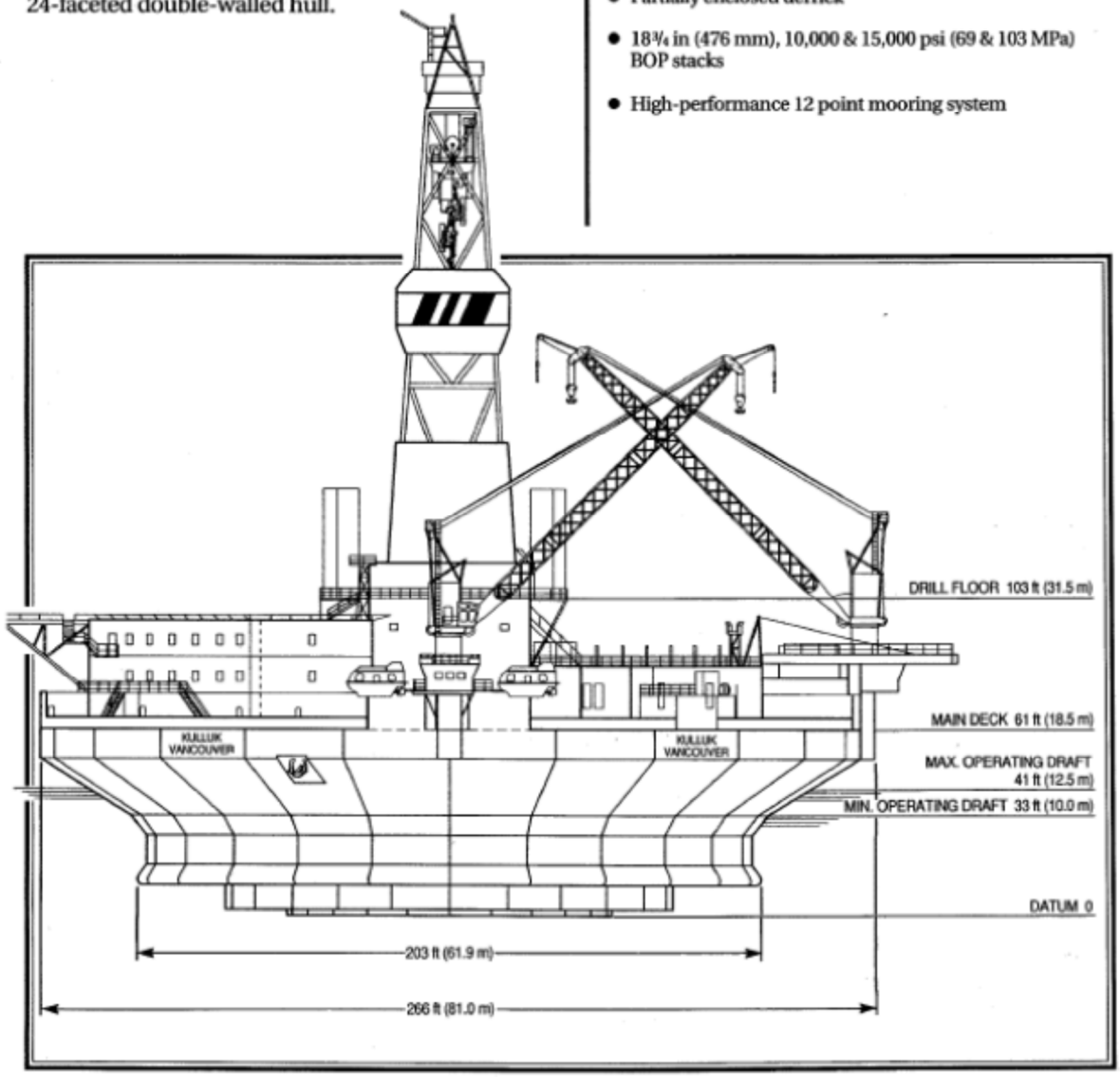
Kulluk

Kulluk is the first floating drilling vessel designed and constructed for extended season drilling operations in deep Arctic waters.

An improvement on the floating drillship concept, Kulluk is a conically shaped, ice strengthened floating drilling unit with a 24-faceted double-walled hull.

Key Features

- Unique, purpose-built conical Arctic Class IV hull design
- Operating water depth 60 to 600 ft (18.3 to 183 m), drilling depth up to 20,000 ft (6 096 m)
- Electrically driven Varco top drive drilling system
- 24 ft (7.3 m) diameter glory hole bit capable of drilling and setting a steel caisson 40 ft (12.2 m) into the seabed for ice scour protection
- Partially enclosed derrick
- 18¾ in (476 mm), 10,000 & 15,000 psi (69 & 103 MPa) BOP stacks
- High-performance 12 point mooring system



Classification

The unit has been designated as Arctic Class IV (by the Canadian Coast Guard) under Canadian Arctic Shipping Pollution Prevention Regulations, and as Ice Class 1AA by the American Bureau of Shipping.

Specifications

Owner:	BeauDril Limited
Flag:	Canadian
Rig Type:	Conical Drilling Unit (CDU)
Delivered:	1983
Rig Design:	Earl & Wright - Lavalin
Built By:	Mitsui Engineering and Shipbuilding, Japan

Dimensions

Diameter at main deck:	266 ft (81.0 m)
Diameter at pump deck:	196 ft (59.7 m)
Hull Depth:	61 ft (18.5 m)

Operations

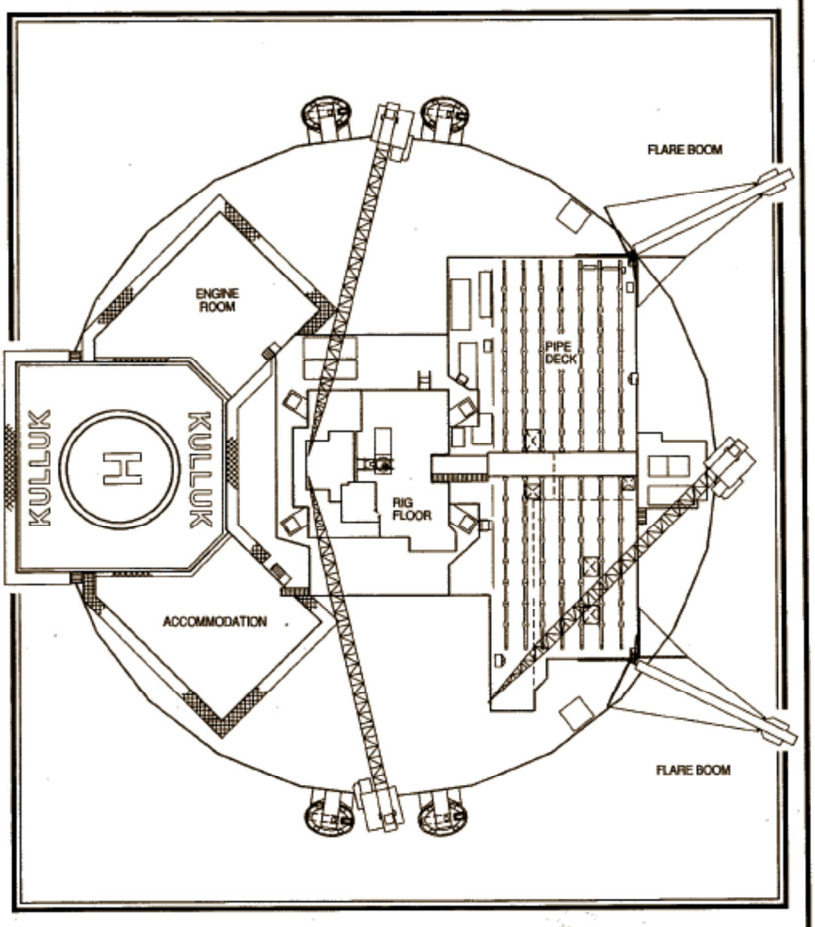
Draft (max. operating):	41 ft (12.5 m)
Draft (min. operating):	33 ft (10.0 m)
Draft (light ship):	26 ft (8.0 m)
Light Ship Displacement:	19,300 tons (17 510 tonnes)
Maximum Drilling Depth:	20,000 ft (6 096 m)
Operating Water Depth:	60 to 600 ft (18.3 to 183 m)

Variable Load

7,717 tons (7 000 tonnes)

Storage Capacities

Barite & cement bulk:	21,471 cf (608 m³)
Liquid mud:	2,605 bbl (414 m³)
Drill water:	4,227 bbl (672 m³)
Fuel:	10,085 bbl (1 603 m³)
Potable water:	1,961 bbl (312 m³)
Ballast:	35,928 bbl (5 712 m³)
Pipe & casing (pipe deck):	1,543 tons (1 400 tonnes)
Brine:	2,010 bbl (320 m³)

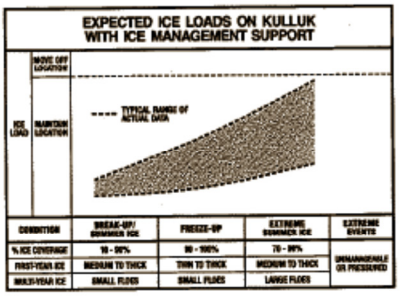


Operational Limits

Stationkeeping Conditions

Kulluk was built to operate in the ice infested waters of the Arctic offshore. The unit was developed to extend the drilling season available to more conventional floating vessels by enabling operations to be carried out through spring breakup conditions, the summer months, and well into the early winter period.

Kulluk was designed to maintain location in a drilling mode in moving first-year ice of 4 ft (1.2 m) thickness. With ice management support provided by BeauDril's Arctic Class IV icebreakers, the unit can maintain location in more severe conditions as shown below.



In terms of Kulluk's open water performance, the drilling unit was designed to maintain location in storm conditions associated with maximum wave heights of 18 ft (5.5 m) while drilling and 40 ft (12.2 m) while disconnected (assumed storm duration of 24 hrs).

If ice or open water storm conditions become more severe than those indicated, the unit's mooring system, which incorporates acoustic release devices, is disconnected from the anchors and the unit moves off location.

Equipment

Drilling Equipment

Derrick
160 ft (44.8 m) Dreco dynamic with a 40 ft x 40 ft (12.2 m x 12.2 m) base, rated at 1,400,000 lb (623 000 daN) with 14 lines

Racking platform has capacity to hold 23,340 ft (7 115 m) of 5 in (127 mm) drill pipe plus bottom hole assembly

Drawworks
Ideco E-3000 electric drawworks complete with sand reel, Elmago model 7838 Baylor auxiliary brake, spinning and breakout catheads and three GE model 752 motors each rated at 1,000 hp (746 kW) continuous

Travelling Block
McKissick model 686, 650 ton (590 tonne) capacity with 7 sheaves grooved for 1⅜ in (41.3 mm) drilling line

Swivel
Ideco TL-500, 500 ton (454 tonne) capacity

Drill Pipe
20,000 ft (6 096 m) x 5 in (127 mm), 19.5 lb/ft (29 kg/m) with 4½ IF connections

Top Drive
Varco TDS-3 with one GE model 752 motor rated at 1,000 hp (746 kW) continuous and a 500 ton (454 tonne) hoisting capacity

Rotary Table
Ideco LR-495, 49.5 in (1 257 mm) driven by one GE model 752 motor, rated at 1,000 hp (746 kW) continuous, coupled to a two speed transmission

Drill String Compensator
NL Shaffer 18 ft (5.5 m) stroke 400,000 lb (178 000 daN) compensating capacity or a 1,000,000 lb (444 800 daN) locked capacity

Tensioner System
4 x 80,000 lb (35 600 daN) Western Gear riser tensioners, 48 ft (14.6 m) wireline travel with 1¾ in (44.5 mm) wire rope

6 x 16,000 lb (7 100 daN) Western Gear guideline/pod tensioners, 40 ft (12.2 m) wireline travel with ¾ in (19.1 mm) wire rope

Mud Pumps
2 x Ideco T1600 triplex, each driven by two GE model 752 motors rated at 1,000 hp (746 kW) continuous

Cementing Unit
Dowell owned R717 twin triplex powered by two GE model 752 motors each rated at 1,000 hp (746 kW) continuous, with 7,500 psi (52 MPa) and 10,500 psi (72 MPa) fluid ends

Rig Floor Pipe Handling System
Varco Iron Roughneck model IR-2000
Range: 2⅞ to 8 in (73 to 203 mm)

Mud Logging Room

Designed to accommodate equipment from any of the major mud logging companies. This room is an integral part of the rig and contains complete lab facilities

Testing Equipment

Complete testing system with a 10,000 BOPD (1 590 m³/day) capacity consisting of: data header, choke manifold, steam heater, 3-phase separator, surge tank, water degasser, transfer pumps, and flare booms

Mud Conditioning Equipment

4 x Thule United VSM-120 shale shakers
1 x Brandt SR-3 desander
1 x Brandt SE-24 desilter
1 x Thule VSM-200 mud cleaner
1 x Wagner Sigma-100 centrifuge
1 x Sharples DM 40 000 centrifuge
2 x Burgess Magna-Vac vacuum degassers
2 x Alfa-Laval AX30 mud coolers

Subsea Equipment

BOP System
1 x NL Shaffer 18¾ in (476 mm), 10,000 psi (69 MPa) BOP stack with annular, 4 ram type preventors, and Vetco H-4 E connector

1 x NL Shaffer 18¾ in (476 mm), 15,000 psi (103 MPa) BOP stack with annular rated at 10,000 psi (69 MPa), 4 ram type preventors, and Vetco H-4 E x F connector

Lower Marine Riser Packages
2 x 18¾ in (476 mm) with 10,000 psi (69 MPa) Shaffer annular, Regan 24 in (610 mm) CR-1 pressure compensated lower ball joint and Vetco H-4E connector

BOP Cranes
2 x Hepburn main bridge cranes, 85 ton (77 tonne) capacity each with 10 ton (9.1 tonne) auxiliary hoists

30 in (762 mm) Marine Riser System
3 x hydraulic pin connectors; 2 x 36 in (914 mm) Cameron and 1 x 30 in (762 mm) Dril-Quip

1 x Regan 28 in (711 mm) CR-1 pressure compensated lower ball joint

30 in (762 mm) riser consisting of 1 in (25.4 mm) wall casing with Hunting Lynx 52S connectors

1 x Regan 28 in (711 mm) telescoping riser joint with 45 ft (13.7 m) stroke

1 x Regan 28 in (711 mm) DR-1 upper ball joint

1 x Regan KFDS 28 in (711 mm) diverter

21¼ in (540 mm) Marine Riser System
21¼ in (540 mm) Cameron RCK riser with 10,000 psi (69 MPa) choke and kill lines

2 x Cameron telescoping riser joints, 1 x 40 ft (12.2 m), and 1 x 50 ft (15.2 m) stroke

1 x Regan 24 in (610 mm) DR-1 upper ball joint

1 x Regan KFDS 24 in (610 mm) diverter

Glory Hole Bit
1 x Brown Tornado, 24 ft (7.3 m) diameter hydraulically operated with airlift discharge. Capable of drilling a glory hole 40 ft (12.2 m) into the seabed for ice scour protection

Power Generation

Prime Movers:
3 x Electro-Motive Diesel rated at 2,817 hp (2 100 kW) each

Emergency Power:
1 x GM Detroit diesel rated 873 hp (651 kW)

Cranes

3 x Liebherr, BOS 65/850, rated at 72 ton (65 tonne) at 30 ft (9.1 m)

Safety Equipment

4 x Whittaker 54-person survival craft; two on port, two on starboard

1 x Hurricane Model 700-D emergency rescue boat

2 x RFD inflatable escape slides

Helideck

Capacity for Sikorsky 61 or similar with fueling station

Accommodation

Bunks for 108 people, recreation room, sauna, galley with seating for 36, offices, and hospital

Kulluk Mooring System

The Kulluk's mooring system consists of twelve Hepburn winches located on the outboard side of the main deck. Anchor wires lead off the bottom of each winch drum inboard for approximately 55 ft (17 m). The wire is then redirected by a sheave, down through a hawse pipe to an underwater, ice protected, swivel fairlead. The wire travels from the fairlead directly under the hull to the anchor system on the seafloor.

Specifications

Anchor Winch
12 x Hepburn single-drum winches with a 287 ton (260 tonne) operating tension

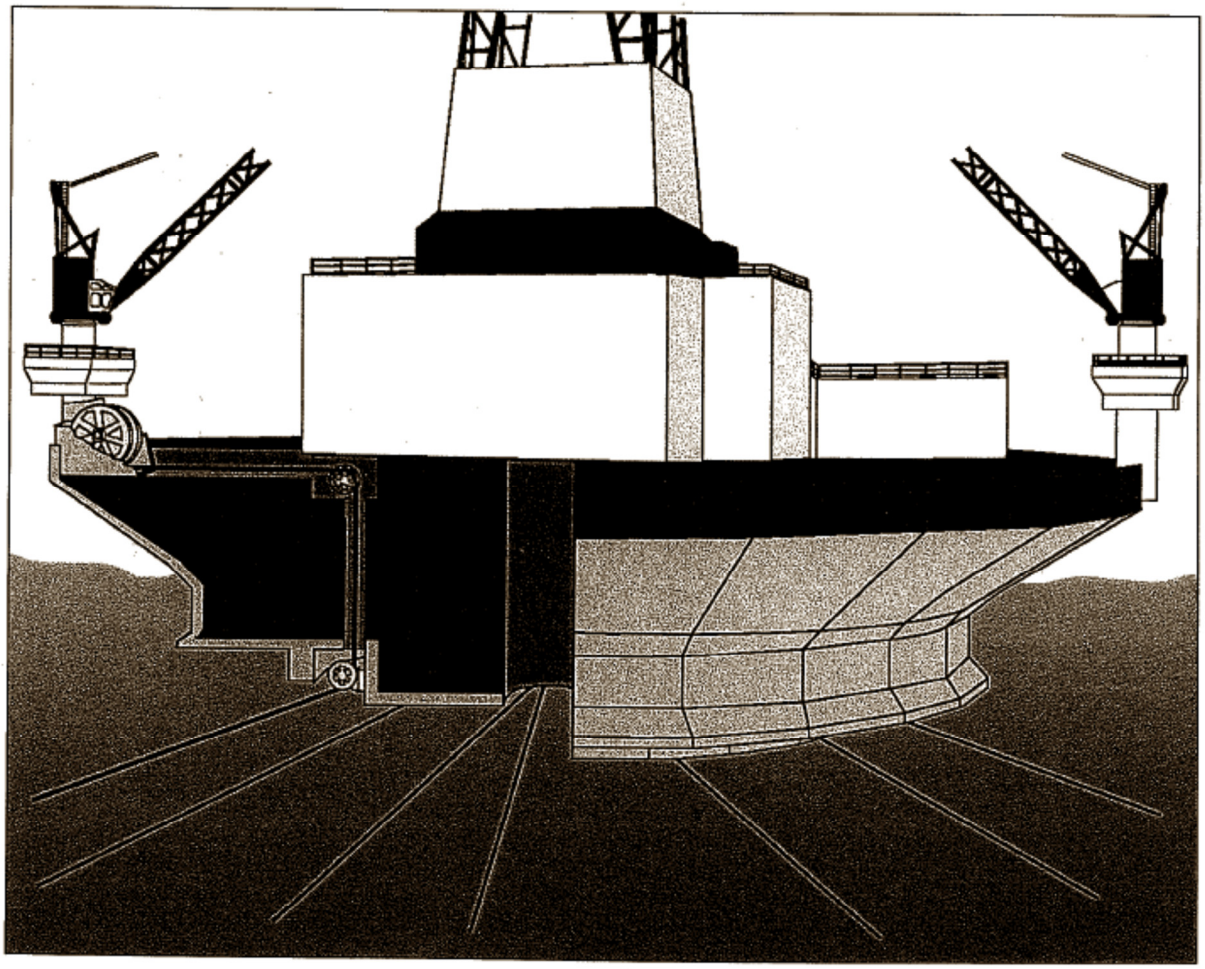
Mooring Wires and Anchors

Anchors:
Various sizes & quantities of anchors are available for use. Exact anchor configuration to be provided once location and seafloor conditions are specified

Wire ropes:
Each winch drum has capacity for 3,763 ft (1 147 m) of 3½ in (88.9 mm), 573 ton (520 tonne) breaking strength wireline

Anchor Release:
Each anchor wire contains a remote acoustic release (RAR) unit

FOR MORE INFORMATION ABOUT KULLUK, CONTACT MANAGER, BEAUDREAU (403) 233-3030.



Kulluk Anchoring Detail

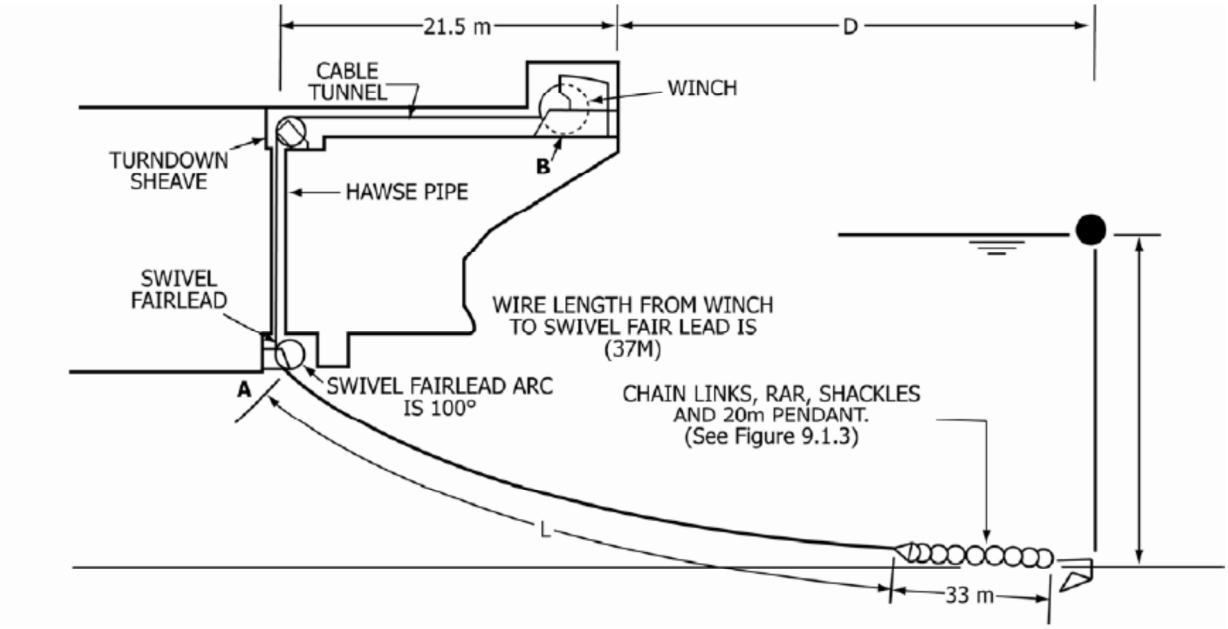


Table 1.c-2 *Discoverer* Specifications

***DISCOVERER* SPECIFICATIONS**	
TYPE-DESIGN	Drillship - Sonat Offshore Drilling *Discoverer* Class
SHAPE	Monohull with sponsons added for ice-resistance[1]
SHIP BUILDERS & YEAR	Namura Zonshno Shipyard, Osaka, Japan - hull number 355
YEAR OF HULL CONSTRUCTION	1965
YEAR OF CONVERSION	1976
DATE OF LAST DRY-DOCKING	2010

***DISCOVERER* DIMENSIONS**		
LENGTH	514 ft	156.7 m
LENGTH BETWEEN PERPINDICULARS (LBP)	486 ft	148.2 m
WIDTH	85 ft	26 m
MAXIMUM (MAX) HEIGHT (ABOVE KEEL)	274 ft	83.7 m
HEIGHT OF DERRICK ABOVE RIG FLOOR	175 ft	53.3 m

***DISCOVERER* MOORING EQUIPMENT**	
Anchor pattern symmetric 8 points system. The unit is fitted with Sonat Offshore Drilling patented roller turret mooring system giving the unit the ability to maintain favorable heading without an interruption of the drilling operations	
ANCHORS	Stevpris New Generation 7,000 kilograms (kg) each (ea) 15,400 pounds (lb) ea
ANCHOR LINES	Chain Wire Combination
SIZE/GRADE	2.75-in. wire 3-in. ORQ Chain
LENGTH	2,750 ft (838 m) wire + 1,150 ft (351 m) chain (useable) per anchor

***DISCOVERER* OPERATING WATER DEPTH**		
MAX WATER DEPTH	1,000 ft (305 m) with present equipment (can be outfitted to 2,500 ft [762 m])	
MAX DRILLING DEPTH	20,000 ft	6,098 m

Table 1.c-2 *Discoverer* Specifications (continued)	
DRAW WORKS	EMSCO E-2,100 - 1,600 horsepower (hp)
ROTARY	National C-495 with 49 ½ -in. opening
MUD PUMPS	2 ea. Continental Emsco Model FB-1600 Triplex Mud Pumps
DERRICK	Pyramid 170 ft. with 1,300,000 lb nominal capacity
PIPE RACKING	BJ 3-arm system
DRILL STING COMPENSATOR	Shaffer 400,000 lb with 18-ft (5.5 m) stroke
RISER TENSIONS	8 ea. 80,000 lb Shaffer 50-ft (15.2 m) stroke tensioners
CROWN BLOCK	Pyramid with 9 ea. 60-in. (1.5 m) diameter sheaves rated at 1,330,000 lb
TRAVELING BLOCK	Continental - Emsco RA60-6
BLOWOUT PREVENTOR (BOP)	Cameron Type U 18 ¾ -in. (48 cm) x 10,000 pounds per square in. (psi)
RISER	Cameron RCK type, 21-in. (53 cm)
TOP DRIVE	Varco TDS-3S, with GE-752 motor, 500 ton
BOP HANDLING	Hydraulic skid based system, drill floor

***DISCOVERER* DISPLACEMENT**	
FULL LOAD	20,253 metric tons (mt)
DRILLING	18,780 mt (Drilling, max load, deep hole, deep water)

***DISCOVERER* DRAUGHT**		
DRAFT AT LOAD LINE	27 ft	8.20 m
TRANSIT	27 ft (fully loaded, operating , departure)	8.20 m
DRILLING	25.16 ft	7.67 m

***DISCOVERER* HELIDECK**	
MAXIMUM HELICOPTER SIZE	Sikorsky 92N
FUEL STORAGE	2 ea. 720-gallon tanks

***DISCOVERER* ACCOMODATIONS**	
NUMBER OF BEDS	140
SEWAGE TREATMENT UNIT	Hamworthy ST-10

***DISCOVERER* PROPULSION EQUIPMENT**	
PROPELLER	1 ea 15 ft 7-in. (4.8 m) diameter, fixed blade
PROPULSION DRIVE UNIT	Marine Diesel, 6 cylinder, 2 cycle, Crosshead type
HORSEPOWER	7,200 hp @ 135 revolutions per minute (RPM)
TRANSIT SPEED	8 knots

GENERAL STORAGE CAPACITIES	
SACK STORAGE AREA	934 cubic meters (m^3)
BULK STORAGE	
Bentonite / Barite	180 m^3 - 4 tanks
Bulk Cement	180 m^3 - 4 tanks
LIQUID MUD	
Active	1,200 barrels (bbl)
Reserve	1,200 bbl
Total	2,400 bbl
POTABLE WATER	1,670 bbl / 265.5 m^3 (aft peak can be used as add. pot water tank)
DRILL WATER	5,798 bbl / 921.7 m^3
FUEL OIL	6,497 bbl / 1,033 m^3

[1] Sponsons designed and constructed to meet requirements of Det Norske Veritas (DNV) Additional Class Notation ICE-05.

d) Service Fee

The required permit fee of $13,768 (four drill sites at $3,442 each) has been paid in full.

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SECTION 2.0 GENERAL INFORMATION

a) Applications and Permits

Table 2.a-1 lists the federal permit and authorization applications and the state consistency review application that are being submitted to the appropriate regulatory agencies that authorize the revised Camden Bay EP exploration drilling program. No local permits are needed for these drilling activities. Some of these permits and authorizations will cover all four drill site locations on the BOEMRE lease blocks north of Point Thomson in the Camden Bay area of the Beaufort Sea, Alaska for the duration of the drilling program, whereas other authorizations will require yearly renewal.

Table 2.a-1 Permit and Authorization Applications

Permits and Authorizations	Agency	Submittal Date	Authorization Date	Comment / Location
Federal Permit / Authorization Applications Under Review				
Air Quality Permit *Discoverer*	EPA	Initial Application submitted May 29, 2009; last revision sent January 18, 2010	April 9, 2010	Authorization R10OCS/PSD-AK-2010-01; remanded back to EPA by the Environmental Appeals Board; see EPA website[1]
Air Quality Permit *Kulluk*		February 2011	Pending	Application for a Minor Source Permit; permit covers the *Kulluk* for the duration of the drilling program; see EPA website[2]
Notices of Intent (NOI) to Discharge under NPDES General Permit AKG-28-0000 *Discoverer*	EPA	December 2010 (for administrative extensions for Lease Block 6610 and 6658 and new NOI for Lease Block 6559)	AKG-28-0005 authorized April 20, 2010 (*Discoverer* – Lease Blocks 6610 and 6658)	Letter sent for Administrative Extension for Lease Blocks 6610, 6658 (current coverage under authorization AKG-28-0005)[3]; see EPA website NOI sent for Lease Block 6559 (see Appendix B this document)
Notices of Intent to Discharge under NPDES General Permit AKG-28-0000 *Kulluk*		April 8, 2011	Pending	Supplemental NOI information sent for lease blocks 6559, 6610, and 6658 (see Appendix B this document)
USACE NWP #8 Oil and Gas Structures	USACE	May 2011	Pending	See Appendix G of this document; authorization will be valid for two years
Application Permit to Drill (one per drill site)	BOEMRE	Sivulliq N submitted October 5, 2010 including additional information required by NTL 2010-N06	TBD	APDs for Sivulliq G, Torpedo H and J to be filed as separate documents following approval of the revised EP

Table 2.a-1 Permit and Authorization Applications

Permits and Authorizations	Agency	Submittal Date	Authorization Date	Comment / Location
Exploration Plan	BOEMRE	Revised EP submitted May 2011	Camden Bay EP upon which this revision is based was approved October 16, 2009	This document is a revision of a currently approved Camden Bay EP; authorization valid for the duration of the drilling program
OSRP (aka Oil Discharge Prevention and Contingency Plan [ODPCP])	BOEMRE	Revised ODPCP submitted May 2011	Beaufort Sea Regional ODPCP upon which the revision is based was approved March 11, 2010	Revised edition of the currently approved ODPCP; submitted as a separate document
MMPA IHA Application (whales and seals)	NMFS	May 2011	pending	Appendix C of this document; authorization valid for one year
MMPA LOA Application (polar bears and Pacific walrus); Incidental and Intentional Take	USFWS	May 2011	pending	Appendix E of this document; authorization valid for one year
State of Alaska Coastal Management Program				
ACMP Consistency Review	ADNR-DCOM[4]	Anticipated June 2011	pending	Section 15.0 of this document; consistency review concurrence valid for the duration of the drilling program

Notes
[1]Additional information found at http://yosemite.epa.gov/R10/airpage.nsf/Permits/beaufortap/
[2]Additional information found at http://yosemite.epa.gov/r10/airpage.nsf/Permits/kullukap/
[3]Also found at http://yosemite.epa.gov/R10/WATER.NSF/NPDES+Permits/General+NPDES+Permits
[4] Submitted to BOEMRE in this document, and then forwarded by BOEMRE to ADNR-DCOM for ACMP consistency review.
ACMP = Alaska Coastal Management Program
ADNR = State of Alaska, Department of Natural Resources
DCOM = Division of Coastal and Ocean Management
IHA = Incident Harassment Authorization
LOA= Letter of Authorization
MMPA = Marine Mammal Protection Act
NMFS = National Marine Fisheries Service
NOI = Notice of Intent
ODPCP – Oil Discharge Prevention and Contingency Plan
OSRP = Oil Spill Response Plan
TBD = To be determined
USACE = U.S. Army Corps of Engineers
USFWS = U.S. Fish and Wildlife Service

b) Drilling Fluids

Shell is planning to use water based drilling mud (WBM) for the proposed drilling activities. Only seawater will be used during the construction of the mudline cellar (MLC), the 36–in. hole section (30-in. casing) and the 26–in. hole section (20-in. casing). Below the 26–in. hole section, Shell will use WBM during drilling. These WBMs and cuttings will be collected aboard the drilling vessel and will be transferred to an adjacent vessel for storage and ultimate transit out of the Arctic Ocean. This waste stream, as well as other waste streams collected during the drilling program (treated sanitary effluent, domestic waste, bilge water and ballast water) will be disposed of at an EPA approved treatment/disposal site (see Section 6).

The following is the anticipated amounts of WBM and cuttings with adhered mud that will be generated, collected and disposed of per planned well regardless of whether the *Kulluk* or *Discoverer* drills the wells:

- Sivulliq G – 1,426 bbl
- Sivulliq N – 1,426 bbl
- Torpedo H – 3,045 bbl
- Torpedo J – 3,007 bbl

In addition to the listed generated mud and cuttings, a reserved volume of 1,500 bbl of mud is available to replace mud that has deteriorated and cannot be recycled and it is available in the event of lost circulation down the hole. This volume of mud will be captured, stored and disposed of at the end of each drilling season, per disposal details discussed in Section 6.

Shell's drilling mud service provider drafted a Drilling/Completion Fluids Proposal (Mud Plan) specifically for each well that defines the types and amounts of drilling fluids to be used for each section of each well. The Mud Plan for each well is not submitted as part of the EP, but will be submitted as part of each APD that Shell submits to BOEMRE. Each mud plan will include the specific estimated quantities and loadout list of mud materials for each well. More information is provided on estimated weights and volume of mud for the proposed wells is found in Section 6 of this revised Camden Bay EP.

The following Table 2.b-1 is a list of products that may be mixed in varying quantities to form various drilling fluid compositions. Weights or volumes of these products are found in Section 6.

Table 2.b-1 List of WBM Products

Product	Function
Caustic Soda (sodium hydroxide)	pH adjuster
Citric Acid	pH adjuster
DUOVIS	Viscosifier
M-I Wate (Barite)	Weighting agent
M-I Gel (Bentonite)	Viscosifier
Poly Pac UL	Viscosifier, Fluid loss control
Poly Pac R	Viscosifier, Fluid loss control
KlaStop	Shale encapsulation
Salt (NaCl) & brine solution	Densifier
Soda Ash	Calcium precipitation
Sodium Bicarbonate	Alkalinity control
SP-101	Fluid loss agent
Tackle	Polymeric thinner
Contingency Products	
Gelex	Bentonite extender
Defoam X	Defoamer
Nut Plug (Assorted)	Lost circulation material
IDCAP D	Lost circulation material
Mix II (Assorted)	Lost circulation material
Desco CF	Dispersant
Sapp	Dispersant
Durogel	Viscosifier
Miocide	biocide

Mud products and additives will be available in sufficient quantities so that a completely new mud system can be built. There are also sufficient quantities to begin a relief well in the unlikely event that there is a blowout. Contingency products provide the means to combat lost circulation should it occur

unexpectedly. There will be ample lost circulation material aboard the *Kulluk* or *Discoverer* to prevent wholesale mud losses. Excess cement is also available for permanently sealing lost circulation zones, and there is sufficient hole diameter available for contingent casing strings/liners to case off any severe lost circulation zones, as well.

Details regarding drilling fluid volumes, discharge volumes and rates, additives and other information are found in Section 6.0.

c) Chemical Products

No chemicals will be stored aboard the *Kulluk* or *Discoverer* above reportable quantities.

d) New or Unusual Technology

There is no new or unusual technology proposed.

e) Bonds, Oil Spill Financial Responsibility and Well Control Statements

Shell, BOEMRE Operator Number YK00689, is of sound financial strength and reliability and has demonstrated oil spill financial responsibility according to 30 CFR 253 for the facilities planned in the revised Camden Bay EP.

The bond requirement for the activities planned in the revised Camden Bay EP is satisfied by an area-wide bond of $1,000,000 furnished and maintained according to 30 CFR 256, subpart I, and Notice to Lessees No. 2008-N07, Supplemental Bond Procedures. The bond identification number is 022-014-198 through Liberty Mutual Insurance Company. Shell is also covered under a $150,000,000 indemnity that certifies the company has the oil spill financial responsibility (OSFR) for the costs in the extremely unlikely event of an oil spill. BOEMRE renewed Shell's OSFR April 11, 2011.

This is a planned exploration drilling program with temporary and seasonal operations. There will be minimal sea bed disturbance for MLCs at any drill site. MLCs are designed to protect the wellhead, casing and BOP from potential ice gouge events should circumstances require that the lower section of the BOP remain on the well over the winter. Vessel anchoring systems employed during operations will be removed upon abandonment of each well. Permanent facilities will be limited to the casing, wellhead housings and the guide base remaining subsurface after well abandonment and will comply with the Abandonment of Wells citation listed under 30 CFR 250.702(i). The uppermost portion of the permanent guidebase (i.e., the top of the guidearms) will be in the MLC some 28 ft (8.5 m) below the mudline upon permanent abandonment of each well.

Outline emergency response plans including a COCP (Appendix J), IMP (Appendix K), and a Well Control Plan (WCP) including a Relief Well Plan (RWP) (Appendix L) are available in the unlikely event there is an emergency or drilling operations must be curtailed due to ice conditions, weather, a well control incident or other hazardous condition.

f) Suspension of Operations

Shell has plans and measures in place that accommodate the forced or voluntary suspension of operations during the planned exploration drilling program.

Forced suspension of operations could result from conditions such as weather, ice conditions, the drilling vessel mechanical conditions, or downhole conditions, among others. In order to facilitate a possible suspension of operations, Shell has drafted several general plans containing Shell's emergency

management philosophy. These plans are presented in Section 9.0 and in Appendices J, K and L. Detailed emergency response procedures will be developed to reside on the drilling vessel and in Shell's offices as references to guide response actions in the event of an emergency.

Shell plans to voluntarily shut down exploration drilling operations on August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. During the suspension for the whale hunts the drilling fleet will leave the Camden Bay project area and move to an area north of latitude 71° 25'N and west of longitude 146° 4'W. Shell will return to resume activities after the subsistence bowhead whale hunts conclude. These and other mitigative measures are found in Section 12.0.

g) Blowout Scenario

Procedures and protocols for a blowout are detailed in the Oil Discharge Prevention and Contingency Plan (ODPCP), or C-Plan, (also referred to as an Oil Spill Response Plan - OSRP) which is submitted to BOEMRE as a separate document concurrent with this revised Camden Bay EP. This blowout scenario is summarized in Section 8 of this document.

It is expected that in the unlikely event of a blowout, the highest calculated flow rate would be from the Torpedo H location, calculated at 9,468 bbl of oil per day (Table 2.g-1).

Table 2.g-1 Calculated Worst Case Discharge (WCD) for the Camden Bay EP Potential Wells

Potential Well	Calculated Worst Case Discharge (bbl/day)
Sivulliq G	594
Sivulliq N	918
Torpedo H	9,468
Torpedo J	5,824

Shell's ODPCP details an oil spill response capability to cover a potential blowout of a flow rate of 16,000 bbl/day for a duration of 30 days – a total volume of 480,000 bbl of oil. This is the volume used for planning purposes in the revised Beaufort Sea Regional ODPCP and is sufficient to cover a potential blowout of any well in the revised Camden Bay EP.

The assumption and basis for calculation of the WCD are provided in Section 3 of this document.

Potential for the Well to Bridge

The WCD outlined in proprietary Section 3 does not include the potential for the well to bridge.

Surface Intervention

See Section 9f) to read a discussion of Surface Intervention – Capping Stack and Containment System.

Relief Well Availability

The *Kulluk* or *Discoverer* will serve as its own primary relief well drilling vessel in the unlikely event of a well blowout. In the event that the primary relief well drilling vessel cannot be used, the secondary relief well drilling vessel will be mobilized. If the *Kulluk* is drilling the well at the time of a blowout, it is estimated that the *Discoverer* will be available to be on-site within 9 days (Table 2.g-2). If the *Discoverer* is drilling the well at the time of the blowout, it is estimated that the *Kulluk* will be onsite in 18 days.

Table 2.g-2 Relief Well Drilling Information

Secondary Relief Well Drilling Vessel	Location at time of blowout	Time to Arrive at Relief Well Drill Site	Days to Drill a Relief Well
Discoverer	Chukchi Sea	9 days (3 days for well suspension and mooring retrieval; 6 days transit)	20 days (Sivulliq N or G) 25 days (Torpedo H or J)
Kulluk	Dutch Harbor	18 days transit	20 days (Sivulliq N or G) 25 days (Torpedo H or J)

Drilling Vessel Constraints

The *Kulluk* has an Arctic Class IV hull design and has successfully and safely drilled several wells in the arctic environment. The *Discoverer* has an ice-strengthened hull. Either vessel will be inspected by DNV and the USCG prior to mobilizing to Camden Bay. Final inspection reports will be submitted to BOEMRE when they are available.

Time to Drill a Relief Well

Once onsite, the *Kulluk* or *Discoverer* can drill a relief well for either the Sivulliq G or N well in 20 days and the Torpedo H or J well in 25 days. For the *Kulluk* as secondary relief well drilling vessel, total time from the blowout to completing the relief well is estimated to be 38 days for the Sivulliq wells and 43 days for the Torpedo wells. For the *Discoverer* as secondary relief well drilling vessel, total time from the blowout to completing the relief well is estimated to be 29 days for the Sivulliq wells and 34 days for the Torpedo wells.

h) Contact Information

Contact Susan Childs, Alaska Venture Support Integrator Manager, at telephone number 907-646-7112, fax 907-646-7145, or e-mail at susan.childs@shell.com.

SECTION 3.0 GEOLOGICAL AND GEOPHYSICAL INFORMATION (PROPRIETARY AND CONFIDENTIAL)

The information for the Sivulliq and Torpedo prospects in this section contains confidential and proprietary information and is not available in this public information copy of the revised Camden Bay EP.

a) Geological Description and Drill Site Locations

b) Structure Contour Maps

c) Key Seismic Lines

d) Geological Cross Sections

e) Shallow Hazards Reports

f) Shallow Hazards Assessment

g) Stratigraphic Columns

h) Time Versus Depth Charts

i) High-Resolution Seismic Lines

j) Geochemical Information

k) Future Geological and Geophysical Activities

l) WCD Calculations

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SECTION 4.0 HYDROGEN SULFIDE

a) Concentration

The concentration of hydrogen sulfide (H_2S) is expected to be zero based on the information derived from the wells described in the following Classification sub-section.

b) Classification

Shell records indicate that hydrocarbon samples were collected from the Oligocene objective section in the two legacy Hammerhead Wells drilled by Unocal et al. in 1985 and 1986, respectively (Flaxman Island Block 6708, OCS-Y 849 #1 and #2). No H_2S was observed in fluid samples from either well. Additionally, based on scout ticket information, final well reports, and publicly-available reservoir engineering data, none of the following nearby wells encountered H_2S, including those that penetrated stratigraphically older Eocene and Paleocene horizons:

- OCS Y-0917 #1 (Belcher)
- OCS Y-0943 #1 (Aurora)
- Point Thomson #1, #2 and #3
- OCS-Y-1597 #1 (Wild Weasel)
- OCS-Y-1663 #1 (Warthog)
- OCS-Y-0866 #1, #2 and #3 (Kuvlum)
- OCS Y-0871 #1 (Corona)
- OCS Y-1092 #1 (Galahad)
- OCS-Y-1578 #1 (McCovey)

All these wells penetrated age-equivalent formations similar to Shell's currently planned targets.

These data were supplied to the BOEMRE Anchorage office as part of a previous EP evaluation (initial Camden Bay EP submitted to BOEMRE in May 2009), and Shell requests that the RS/FO classify the objective zones in the planned exploration wells as "H_2S absent".

c) Contingency Plan

A Contingency Plan is not needed because of the expected absence of H_2S in the Sivulliq and Torpedo prospects.

d) Modeling Report

A Modeling Report is not needed because of the expected absence of H_2S.

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SECTION 5.0 BIOLOGICAL, PHYSICAL, AND SOCIOECONOMIC INFORMATION

a) Biological Environment Reports

The most current reports available regarding site specific biological studies over the Sivulliq and Torpedo prospects include data gathered during 2008. Shell funded biological and chemical studies of water and sediment samples in an around the planned Sivulliq and Torpedo prospects during 2008. The reports are titled:

- *Characterization of Benthic Habitat in Camden Bay (Sivulliq Prospect and Hammerhead Drill Sites) Beaufort Sea Alaska.* Dunton, Schonberg and McTigue, University of Texas Marine Science Institute - Final Report July 15, 2009.
- *Chemical Assessment in Camden Bay (Sivulliq Prospect and Hammerhead Drill Sites) Beaufort Sea Alaska.* Trefry and Trocine, Florida Institute of Technology - Final Report July 2009.

Dunton et al. (2009) Report

The overall objective of the Dunton et al. (2009) baseline sampling program was to collect samples for water quality determinations, sediment chemistry, and benthic biological data for subsequent evaluation of possible future oil and gas development impacts. This report is specifically focused on biological resources of the region surrounding the planned Sivulliq N and G drill sites and the previously drilled (1985 and 1986) two Hammerhead wells. At the time of data collection, coverage over the Torpedo Prospect was not part of the sampling program. However, some of the more northerly samples were collected in close proximity to the Torpedo H drill site.

Benthic (seafloor surface sediments) and sediment cores 3-4 in. (8 – 10 cm) in length and water column samples were collected at 45 designated stations. Two benthic grabs were collected at each station, one for biology (infaunal abundance and biomass) and one for chemistry (sediment parameters and selective collection of biota for determination of trophic structure). Vertical profiles of water column characteristics were assayed at seven selected stations.

One sample each was collected at 19 sites across the monitoring area to describe the spatial extent and patterns of biota biomass and density in the Sivulliq and Torpedo prospect areas on the nearshore shelf northwest of Camden Bay. The location for each site was chosen by laying a probability based grid over the study site area and randomly choosing a location within each grid cell. To gain a better resolution of the variability around a specific site, a second probability grid over a smaller area (1,640 ft [500 m]) was created. Six stations were located 820 ft (250 m) from a central point within the Sivulliq Prospect and another six stations were located at a distance of 1,640 ft (500 m). A third probability grid was created around a previous drill site (Hammerhead 1 drilled in 1985). Ten stations were sampled at this prospect but only nine benthic stations were sampled for biology. Finally, five stations that followed the course of the proposed pipeline route from the Sivulliq Prospect were sampled. Of the total number of sites sampled for benthic measurements (45), all but the five pipeline stations were located in water depths greater than 98 ft (30 m).

Dunton et al. (2009) observed no obvious spatial trends in the biomass or density of benthic organisms in the study area. However, several sites contained some of the highest biomass values recorded on the nearshore shelf of the central Alaskan Beaufort Sea so far. The report indicates that the benthic communities have not been adversely affected by previously discharged mud and cuttings during drilling operations at the former Hammerhead prospect drill sites.

Additional discussion regarding benthic communities is found in the EIA (Appendix F).

Trefry and Trocine (2009) Report

These authors used the same set of samples as Dunton et al. (2009) yet rather than examining the benthic environment, this report presents results from chemical studies that include the following: (1) sediment total concentrations of various elements and other parameters; (2) water column concentrations of salinity, temperature, turbidity, acidity/alkalinity (pH), dissolved oxygen, total suspended solids (TSS) and particulate organic carbon.

The main conclusions for the chemical portion of the study are as follows:

- Camden Bay has background values for trace metals as well as aliphatic and polycyclic aromatic hydrocarbons, through-out the bay, except for sediments collected within < 328 ft (<100 m) of a 1985 drilling site.
- Based on one example, movement of drilling mud and cuttings seems to be restricted to within ~328 ft (~100 m) of the discharge site, at a water depth of ~105 ft (~32 m).
- Baseline data and supporting interpretative techniques are now in place to facilitate identification of anomalous concentrations of potential contaminants in sediments from Camden Bay well before they reach values that could have adverse environmental effects.
- Results from the companion study of sediment biology by Dunton et al. (2009) found no measurable differences in benthic community abundance or structure relative to the other stations in the area. This finding is consistent with the chemical data obtained during the 2008 survey.

In February 2011, BOEMRE released a fish population study for a portion of the western Beaufort Sea titled "*Beaufort Sea Marine Fish Monitoring 2008: Pilot Survey and Test of Hypotheses*". The eastern extent of the survey area was approximately longitude 152°W, near the Cape Halkett area west of Nuiqsut, well outside the Camden Bay exploration drilling program area. The prospects are situated approximately 140 mi (224 km) east of the fish survey area. A similar study of the central Beaufort Sea is scheduled to begin summer 2011.

Shell has also collected a large amount of information regarding marine mammals in the Beaufort Sea, including the area containing the Sivulliq and Torpedo prospects. The data has been collected during various Shell marine surveys through its marine mammal monitoring program. Reports which include Beaufort Sea marine mammal data are as follows:

- Funk, D. W., R. Rodrigues, D. S. Ireland, and W. R. Koski (eds.). 2007. Joint Monitoring Program in the Chukchi and Beaufort Seas, July-November 2006. LGL Alaska Report P891-2, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., Bioacoustics Research Program, Cornell University, and Bio-Wave Inc. for Shell Offshore, Inc., ConocoPhillips Alaska, Inc., and GX Technology, and National Marine Fisheries Service, U.S. Fish and Wildlife Service. 316 p. plus Appendices.

- Ireland, D.S., D.W. Funk, R. Rodrigues, and W. R. Koski (eds.). 2008. Joint Monitoring Program in the Chukchi and Beaufort Seas, July-November 2007. LGL Alaska Report P1050-3, Report from LGL Alaska Research Associates, Inc., LGL, Ltd., Greeneridge Sciences, Inc., and JASCO Research, Ltd. and for Shell Offshore, Inc., ConocoPhillips Alaska, Inc., and National Marine Fisheries Service, U.S. Fish and Wildlife Service. 445 p. plus Appendices.

- Funk., D.W., D.S. Ireland, R. Rodrigues, and W.R. Koski (eds.). 2010. Joint Monitoring Program in the Chukchi and Beaufort seas, open-water seasons, 2006–2008. LGL Alaska Report P1050-2, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., and JASCO Applied Sciences, for Shell Offshore, Inc. and Other Industry Contributors, and National Marine Fisheries Service, U.S. Fish and Wildlife Service. 462 p. plus Appendices.

- Funk., D.W., D.S. Ireland, R. Rodrigues, and W.R. Koski (eds.). 2011. Joint Monitoring Program in the Chukchi and Beaufort seas, open-water seasons, 2006–2009. LGL Alaska Report P1050-2, Report from LGL Alaska Research Associates, Inc., LGL Ltd., Greeneridge Sciences, Inc., and JASCO Applied Sciences, for Shell Offshore, Inc. and Other Industry Contributors, and National Marine Fisheries Service, U.S. Fish and Wildlife Service. 462 p. plus Appendices.

b) Physical Environment Reports

The following text is summarized from archaeological discussion from the shallow hazards reports covering the Sivulliq N and G and Torpedo H and J planned drill sites. These reports are listed below and are found in the bibliography in Section 17.

- Fugro Geoconsultants. 2009a. *Shallow Hazards Assessment, Sivulliq G, V, W and Supplemental N Wellsites, Blocks 6658, 6659, 6708 and 6709, Flaxman Island Area, Beaufort Sea, Alaska, Report No. 27.2008-2266*

- Fugro Geoconsultants. 2009b. *Shallow Hazards Assessment, Torpedo A, B, G, and H Wellsites, Blocks 6609 and 6610, Flaxman Island Area, Beaufort Sea, Alaska, Report No. 27.2008-2267*

- Fugro Geoconsultants. 2011. *Drill Site Clearance Letter, Proposed Torpedo J Drill Site, Block 6559 Flaxman Island, Beaufort Sea Alaska. Report No. 27.2010-2375-10* (submitted to BOEMRE March 2011)

- GeoLLC. 2007. *Exploration Wellsites Geohazards Assessments, Sivulliq Prospect, Beaufort Sea, Alaska, Report 12731-005-00.*

- GeoLLC. 2008a. *Exploration Wellsites Geohazards Assessments, Sivulliq Prospect, Beaufort Sea, Alaska, Addendum 1, Report 12731-001-02*

- GeoLLC. 2008b. *Exploration Wellsites Geohazards Assessments, Torpedo Prospect, Beaufort Sea, Alaska. Report 12731-001-02.*

- Northern Technical Services (Nortec). 1985. *Data Report NR6-4, Federal OCS Lease Blocks 624 and 625, Beaufort Sea Alaska*.

Shipwrecks

The BOEMRE Web site was reviewed, and discussions were held with personnel in the BOEMRE Alaska office (June 2007) and it was determined that there are no known shipwrecks or obstructions in the areas surveyed by Fugro. Several shipwrecks are noted in the general area, however, most are nearshore wrecks (outside of the exploration drilling program area) or the locations are not known with certainty. No specific shipwrecks are known in the vicinity of the Sivulliq and Torpedo prospects. Shipwrecks or other historic artifacts were not observed or reported during the evaluation of side scan sonar data presently available for the prospects.

Archaeology

Water depths at the planned drill site locations in the Camden Bay area range from 107 ft (32.6 m) at Sivulliq N to 124 ft (37.8 m) at Torpedo J. In general, water depths increase to the north. During the last major regression in sea level during the last ice age, approximately 18,000 years before present (YBP), the sea level was approximately 295 ft (90 m) below the present elevation. Recent research in the Bering Sea suggests that sea levels were about 164 ft (50 m) lower than present approximately 11,000 years ago. Rising marine waters following the last ice age (approximately 7,500 YBP) would have inundated all of the planned drill site locations on the prospects. Early humans in North America could have traversed presently inundated areas within the planned drill site locations up until about 7,500 YBP. It is also possible that prehistoric archaeological materials could have existed at suitable habitation sites at or near the planned drill sites. Candidate sites would be former subaerially exposed areas adjacent to stream channels or shoals and barrier islands that were exposed as land masses when sea levels were lower than present. Potential buried channels with nearby areas of subtle elevated relief are interpreted to exist near the planned drill sites. Early humans could have left behind artifacts at localized habitation sites near the planned drill site locations in the Camden Bay area before sea level rose and flooded the Beaufort Shelf area; however, shallow hazards reports do not indicate any greater likelihood of artifacts at planned drill site locations versus other surveyed areas of Camden Bay.

The planned drill site locations at the Sivulliq and Torpedo prospects are within water depths where the seafloor is subject to extensive ice gouging and ice keel scouring. Side scan sonar studies document many intersecting and overlapping ice keel scour lines. Former subaerial exposures most suitable for human habitation (e.g. shoals, barrier islands, high terraces adjacent to stream channels, etc.) would be the landforms most susceptible to disturbance from ice thrusting and ice gouging after inundation by rising sea levels. Even if prehistoric habitation sites and artifacts may once have existed in the vicinity of the planned drill site locations, they have almost certainly been destroyed by repeated ice keel scour events over the last 7,500 years. Therefore, it can be concluded that the potential for encountering or damaging prehistoric archaeological resources by exploration drilling activities is remote at the planned drill site locations.

Soils

Sivulliq

From GeoLLC (2007) the surficial Holocene soils consist primarily of soft to stiff silts and clays with low to medium plasticity. Surface deposits with interbedded layers of fine to medium sand, silty sand, and gravelly muds also may be present. The fine sand present in contact with underlying silts and clays is variable, as the sand tends to infill old gouges. Local depositional processes will strongly affect the range of properties for Holocene soils, which are expected to be less than 22 ft (7 m) thick at proposed drill site locations in the Sivulliq Prospect. Further review of the 1985 mapping of surficial sediment thickness at the Sivulliq Prospect finds a 1.6 - 4.9 ft (0.5 - 1.5 m) thinning of surficial sediment thickness between the major faults in the interpreted/mapped uplifted area.

Chirp subbottom profiler data acquired at the Sivulliq Prospect during 2006 support interpretations that were made during the 1985 Nortec Hammerhead Prospect (now Sivulliq Prospect) geohazards assessment of remolded soils whose thickness was less than 16 - 22 ft (5 - 7 m). Holocene soils were found to be less than 22 ft (7 m) thick and underlain by hard cohesive Pleistocene soils.

As part of the past Hammerhead program, four grab samples and one soil boring were completed in relative proximity to several of the proposed Sivulliq wells (Nortec 1985). The grab samples were obtained with a Van Veen surface sampler. All of the grab samples indicated "soft, very fine muds."

Hammerhead Boring 1 was drilled to a depth of 80 ft (24.5 m) approximately 4 mi (6.5 km) southwest of the planned Sivulliq N drill site. This soil boring encountered 7.8 ft (2.4 m) of soft to firm clay (likely remolded from ice gouging). The ice gouges present in the Hammerhead sonar records support interpretations of stiff to hard cohesive soils across the Sivulliq Prospect, as they appear well defined with steep-sided flanks and ridges. Hard Pleistocene clay was encountered at 22 ft (7.0 m). Ice-bonded clay was noted at 78 ft (24 m) in this borehole. The borehole was drilled by McClelland-EBA in September of 1984 and the following geotechnical summary was provided:

- 0 – 7.9 ft (0 -2.4 m) — soft to firm clay
- 7.9 – 23.0 ft (2.4 - 7.0 m) — very stiff, thinly laminated clay
- 23.0 – 26.9 ft (7.0 - 8.2 m) — hard/dense gravely clay
- 26.9 – 80 ft (8.2 -24.5 m) — hard clay, with sand and gravel (ice –bonding at 78.7 ft [24 m])

Torpedo

The surficial Holocene soils appear to consist primarily of silts and clays with a firm consistency and low to medium plasticity. The shallow hazards survey (GeoLLC, 2008b) dataset exhibits no evidence of bedforms such as sand waves, mounds shoals, or slumping. Local depositional processes in combination with ice gouging will strongly affect the range of properties for Holocene soils, which are expected to be less than 20 ft (6 m) thick at the Torpedo Prospect.

Holocene soils are underlain by Pleistocene sediments consisting of laterally discontinuous marine and non-marine sequences corresponding to glacial and interglacial periods. These sediments typically consist of silty-clays, interspersed gravely muds, interbedded sands or sandy gravels in the Eastern Beaufort Sea. The acoustic transparency in the shallow geophysical sections is normally indicative of unconsolidated sediments and uniform composition; the hummocky reflectors suggest non-marine regressive sedimentary sequences.

c) Socioeconomic Study Reports

A Plan of Cooperation (POC) Addendum identifies the measures Shell has developed in consultation with North Slope communities and will implement during its planned revised Camden Bay exploration drilling program to minimize any adverse effects on the availability of marine mammals for subsistence uses. In addition, the POC Addendum details Shell's communications and consultations with local communities concerning its planned exploration drilling program, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR § 18.128(d) and 50 CFR § 216.104(a) (12) (i), (ii), (iv)). Shell has documented its contacts with North Slope communities, as well as the substance of its communications with subsistence stakeholder groups. Tables summarizing the substance of Shell's communications, and responses thereto, are included in the POC Addendum (Appendix H). This POC Addendum may be supplemented, as appropriate, to reflect additional engagements with local subsistence users and any additional or revised mitigation measures that are adopted as a result of those engagements.

The results of the POC meetings are submitted to BOEMRE in the revised Camden Bay EP, and will be provided contemporaneously to NMFS, and USFWS in applications for MMPA authorizations of incidental take of the trust species for which these agencies are responsible. The requirements of BOEMRE Stipulation No. 5 parallel requirements of the USFWS LOA and the NMFS IHA. The LOA

and IHA provide authorization for the nonlethal harassment of species protected by the MMPA. Both the USFWS and NMFS require an applicant to implement a POC to mitigate the potential for conflicts between the proposed activity and traditional subsistence activities (50 CFR § 18.124(c)(4) and 50 CFR § 216.104(a)(12)). The POC must identify the measures that will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses. In addition, both the USFWS and NMFS require an applicant to communicate and consult with local subsistence communities concerning the proposed activity, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR § 18.128(d) and 50 CFR § 216.104(a) (12) (i), (ii), (iv)).

Shell offers several programs that involve the training and subsequent hiring of local residents. Programs include the following.

MMO Program

The MMO program involves the use of local Inupiat residents as MMOs. The MMOs obtain intensive training for marine mammal identification and documentation, computer use, and health and safety. During Shell's planned exploration drilling operations, best efforts will be made to hire local MMOs to work aboard each vessel. MMOs will also serve as avian observers.

Subsistence Advisors (SA) Program

The SA program was developed to address the concerns of the North Slope residents regarding impacts to subsistence activities since Shell has active offshore exploration drilling programs in the Beaufort and Chukchi Seas. Objectives of the program include:

- Preserve the subsistence lifestyle of North Slope residents
- Establish and maintain frequent communications between Shell and subsistence users
- Communicate the program objectives to community members and
- Attend community meetings relevant to subsistence use on Shell's behalf.

During the SA program, subsistence questionnaires were designed and each SA was asked to fill in one questionnaire for each resident that participates in subsistence hunting/fishing activities. In addition, subsistence hunters and fishers were asked to draw subsistence use locations on regional maps of their respective areas. The maps are intended to define spring and fall hunting/fishing areas, migratory routes, calving routes, calving areas, mating areas and feeding ground locations. These various locations were digitally transferred onto maps for each village.

SA reports have been generated documenting the results of the SA work in the villages. These reports are:

- ASRC Energy Services. 2009. *Subsistence Advisor Program Summary, North Slope, Alaska*. Report prepared by ASRC Energy Services, Anchorage, AK for Shell Exploration and Production Company, Houston, TX.
- UIC UMIAQ. 2011. *2010 Subsistence Advisor Program, North Slope Alaska*. Report prepared by UIC UMIAQ for Shell Exploration and Production Company, Anchorage Alaska.

Community Liaison Officers (CLO)

The CLO program includes community liaisons in Point Hope, Kaktovik, and Barrow that serve as Shell's point-of-contact for questions regarding Shell programs .

Cultural Awareness Program

Shell and contractor personnel involved in field operations during the planned exploration drilling program will attend the orientation training annually, which addresses environmental, social, and cultural concerns related to the project area. The program is designed to increase sensitivity and understanding by Shell and its contractors of community values, customs, and lifestyles in the area they will be working, and how to avoid conflicts with Native Alaskans and their subsistence activities. The program stresses the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals and provides guidance on how to avoid disturbance. The Cultural Awareness Program is described in more detail in Section 11.

Communication and Call Centers (Com Centers) Program

The Com Centers program involves hiring of one or two individuals from each of the coastal Beaufort and Chukchi Sea villages to monitor and relay radio transmissions between subsistence vessels and industry vessels. The sharing of information is intended to reduce or eliminate the potential conflict between subsistence users and industry vessels.

Shell has also funded, sponsored, and supported many local events, charities, and associations in addition to holding job fairs and providing information at kiosks during community meetings.

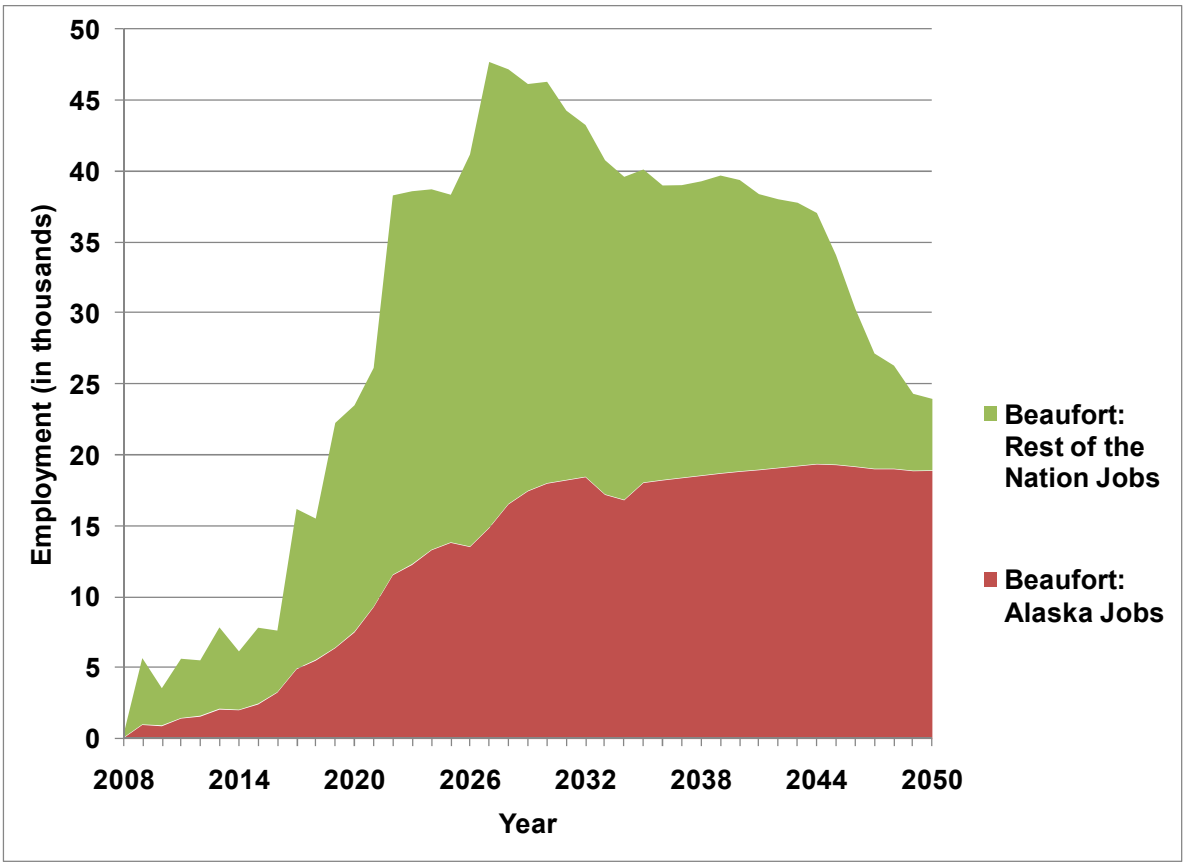
Shell will identify other locations that are appropriate for Com Centers to mitigate any potential impacts from maritime traffic from Dutch Harbor to either Chukchi or Beaufort Sea drilling locations.

Northern Economics Inc. Report

In 2009, Shell commissioned a study by Northern Economics Inc. (NEI) and the Institute of Social and Economic Research at the University of Alaska Anchorage. The study describes the potential economic benefits to the State of Alaska and local governments from developing oil and gas resources in the OCS areas, with focus on the Beaufort Sea, Chukchi Sea and the North Aleutian Basin.

The study determined that development of offshore field(s) in either the Beaufort and/or Chukchi sea(s) as a result of Shell's proposed project will have positive effects on the NSB economy and provide employment and community development opportunities for residents from the region (Figure 5.c-1). A successful exploration drilling program completed as a result of the wells planned in the revised Camden Bay EP could signal the start of such economic development.

Figure 5.c-1 **Estimated Incremental Employment in Alaska and the Remainder of the United States from OCS Development in the Beaufort Sea (NEI and ISER 2011)**



An estimated annual average of 30,100 new jobs would be created and sustained for 50 years from development of the oil and gas resources of the US Beaufort Sea, with total payroll of $80 billion (NEI and ISER 2011). Approximately 13,700 of these new jobs would be in Alaska and approximately 3,100 would be located in the North Slope Borough (NEI and ISER 2009, NEI and ISER 2011). New revenue for the NSB from development of the oil and gas resources of the US Beaufort Sea would total nearly $1.2 billion over a 50-year period under current policies (NEI 2011).

More detail regarding the NEI February 2011 report can be found in the EIA, Appendix F.

SECTION 6.0 SOLID & LIQUID WASTE AND DISCHARGE INFORMATION

a) Projected Wastes and Projected Ocean Discharges

This section describes the potential solid and liquid waste generated and disposal methods for four planned exploration wells for both the *Kulluk* and *Discoverer*. The potential total generated waste stream volumes were estimated or calculated from the following sources:

- Drill cuttings, mud and cement volumes: calculated based on the various approximate widths and lengths of portions of each well, while taking into account an additional factor for hole "washout" during drilling;
- Volume for non-contact cooling water, sanitary waste, domestic waste, ballast water, desalination unit water, firewater, used oil, potential hazardous waste and trash/debris: supplied by the drilling contractor currently working on the *Kulluk* and *Discoverer*;
- Deck drainage: estimated based on collected precipitation expected during each drilling season.

The EPA GP AKG-28-0000 allows for authorization to discharge regulated waste streams to the ocean waters of the Beaufort Sea. In response to comments from North Slope communities, Shell has voluntarily decided to not discharge to the ocean the following regulated waste streams:

- drilling mud and cuttings with adhered mud (GP AKG-28-0000 discharge 001);
- treated sanitary waste (discharge 003);
- domestic waste (discharge 004);
- bilge water (discharge 011); and
- ballast water (discharge 010).

These wastes will be transferred from the drilling vessel to a support vessel that will transport the wastes to an ocean-going deck barge or waste barge. The deck barge or waste barge will temporarily store the mud and cuttings waste, treated sanitary waste, domestic waste, bilge water, and ballast water. At the end of each drilling season, all wastes will be transported to an EPA-permitted TDS (see list of potential TDS below).

During drilling operations, cuttings will be separated from the drilling fluids with shakers, de-sanders and de-silters. Drilling fluids will be recovered, reconditioned and reused as much as practicable. When drilling fluids have been exhausted, those spent drilling fluids will be held in storage aboard the drilling vessel until they are transported to the deck barge or waste barge for temporary storage. Drill cuttings that are recovered off the shakers will be transferred from the drilling vessel to the same adjacent vessel, via a separate flexible hose connection, using compressed air. On the adjacent vessel, the cuttings will be held within lined, covered containers.

The treated sanitary water, domestic water, bilge and ballast water will be transferred via a separate flexible hose with secured fittings to an adjacent vessel for transport to and temporary storage on a deck barge or waste barge. Shell is finalizing a contract for the handling, transporting and disposal of the recovered waste streams.

In addition to these waste streams, Shell will also temporarily store trash and debris, used petroleum products, and potential hazardous waste (i.e. paint, solvents, unused chemicals, batteries, lamps, etc.) to be disposed at an EPA-permitted TDS.

Although Shell has not signed a contract with any particular disposal facility regarding the handling of waste streams that will not be discharged to the ocean as of the submission of this revised Camden Bay EP, Shell has located appropriate licensed facilities capable of handling the various waste streams. These facilities are licensed to handle the materials identified above in accordance with all applicable laws and regulations, including the Solid Waste Disposal Act and Resource Conservation and Recovery Act 42 USC 6901 et seq., and the EPA Solid Waste Disposal Facilities Regulations at 40 CFR 257-259. The addresses for these facilities are:

Waste Management Inc.
Columbia Ridge Recycling and Landfill
18177 Cedar Springs Lane
Arlington, OR 97812
Telephone: 541-454-2030 Fax: 541-454-3312
http://www.wmnorthwest.com/landfill/landfillcities/columbia.html
(disposal of WBM, cuttings, sanitary waste water, domestic waste water, ballast water, bilge water, solid trash and debris, used petroleum products, hazardous waste)

Emerald Services Inc. (local address)
425 Outer Springer Loop Road
Palmer, AK 99645
Telephone: 907-258-1558
(disposal of used petroleum products, hazardous waste; disposal occurs in Seattle, WA)

The following tables (6.a-1 through 6.a-4) present relevant information regarding disposal of solid and liquid wastes expected to be generated by the *Kulluk* or *Discoverer* per well drilled during the revised Camden Bay drilling program. The discharge number listed under the 'Type of Waste' column is a reference to the numbered discharges listed in GP AKG-28-0000.

Kulluk **Disposal Caisson**

All wastes not captured for offsite disposal will be discharged to the ocean.

The base of the disposal caisson while drilling is approximately 41 ft (12.5 m) below the surface of the ocean. Because of heave, the water level inside the caisson is constantly undergoing minor changes. The disposal caisson is not equipped with a one-way or "float" valve; it is a 36-in. diameter open pipe. Since it remains open to the sea at all times, the disposal caisson is constantly filled with water and serves as the conduit through which selected waste streams are disposed below sea level. Figure 6a-1 displays the disposal caisson for the *Kulluk*.

Modeling of the discharge of cuttings generated while constructing the MLC, as well as the 36- and 26-inch hole segments, was completed assuming a discharge point of approximately 10 ft (3 m) above the seafloor (Section 6c).

Discoverer **Disposal Caisson**

The disposal caisson runs vertically through the sponson from the main deck level to the base of the sponson. The sponson is an exterior reinforced cladding on the hull to provide ice resistance. It is hollow

and extends from the main deck level to well below the water line. Certain waste streams are collected aboard the drillship to a point on the main deck near the mud room. A 15-in. (38 cm) diameter pipe exits the hull, turns downwards and is connected to the top of the disposal caisson.

The disposal caisson is a 15-in. diameter pipe welded into the sponson top and bottom (such that the inside of the sponson remains dry). The bottom of the sponson is 5.6 ft (1.7 m) above the keel depth. The disposal caisson is not equipped with a "float" valve; it is an open pipe. Because it remains open to the sea at all times, the disposal caisson is constantly filled with water and serves as the conduit through which selected waste streams are disposed below sea level.

With the bottom of the sponson located 5.6 ft (1.7 m) above the keel, and the draught of the *Discoverer* being 25.2 ft (7.7 m) while drilling, the base of the disposal caisson while drilling is approximately 19.6 ft (6.0 m) below mean sea level. Because of heave, the water level inside the caisson changes constantly. Figure 6.a-1 shows the disposal caisson location.

Modeling of the discharge of cuttings generated while constructing the MLC, as well as the 36- and 26-inch hole segments, was completed assuming a discharge point of approximately 10 ft (3 m) above the seafloor (Section 6c).

In addition to cuttings and WBM that will be captured and stored on the drilling vessel for later disposal, there will be an additional 1,500 bbl of mud stored onboard in a reserve tank. At the end of the drilling season, this mud will also be transferred to a vessel for disposal at one of the facilities previously listed. Because the drilling sequence is not defined, and since ice and weather conditions could limit the available time remaining in the drilling season, this 1,500 bbl mud volume is included in the following discharge tables for each well in the planned exploration drilling program.

Table 6.a-1 Projected Wastes Generated and Ocean Discharges for Sivulliq Location G

Type of Waste	Total Generated*	Total Amount to be Discharged	Discharge Rate	Discharge Method**
Drill Cuttings – Discharge 013	*Kulluk* – 5,184 bbl (cuttings only; no drilling mud used)	5,184 bbl (cuttings only; no drilling mud used)	432 bbl/day (discharged over 12 days)	Cuttings from the MLC through 26-in. diameter hole section will be deposited on the surface of the seafloor
	Discoverer – 3,851 bbl (cuttings only; no drilling mud used)	3,851 bbl (cuttings only; no drilling mud used)	321 bbl/day (discharged over 12 days)	Cuttings from the MLC through 26-in. diameter hole section will be deposited on the surface of the seafloor
Water Based Mud – Discharge 001	2,213 bbl (includes 1,500 bbl of mud in the active pit system remaining at the conclusion of drilling and abandonment operations)	0 bbl	0 bbl/day	**No discharge**. Water based mud will be collected and transported out of region for disposal at a licensed TDS
Drill Cuttings From Water Base Drilling Interval – Discharge 001	713 bbl	0 bbl	0 bbl/day	**No discharge**. Cuttings will be collected and transported out of region for disposal at a licensed TDS
Excess Cement – Discharge 012	50 bbl	50 bbl	Two occasions at 1 bbl/minute (min)	Forty-five bbl discharged at seafloor during 30-and 20-in.

Table 6.a-1 Projected Wastes Generated and Ocean Discharges for Sivulliq Location G

Type of Waste	Total Generated*	Total Amount to be Discharged	Discharge Rate	Discharge Method**
				pipe cementing operations with 5 bbl discharged at the surface with wash-up water
Non-Contact Cooling Water – Discharge 009	*Kulluk* – 448,052 bbl (13,178 bbl/day for 34 days)	448,052 bbl	13,178 bbl/day	Discharged to the sea through the disposal caisson
	Discoverer – 1,530,000 bbl (45,000 bbl/day for 34 days)	1,530,000 bbl	45,000 bbl/day	Discharged to the sea at several sites around the hull
Sanitary Waste – Discharge 003	*Kulluk* – 4,371 bbl all recycled (throughput based on 108 persons at 50 gallons (gal)/person/day for 34 days)	0 bbl/well	0 bbl/day	**No discharge**. Treated in the Marine Sanitation Device (MSD) and recycled for use aboard the *Kulluk*. Any unrecycled sanitary waste will be transported out of region for disposal at a licensed TDS
	Discoverer – 1,020 bbl (based on 140 persons at 9 gal/person/day for 34 days)	0 bbl/well	0 bbl/day	**No discharge**. Treated in the MSD and stored on the drillship then transported out of region for disposal at a licensed TDS
Domestic Waste – Discharge 004	*Kulluk* – 8,742 bbl (based on 108 persons at 100 gal/person/day for 34 days)	0 bbl	0 bbl/day	**No discharge**. Treated as required and stored aboard then transported out of region for disposal at a licensed TDS. Food wastes will not be discharged, they will be incinerated
	Discoverer – 11,333 bbl (based on 140 persons at 100 gal/person/day for 34 days)	0 bbl	0 bbl/day	
Desalination Unit Brine Water – Discharge 005	4,200 bbl (based on 125 bbl/day for 34 days)	4,200 bbl	125 bbl/day	Discharged through disposal caisson below water's surface
Deck Drainage – Discharge 002	170 bbl (based on 5 bbl/day for 34 days)	170 bbl	5 bbl/day (dependent on rainfall)	Discharged through disposal caisson below water's surface
Uncontaminated Ballast Water – Discharge 010	*Kulluk* – 1,500 bbl (approximately 44 bbl/day for 34 days)	0 bbl	0 bbl/day	**No discharge**. Ballast water is stored aboard then transported out of region for disposal at a licensed TDS
	Discoverer – 170 bbl (based on 5 bbl/day for 34 days)	0 bbl	0 bbl/day	
Firewater Bypass – Discharge 008	*Kulluk* – 286 bbl (1 test)	286 bbl (1 test)	Monthly test of fire hoses at 200 gallons per minute (gal/min) for 60 minutes	Discharged through disposal caisson below water's surface
	Discoverer – no testing	No testing	No testing	No testing
Bilge Water – Discharge 011	*Kulluk* – 170 bbl (based on 5 bbl/day for 34 days)	0 bbl/well	0 bbl/day	**No discharge**. Treated in an oil/water separator;

Table 6.a-1 Projected Wastes Generated and Ocean Discharges for Sivulliq Location G

Type of Waste	Total Generated*	Total Amount to be Discharged	Discharge Rate	Discharge Method**
	Discoverer – 442 bbl (based on 13 bbl/day for 34 days)	0 bbl/well	0 bbl/day	uncontaminated water is stored aboard then transported out of region for disposal at a licensed TDS
BOP Fluid – Discharge 006	56.4 bbl	56.4 bbl	Up to 6 BOP tests at an average 9.4 bbl/test	Discharged at the seafloor at the BOP
Trash and Debris	300 bbl/month	0 bbl/well	0 bbl/day	**No discharge**. Segregated and disposed of at an approved TDS
Used Oil (Lube Oil)	50 bbl	0 bbl	0 bbl/day	**No discharge**. Stored aboard in waste oil tanks. Transferred to lube cubes for transport by boat to an approved TDS
Hazardous Waste	10 bbl	0 bbl	0 bbl/day	**No discharge**. Stored aboard in an approved container. Transferred by boat to an approved TDS

*Discharges for the *Kulluk* or *Discoverer* are the same unless where noted.
**The types of wastes whose discharge method is listed as "No Discharge" will be shipped to one of the EPA approved facilities listed in Section 6 a).

Table 6.a-2 Projected Wastes Generated and Ocean Discharges for Sivulliq Location N

Type of Waste	Total Generated*	Total Amount to be Discharged	Discharge Rate	Discharge Method**
Drill Cuttings – Discharge 013	*Kulluk* – 5,187 bbl (cuttings only; no drilling mud used)	5,187 bbl (cuttings only; no drilling mud used)	432 bbl/day (discharged over 12 days)	Cuttings from the MLC through 26-in. diameter hole section will be deposited on the surface of the seafloor
	Discoverer – 3,854 bbl (cuttings only; no drilling mud used)	3,854 bbl (cuttings only; no drilling mud used)	321 bbl/day (discharged over 12 days)	Cuttings from the MLC through 26-in. diameter hole section will be deposited on the surface of the seafloor
Water Based Mud – Discharge 001	2,213 bbl (includes 1,500 bbl of mud in the active pit system remaining at the conclusion of drilling and abandonment operations)	0 bbl	0 bbl/day	**No discharge**. Water based mud will be collected and transported out of region for disposal at a licensed TDS
Drill Cuttings From Water Base Drilling Interval – Discharge 001	713 bbl	0 bbl	0 bbl/day	**No discharge**. Cuttings will be collected and transported out of region for disposal at a licensed TDS
Excess Cement – Discharge 012	50 bbl	50 bbl	Two occasions at 1 bbl/min	Forty-five bbl discharged at seafloor during 30- and 20-in.

Table 6.a-2 Projected Wastes Generated and Ocean Discharges for Sivulliq Location N

Type of Waste	Total Generated*	Total Amount to be Discharged	Discharge Rate	Discharge Method**
				pipe cementing operations with 5 bbl discharged at the surface with wash-up water
Non-Contact Cooling Water – Discharge 009	*Kulluk* – 448,052 bbl (13,178 bbl/day for 34 days)	448,052 bbl	13,178 bbl/day	Discharged to the sea through the disposal caisson
	Discoverer – 1,530,000 bbl (45,000 bbl/day for 34 days)	1,530,000 bbl	45,000 bbl/day	Discharged to the sea at several sites around the hull
Sanitary Waste – Discharge 003	*Kulluk* - 4,371 bbl all recycled (throughput based on 108 persons at 50 gal/person/day for 34 days)	0 bbl/well	0 bbl/day	**No discharge**. Treated in the MSD and recycled for use aboard the *Kulluk*. Any unrecycled sanitary waste will be transported out of region for disposal at a licensed TDS
	Discoverer – 1,020 bbl (based on 140 persons at 9 gal/person/day for 34 days)	0 bbl/well	0 bbl/day	**No discharge**. Treated in the MSD and stored on the drillship then transported out of region for disposal at a licensed TDS
Domestic Waste – Discharge 004	*Kulluk* – 8,742 bbl (based on 108 persons at 100 gal/person/day for 34 days)	0 bbl	0 bbl/day	**No discharge**. Treated as required and stored aboard then transported out of region for disposal at a licensed TDS. Food wastes will not be discharged, they will be incinerated
	Discoverer – 11,333 bbl (based on 140 persons at 100 gal/person/day for 34 days)	0 bbl	0 bbl/day	
Desalination Unit Brine Water – Discharge 005	4,200 bbl (based on 125 bbl/day for 34 days)	4,200 bbl	125 bbl/day	Discharged through disposal caisson below water's surface
Deck Drainage – Discharge 002	170 bbl (based on 5 bbl/day for 34 days)	170 bbl	5 bbl/day (dependent on rainfall)	Discharged through disposal caisson below water's surface
Uncontaminated Ballast Water – Discharge 010	*Kulluk* – 1,500 bbl (approximately 44 bbl/day for 34 days)	0 bbl	0 bbl/day	**No discharge**. Ballast water is stored aboard then transported out of region for disposal at a licensed TDS
	Discoverer – 170 bbl (based on 5 bbl/day for 34 days)	0 bbl	0 bbl/day	
Firewater Bypass – Discharge 008	*Kulluk* – 286 bbl (1 test)	286 bbl (1 test)	Monthly test of fire hoses at 200 gal/min for 60 minutes	Discharged through disposal caisson below water's surface
	Discoverer – no testing	No testing	No testing	No testing
Bilge Water –	*Kulluk* – 170 bbl	0 bbl/well	0 bbl/day	**No discharge**. Treated

Table 6.a-2 Projected Wastes Generated and Ocean Discharges for Sivulliq Location N

Type of Waste	Total Generated*	Total Amount to be Discharged	Discharge Rate	Discharge Method**
Discharge 011	(based on 5 bbl/day for 34 days)			in an oil/water separator; uncontaminated water is stored aboard then transported out of region for disposal at a licensed TDS
	Discoverer – 442 bbl (based on 13 bbl/day for 34 days)	0 bbl/well	0 bbl/day	
BOP Fluid – Discharge 006	56.4 bbl	56.4 bbl	Up to 6 BOP tests at an average 9.4 bbl/test	Discharged at the seafloor at the BOP
Trash and Debris	300 bbl/month	0 bbl/well	0 bbl/day	**No discharge**. Segregated and disposed of at an approved TDS
Used Oil (Lube Oil)	50 bbl	0 bbl	0 bbl/day	**No discharge**. Stored aboard in waste oil tanks. Transferred to lube cubes for transport by boat to an approved TDS
Hazardous waste	10 bbl	0 bbl	0 bbl/day	**No discharge**. Stored aboard in an approved container. Transferred by boat to an approved TDS

*Discharges for the *Kulluk* or *Discoverer* are the same unless where noted.
**The types of wastes whose discharge method is listed as "No Discharge" will be shipped to one of the EPA approved facilities listed in Section 6 a).

Table 6.a-3 Projected Wastes Generated and Ocean Discharges for Torpedo Location H

Type of Waste	Total Generated*	Total Amount to be Discharged**	Discharge Rate	Discharge Method
Drill Cuttings – Discharge 013	*Kulluk* – 5,335 bbl (cuttings only; no drilling mud used)	5,335 bbl (cuttings only; no drilling mud used)	445 bbl/day (discharged over 12 days)	Cuttings from the MLC through 26-in. diameter hole section will be deposited on the surface of the seafloor
	Discoverer – 4,002 bbl (cuttings only; no drilling mud used)	4,002 bbl (cuttings only; no drilling mud used)	334 bbl/day (discharged over 12 days)	Cuttings from the MLC through 26-in. diameter hole section will be deposited on the surface of the seafloor
Water Based Mud – Discharge 001	3,022 bbl (includes 1,500 bbl of mud in the active pit system remaining at the conclusion of drilling and abandonment operations)	0 bbl	0 bbl/day	**No discharge**. Water based mud will be collected and transported out of region for disposal at a licensed TDS
Drill Cuttings From Water Base Drilling Interval – Discharge 001	1,522 bbl	0 bbl	0 bbl/day	**No discharge**. Cuttings will be collected and transported out of region for disposal at a licensed TDS

Table 6.a-3 Projected Wastes Generated and Ocean Discharges for Torpedo Location H

Type of Waste	Total Generated*	Total Amount to be Discharged**	Discharge Rate	Discharge Method
Excess Cement – Discharge 012	50 bbl	50 bbl	two occasions at 1 bbl/min	Forty-five bbl discharged at seafloor during 30- and 20-in. pipe cementing operations with 5 bbl discharged at the surface with wash-up water
Non-Contact Cooling Water – Discharge 009	*Kulluk* – 579,832 bbl (13,178 bbl/day for 44 days)	579,832 bbl	13,178 bbl/day	Discharged to the sea through the disposal caisson
	Discoverer – 1,980,000 bbl (45,000 bbl/day for 44 days)	1,980,000 bbl	45,000 bbl/day	Discharged to the sea at several sites around the hull
Sanitary Waste – Discharge 003	*Kulluk* – 5,657 bbl all recycled (throughput based on 108 persons at 50 gal/person/day for 44 days)	0 bbl	0 bbl/day	**No discharge**. Treated in the MSD and recycled for use aboard the *Kulluk*. Any unrecycled sanitary waste will be transported out of region for disposal at a licensed TDS
	Discoverer – 1,320 bbl (based on 140 persons at 9 gal/person/day for 44 days)	0 bbl	0 bbl/day	**No discharge**. Treated in the MSD and stored on the drillship then transported out of region for disposal at a licensed TDS
Domestic Waste – Discharge 004	*Kulluk* – 11,314 bbl (based on 108 persons at 100 gallons/person/ day for 44 days)	0 bbl	0 bbl/day	**No discharge**. Treated as required and stored aboard then transported out of region for disposal at a licensed TDS. Food wastes will not be discharged, they will be incinerated
	Discoverer – 14,667 bbl (based on 140 persons at 100 gal/person/day for 44 days)	0 bbl	0 bbl/day	
Desalination Unit Brine Water – Discharge 005	5,500 bbl (based on 125 bbl/day for 44 days)	5,500 bbl	125 bbl/day	Discharged through disposal caisson below water's surface
Deck Drainage – Discharge 002	220 bbl (based on 5 bbl/day for 44 days)	220 bbl	5 bbl/day (dependent on rainfall)	Discharged through disposal caisson below water's surface
Uncontaminated Ballast Water – Discharge 010	*Kulluk* – 1,500 bbl (approximately 34 bbl/day for 44 days)	0 bbl	0 bbl/day	**No discharge**. Ballast water is stored aboard then transported out of region for disposal at a licensed TDS
	Discoverer – 220 bbl (based on 5 bbl/day for 44 days)	0 bbl	0 bbl/day	
Firewater Bypass – Discharge 008	*Kulluk* – 572 bbl (2 tests)	572 bbl (2 tests)	Monthly test of fire hoses at 200 gal/min for 60 minutes	Discharged through disposal caisson below water's surface
	Discoverer – no testing	No testing	No testing	No testing
Bilge Water – Discharge 011	*Kulluk* – 220 bbl (based on 5 bbl/day for 44	0 bbl	0 bbl/day	**No discharge**. Treated in an oil/water

Table 6.a-3 Projected Wastes Generated and Ocean Discharges for Torpedo Location H

Type of Waste	Total Generated*	Total Amount to be Discharged**	Discharge Rate	Discharge Method
	days)			separator; uncontaminated water is stored aboard then transported out of region for disposal at a licensed TDS
	Discoverer – 572 bbl (based on 13 bbl/day for 44 days)	0 bbl	0 bbl/day	
BOP Fluid – Discharge 006	56.4 bbl	56.4 bbl	Up to 6 BOP tests at an average 9.4 bbl/test	Discharged at the seafloor at the BOP
Trash and Debris	300 bbl/month	0 bbl	0 bbl/day	**No discharge**. Segregated and disposed of at an approved TDS
Used Oil (Lube Oil)	50 bbl	0 bbl	0 bbl/day	**No discharge**. Stored aboard in waste oil tanks. Transferred to lube cubes for transport by boat to an approved TDS
Hazardous Waste	10 bbl	0 bbl	0 bbl/day	**No discharge**. Stored aboard in an approved container. Transferred by boat to an approved TDS

*Discharges for the *Kulluk* or *Discoverer* are the same unless where noted.
**The types of wastes whose discharge method is listed as "No Discharge" will be shipped to one of the EPA approved facilities listed in Section 6 a).

Table 6.a-4 Projected Wastes Generated and Ocean Discharges for Torpedo Location J

Type of Waste	Total Generated*	Total Amount to be Discharged**	Discharge Rate	Discharge Method
Drill Cuttings – Discharge 013	*Kulluk* – 5,335 bbl (cuttings only; no drilling mud used)	5,335 bbl (cuttings only; no drilling mud used)	445 bbl/day (discharged over 12 days)	Cuttings from the MLC through 26-in. diameter hole section will be deposited on the surface of the seafloor
	Discoverer – 4,002 bbl (cuttings only; no drilling mud used)	4,002 bbl (cuttings only; no drilling mud used)	334 bbl/day (discharged over 12 days)	Cuttings from the MLC through 26-in. diameter hole section will be deposited on the surface of the seafloor
Water Based Mud – Discharge 001	3,003 bbl (includes 1,500 bbl of mud in the active pit system remaining at the conclusion of drilling and abandonment operations)	0 bbl	0 bbl/day	**No discharge**. Water based mud will be collected and transported out of region for disposal at a licensed TDS
Drill Cuttings From Water Base Drilling Interval – Discharge 001	1,503 bbl	0 bbl	0 bbl/day	**No discharge**. Cuttings will be collected and transported out of region for disposal at a licensed TDS
Excess Cement – Discharge 012	50 bbl	50 bbl	Two occasions at 1 bbl/min	Forty-five bbl discharged at seafloor

Table 6.a-4 Projected Wastes Generated and Ocean Discharges for Torpedo Location J

Type of Waste	Total Generated*	Total Amount to be Discharged**	Discharge Rate	Discharge Method
				during 30- and 20-in. pipe cementing operations with 5 bbl discharged at the surface with wash-up water
Non-Contact Cooling Water – Discharge 009	*Kulluk* – 579,832 bbl (13,178 bbl/day for 44 days)	579,832 bbl	13,178 bbl/day	Discharged to the sea through the disposal caisson
	Discoverer – 1,980,000 bbl (45,000 bbl/day for 44 days)	1,980,000 bbl	45,000 bbl/day	Discharged to the sea at several sites around the hull
Sanitary Waste – Discharge 003	*Kulluk* – 5,657 bbl all recycled (throughput based on 108 persons at 50 gal/person/day for 44 days)	0 bbl	0 bbl/day	**No discharge**. Treated in the MSD and recycled for use aboard the *Kulluk*. Any unrecycled sanitary waste will be transported out of region for disposal at a licensed TDS
	Discoverer – 1,320 bbl (based on 140 persons at 9 gal/person/day for 44 days)	0 bbl	0 bbl/day	**No discharge**. Treated in the MSD and stored on the drillship then transported out of region for disposal at a licensed TDS
Domestic Waste – Discharge 004	*Kulluk* – 11,314 bbl (based on 108 persons at 100 gal/person/day for 44 days)	0 bbl	0 bbl/day	**No discharge**. Treated as required and stored aboard then transported out of region for disposal at a licensed TDS. Food wastes will not be discharged, they will be incinerated
	Discoverer – 14,667 bbl (based on 140 persons at 100 gal/person/day for 44 days)	0 bbl	0 bbl/day	
Desalination Unit Brine Water – Discharge 005	5,500 bbl (based on 125 bbl/day for 44 days)	5,500 bbl	125 bbl/day	Discharged through disposal caisson below water's surface
Deck Drainage – Discharge 002	220 bbl (based on 5 bbl/day for 44 days)	220 bbl	5 bbl/day (dependent on rainfall)	Discharged through disposal caisson below water's surface
Uncontaminated Ballast Water – Discharge 010	*Kulluk* – 1,500 bbl (approximately 34 bbl/day for 44 days)	0 bbl	0 bbl/day	**No discharge**. Ballast water is stored aboard then transported out of region for disposal at a licensed TDS
	Discoverer - 220 bbl (based on 5 bbl/day for 44 days)	0 bbl	0 bbl/day	
Firewater Bypass – Discharge 008	*Kulluk* – 572 bbl (2 tests)	572 bbl (2 tests)	Monthly test of fire hoses at 200 gal/min for 60 minutes	Discharged through disposal caisson below water's surface
	Discoverer – no testing	No testing	No testing	No testing
Bilge Water – Discharge 011	*Kulluk* – 220 bbl/well (based on 5 bbl/day for 44 days)	0 bbl	0 bbl/day	**No discharge**. Treated in an oil/water separator; uncontaminated water
	Discoverer – 572 bbl	0 bbl	0 bbl/day	

Table 6.a-4 Projected Wastes Generated and Ocean Discharges for Torpedo Location J

Type of Waste	Total Generated*	Total Amount to be Discharged**	Discharge Rate	Discharge Method
	(based on 13 bbl/day for 44 days)			is stored aboard then transported out of region for disposal at a licensed TDS
BOP Fluid – Discharge 006	56.4 bbl	56.4 bbl	Up to 6 BOP tests at an average 9.4 bbl/test	Discharged at the seafloor at the BOP
Trash and Debris	300 bbl/month	0 bbl	0 bbl/day	**No discharge**. Segregated and disposed of at an approved TDS
Used Oil (Lube Oil)	50 bbl	0 bbl	0 bbl/day	**No discharge**. Stored aboard in waste oil tanks. Transferred to lube cubes for transport by boat to an approved TDS
Hazardous Waste	10 bbl	0 bbl	0 bbl/day	**No discharge**. Stored aboard in an approved container. Transferred by boat to an approved TDS

Discharges for the *Kulluk* or *Discoverer* are the same unless where noted.
**The types of wastes whose discharge method is listed as "No Discharge" will be shipped to one of the EPA approved facilities listed in Section 6 a).

A list of the components that may be added to the drilling fluid are captured in Table 6.a-5. This component list and the respective volumes have been designed for the drilling depth from the MLC to proposed total depth for the Torpedo H wells in the revised Camden Bay EP (the Load Out list for the Sivulliq wells will involve smaller volumes and numbers of containers due to the shallower depths).

Table 6.a-5 Drilling Fluid Components and Load Out List

PRODUCT	UNITS	Unit Size	Units per Box	Total Sacks	Number of Pallets (unless noted)
M-I WATE	SACK	bulk	N/A	6,800	340 tons
M-I GEL	SACK	bulk	30	1,500	75 tons
CAUSTIC SODA	SACK	50 lb	50	100	2
SODA ASH	SACK	50 lb	50	100	2
SODIUM BICARBONATE	SACK	50 lb	50	100	2
DUOVIS	SACK	25 lb	80	320	4
KLASTOP	DRUM	55 gal	4	240	60
POLY PAC R	SACK	50 lb	40	80	2
POLY PAC UL	SACK	50 lb	40	160	4
CITRIC ACID	SACK	50 lb	50	100	2
CONTINGENCY					
SALT (or Brine)	SACK	BIG BAG	1500 kg	55	55
DEFOAM X	CAN	5 gal	32	32	1

Table 6.a-5 Drilling Fluid Components and Load Out List

PRODUCT	UNITS	Unit Size	Units per Box	Total Sacks	Number of Pallets (unless noted)
NUT PLUG (ASST.)	SACK	50	40	40	1
IDCAP D	SACK	50	40	160	4
MIX II (ASST.)	SACK	25	40	40	1
DESCO CF	SACK	25#	80	80	1
SAPP	SACK	50	45	45	1
DUROGEL	SACK	50	40	320	8
Myacide	SACK	5 gal	32	128	4
Total Pallets					154
BRINE (9.8 pounds per gallon [ppg]), only 8 Big Bags of Salt for contingencies	**8,214 bbl**				

Aboard the *Kulluk* or *Discoverer* there is a sufficient supply of mud materials to prepare a completely new mud system in case the original mud system must be replaced. There is also a sufficient supply of mud chemicals and other materials available to combat lost circulation should it become problematic. Further, there is sufficient cement to squeeze off and permanently seal a severe lost circulation zone. In addition, sufficient hole diameter is planned and pipe will be available to case off a severe lost circulation zone and still deliver a suitable wellbore through all objective intervals.

Cement Composition

Two types of cement discharges are expected. One of these involves bulk cement plus additives circulated around the 30-inch (in.) structural pipe and 20-in. conductor casing that collects in the base of the MLC. There, the cement cures to a hardened mass surrounding the 30-in. conductor. The combined volume of both circulated cement volumes can be as much as 45 barrels (bbl) of cement slurry per well. The other discharge involves small volumes of cement washed from the cement pump and lines on the drilling vessel at the surface after cementing casing strings[1] or setting cement abandonment plugs. The total volume of cement slurry discharged to the ocean from these operations could be as much as five bbl per well.

1. Both of the large-diameter pipe strings are cemented using the following mixture (total discharged volume in base of MLC = 45 bbl/well):

[1] While cementing each casing string, the surface lines and cement pump will be cleaned by washing up "on top of the plug" meaning that the cement so removed is pumped down the casing ahead of the displacement fluid to minimize discharges to the sea.

- Type C Permafrost[2] cement (API Class C cement plus gypsum and/or calcium sulfate hemi-hydrate)
- Seawater

2. Cement and other materials washed from the cement unit and piping may include (total discharged volume = 5 bbl/well):
    - Type C Permafrost[2] cement
    - API Class G "Premium" cement
    - Econolite L[2] (flyash, calcium oxide) in small amounts
    - Halad-344EXP[2] (fluid loss additive) in very small amounts
    - Calcium chloride (accelerator) in very small amounts
    - SCR-100[2] (sodium citrate retarder) in very small amounts
    - Dual Spacer[2] (surfactant blend) in trace amounts
    - Fresh water (mixing fluid)
    - Seawater (wash water)

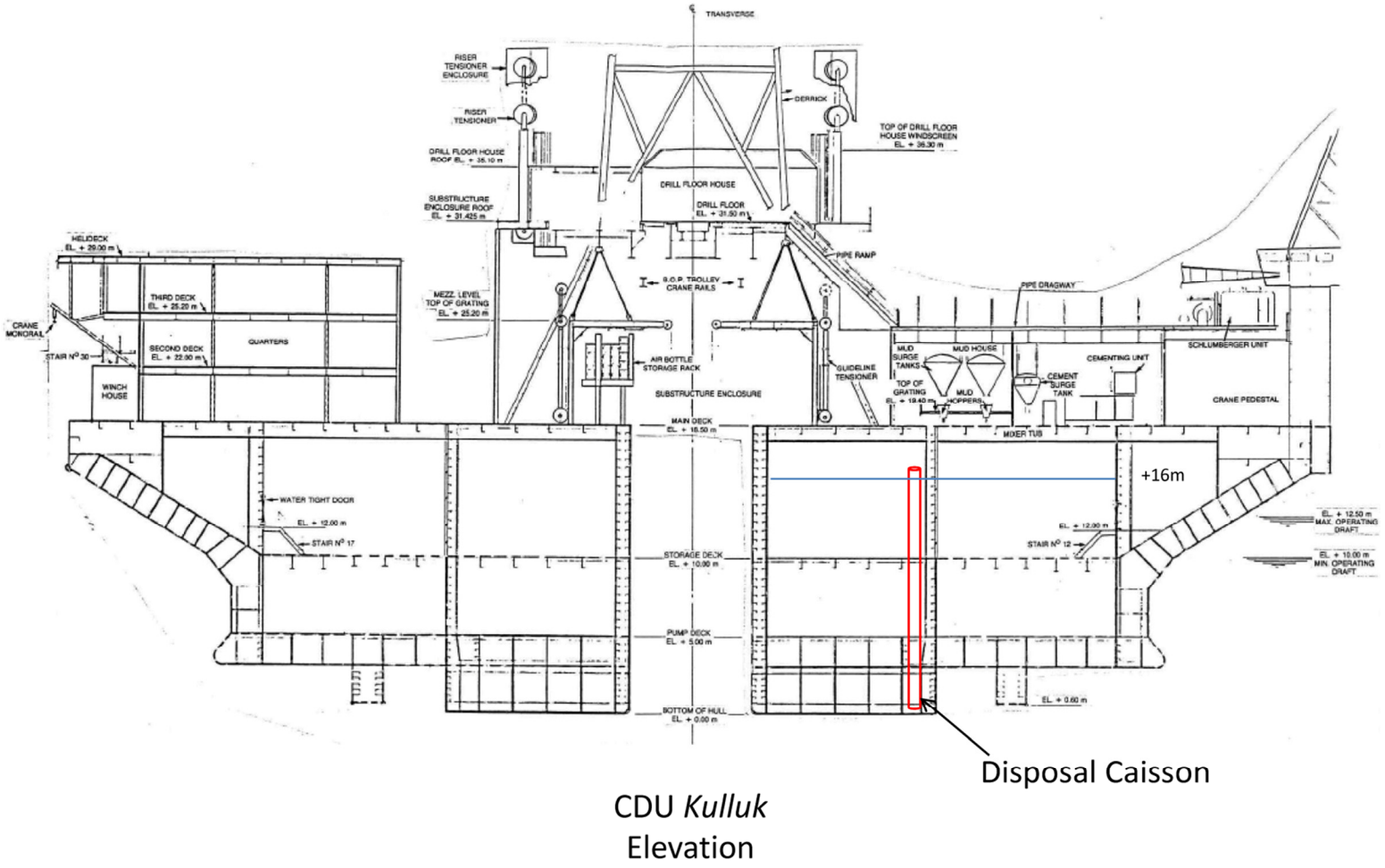
Blowout Preventer Fluid Composition

BOP fluid is a pressured fresh water-based fluid used to operate various components of the subsea BOP including rams, locking mechanisms, annular preventers, choke and kill line valves and the hydraulic connectors to the wellhead and to the lower marine riser package. The fluid is discharged at the device after use rather than bringing it back to the surface in a closed loop system. This reduces back-pressure and ensures the devices will function quickly. Only small volumes of fluid are discharged within and just above the MLC which dilute and diffuse quickly in the seawater column. It is estimated that 6 or 7 BOP tests will occur during the drilling of each well for a total of 56.4 bbl of BOP fluid per well (see Section 6 of the revised Camden Bay EP). The composition of the BOP fluid is as follows:

- Fresh water
- 12.5% Pelagic GZ[3] (water-based lubricant concentrate)
- 25% monoethylene glycol (antifreeze)

[2] All additive names are registered products of Halliburton.
[3] A product of Niche Products Ltd., classified Green Zone (OSPAR) or PLONOR

Figure 6a-1 ***Kulluk* Disposal Caisson Location**



In addition to Shell's authorization to discharge wastes under the NPDES General Permit AKG-28-0000, drilling support vessels in excess of 300 gross registered tons or having a ballast capacity of 2,113 gal (8 m^3) or greater must acquire authorization to discharge under the EPA administered *Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels Version Nov. 2010* (VGP). Authorizations to discharge under this VGP will be undertaken by the vessel owner and/or operator and is not a part of Shell's required permit and authorization application submittals.

b) National Pollutant Discharge Elimination System Authorization to Discharge

Authorization for the *Discoverer* to discharge under GP AKG-28-0000 (authorization No. AKG-28-0005) was granted to Shell on April 20, 2010 covering lease blocks 6610 and 6658.

On October 12, 2010, Shell submitted a new NOI for the *Discoverer* to discharge waste on lease block 6658, updating the EPA regarding the selected waste streams that would not be discharged, but collected, temporarily stored onsite and then shipped for final disposal at an approved disposal site. These waste streams include drilling mud and cuttings (GP AKG-28-0000 Discharge 001), sanitary wastes (Discharge 003), domestics wastes (Discharge 004), uncontaminated ballast water (Discharge 010) and bilge water (Discharge 011).

On December 15, 2010, Shell submitted a letter request to the EPA for an administrative extension of coverage under the GP AKG-28-0000 for the current authorization AKG-28-0005. In accordance with 40 CFR 122.21(d) Shell submitted the request for administrative extension, including copies of completed NOIs for lease block 6610 and 6658, greater than 180 days prior to expiration of GP AKG-28-0000. At the same time Shell submitted a new NOI requesting authorization for the *Discoverer* to discharge under GP AKG-28-0000 for lease block 6559.

On April 8, 2011, Supplemental NOI information requesting authorization for the *Kulluk* to discharge under GP AKG-28-0000 for lease block 6559, 6610 and 6658 was sent to the EPA. These NOIs are similar to those of the *Discoverer* in that the previously mentioned wastes will be collected, stored and disposed of at an approved facility.

The projected wastes and amounts listed in Tables 6.a-1 through 6.a-4 are only applicable to the *Kulluk* or *Discoverer*; support vessels are not subject to GP AKG-28-0000. Support vessels will be authorized to discharge various waste under the VGP administered by the EPA.

c) Modeling Report

All permitted discharges will occur in OCS waters. No extended mixing zones or zones of deposit have been requested. Shell has committed to not discharging drilling mud, cuttings with adhered mud, treated sanitary wastes, domestic wastes, bilge water and ballast water. These waste streams will be collected, stored and then shipped for disposal at one of the approved facilities listed in Section 6a).

Shell has modeled the discharge of (non-contact) cooling water to the ocean as well as cuttings from the MLC, the 36-in. diameter hole and the 26-in. diameter hole sections of each well on the seafloor. Modeling information regarding these discharges is as follows.

Temperature and Salinity in the Area of the Prospects

In the summer, Beaufort Sea coastal waters become stratified with warm, fresh water blanketing underlying colder dense seawater. Stratification produces warmer, brackish water along the shoreline where an abundance of fish, birds, marine mammals, and other biota can feed and travel. Stratification is

disrupted by storm activity or wind that agitates the water column delivering nutrient rich water to the surface. Stratification ceases as temperatures cool surface waters producing a uniform temperature water column. From October through June, the water column remains unstratified and fairly uniform with salinities range from 24 to 35 parts per thousand (ppt). Marine waters colder than 28.4 °F (-2.0 °C) typically freeze.

In 1996, the ADEC designated the nearshore Beaufort Sea lagoon waters from the Sagavanirktok River to Simpson Lagoon as "impaired" (ADEC 2008). Reports indicated hydrology and water quality (temperature and salinity) were affected by causeway development. To mitigate the effects, breaches were cut in the West Dock and Endicott causeways. This reversed the problem and two years later in 1998 the waters were delisted but continue to be tracked and monitored.

During the summer of 2008, the vertical profiles of salinity and temperature within Sivulliq and Torpedo prospect areas showed stratification (Figures 6.c-1 and 6.c-2). The sea at Torpedo demonstrated greater display of stratification, with warmer surface water and salinity lower than that measured near the Sivulliq Prospect. (Trefry and Trocine 2009; Dunton et al. 2009).

Figure 6.c-1 Vertical Profiles of Temperature and Salinity Near the Sivulliq Prospect

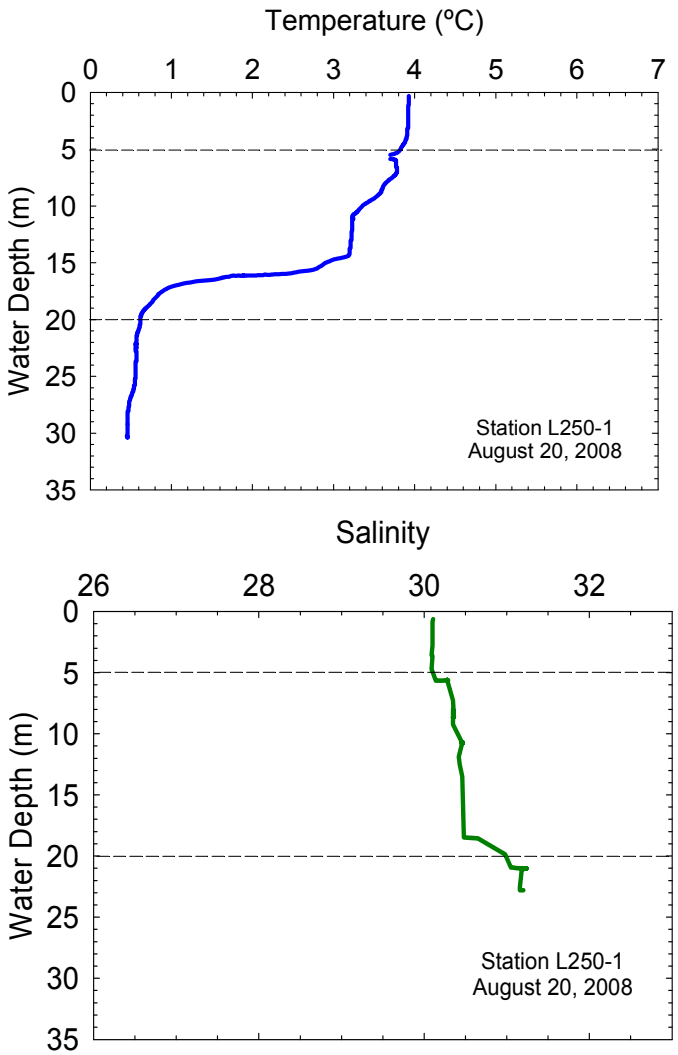
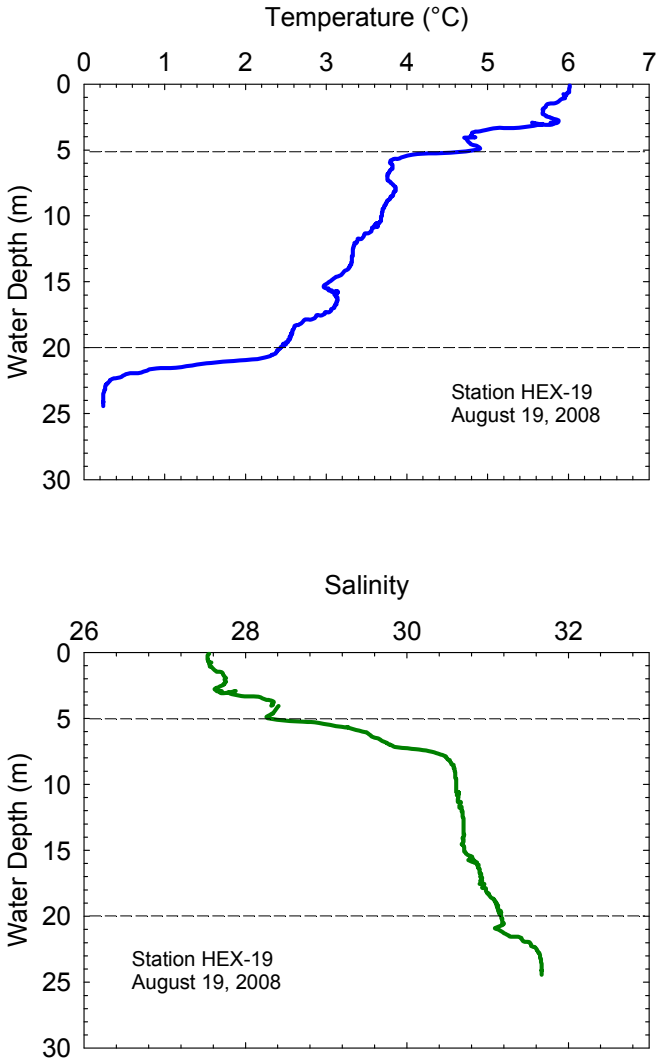


Figure 6.c-2 Vertical Profiles of Temperature and Salinity Near the Torpedo Prospect



Camden Bay Area Water Velocity

Voparil (2009) summarizes that the open-water circulation depends mostly on the wind, and the wind's direction is more important than its speed (Hanzlick et al. 1990). Other controls on circulation include river discharge, ice-melt, bathymetry, and the configuration of the coastline. The mean surface-current direction year-round is to the west and parallels the bathymetry. Average currents are generally 10 centimeters per second (cm/sec) in summer, though storms create short-lived currents that approach 100 cm/sec (MBC Applied Environmental Sciences 2003).

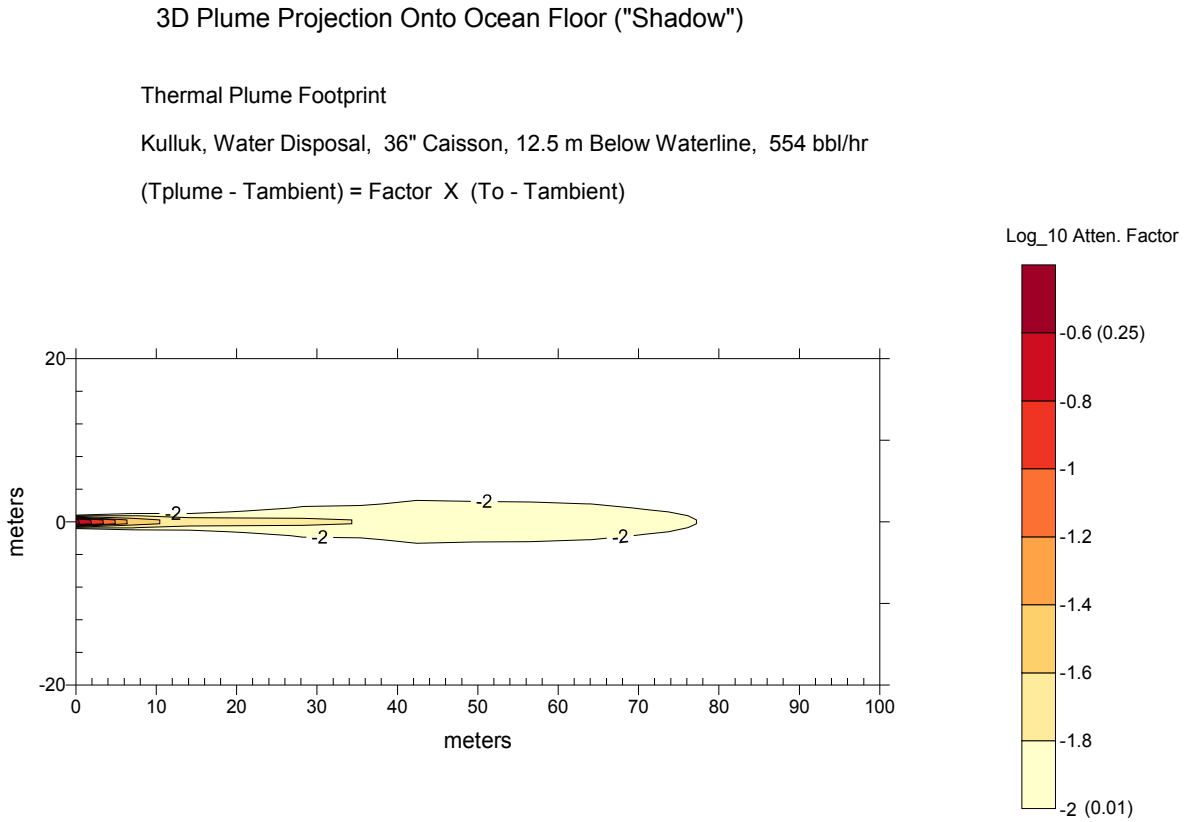
Kulluk Cooling Water Modeling

Shell has modeled the cooling water discharge from the *Kulluk*. A detailed analysis of the dispersion of cooling water into the water column is found in the EIA (Appendix F).

Shell has modeled the cooling water discharge of 13,178 bbl per day (plus a minor amount of water discharge from other onboard system – 125 bbl per day) from the *Kulluk*. The modeling shows that the cooling water reaches ambient seawater temperatures a relatively short distance from the outfall.

The cooling water from the *Kulluk* will be released through a 36-in. (91 cm) disposal caisson at a depth of 41 ft (12.5 m) below the ocean surface at an average rate of 554 bbl/hr. The discharged water creates a plume approximately 256 ft (78 m) in length and up to 16 ft (5 m) wide (Figure 6.c-3). At the edges of this plume, the cooling water will have reached ambient seawater temperatures.

Figure 6.c-3 Cooling Water Plume from the 36-in. Disposal Caisson on the *Kulluk*



***Discoverer* Cooling Water Modeling**

Shell has modeled the cooling water discharge of 45,000 bbl per day from the *Discoverer*. The modeling shows that the cooling water reaches ambient seawater temperatures a relatively short distance from the outfall.

The cooling water from the *Discoverer* will be released at five outfalls each located 11.2 ft (3.4 m) above the surface of the ocean. Two of the outfalls are through 6-in. (15.2 cm) diameter pipe and three outfalls are from 2-in. (5.1 cm) diameter pipes. The flow rate through each 6-in. (15.2 cm) pipe is approximately 562.5 bbl/hr and approximately 250 bbl/hr through each 2-in. (5.1 cm) pipe.

The cooling water coming out of each 6-in. (15.2 cm) outfall attenuates to a plume approximately 164 ft (50m) in length and 13 ft (4m) wide (Figure 6c-4). The cooling water from each 2-in. (5.1 cm) outfall

results in a plume 30 ft (9 m) and 305 ft (1-1.5 m) wide (Figure 6c-5). At the edges of both plumes, the cooling water will have reached ambient seawater temperature.

Figure 6.c-4 Cooling Water Plume From Each 6-in. Outfall on the *Discoverer*

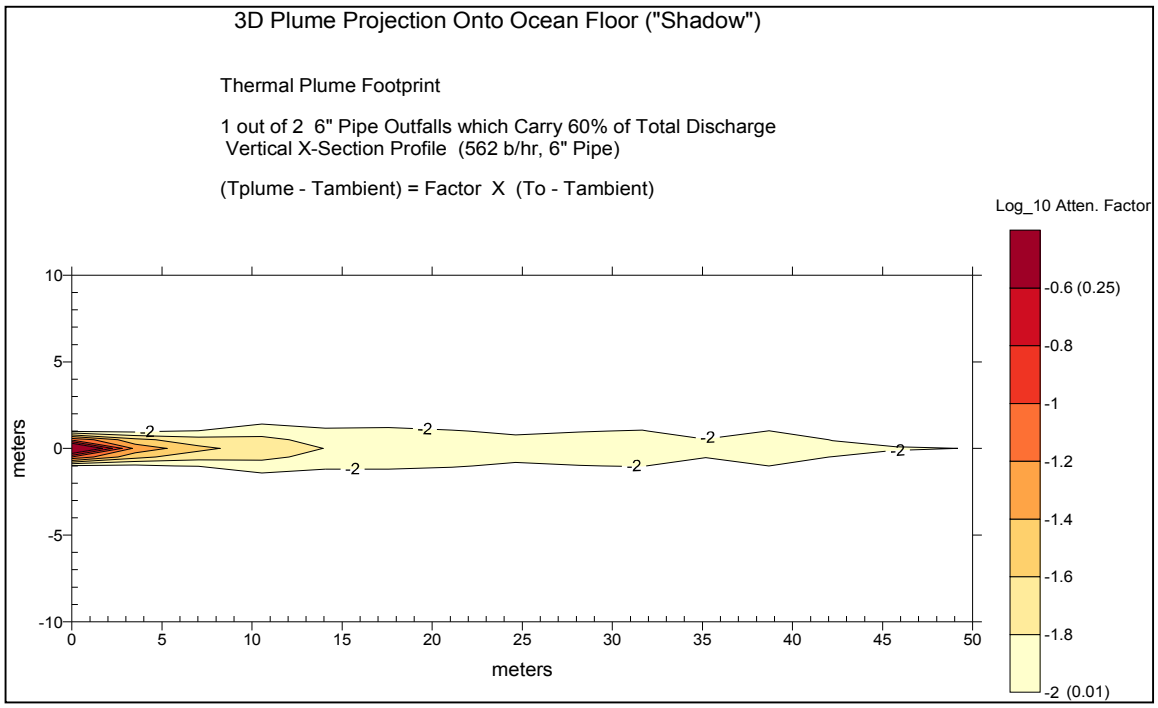
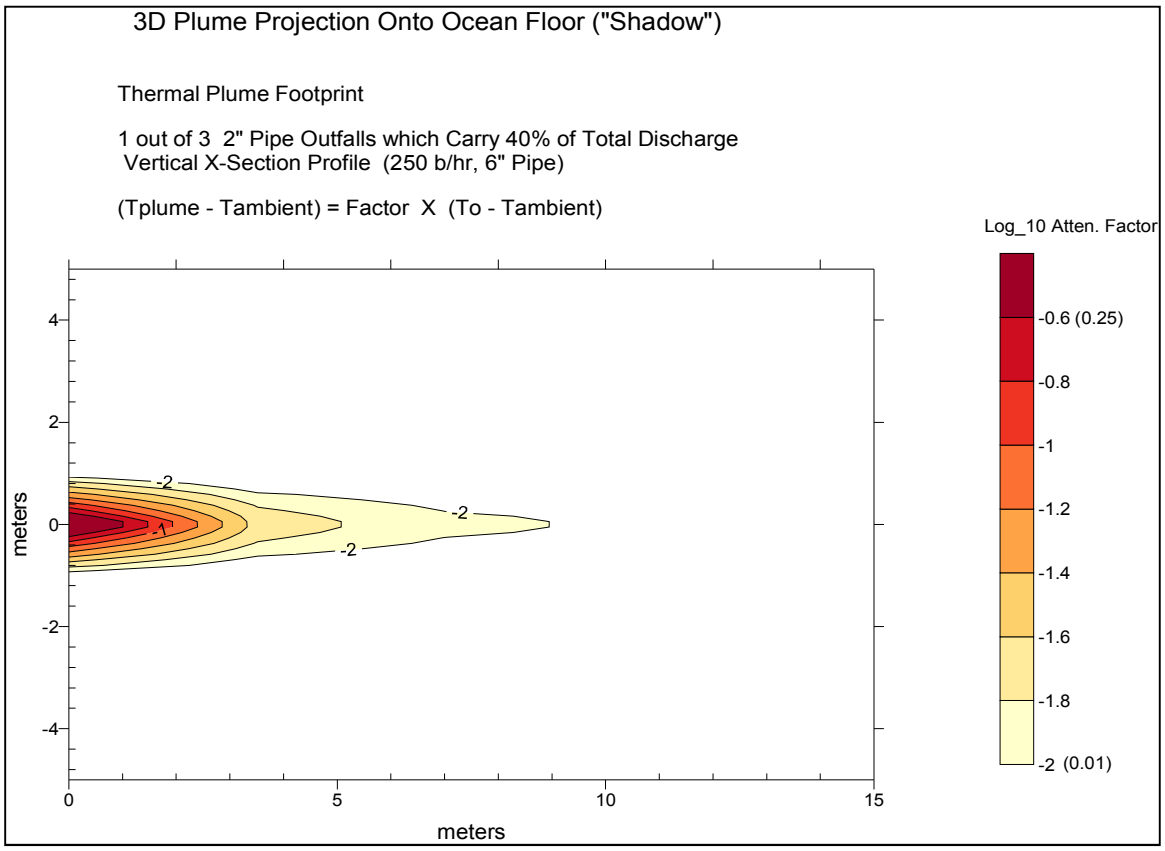


Figure 6.c-5 Cooling Water Plume From Each 2-in. Outfall on the *Discoverer*

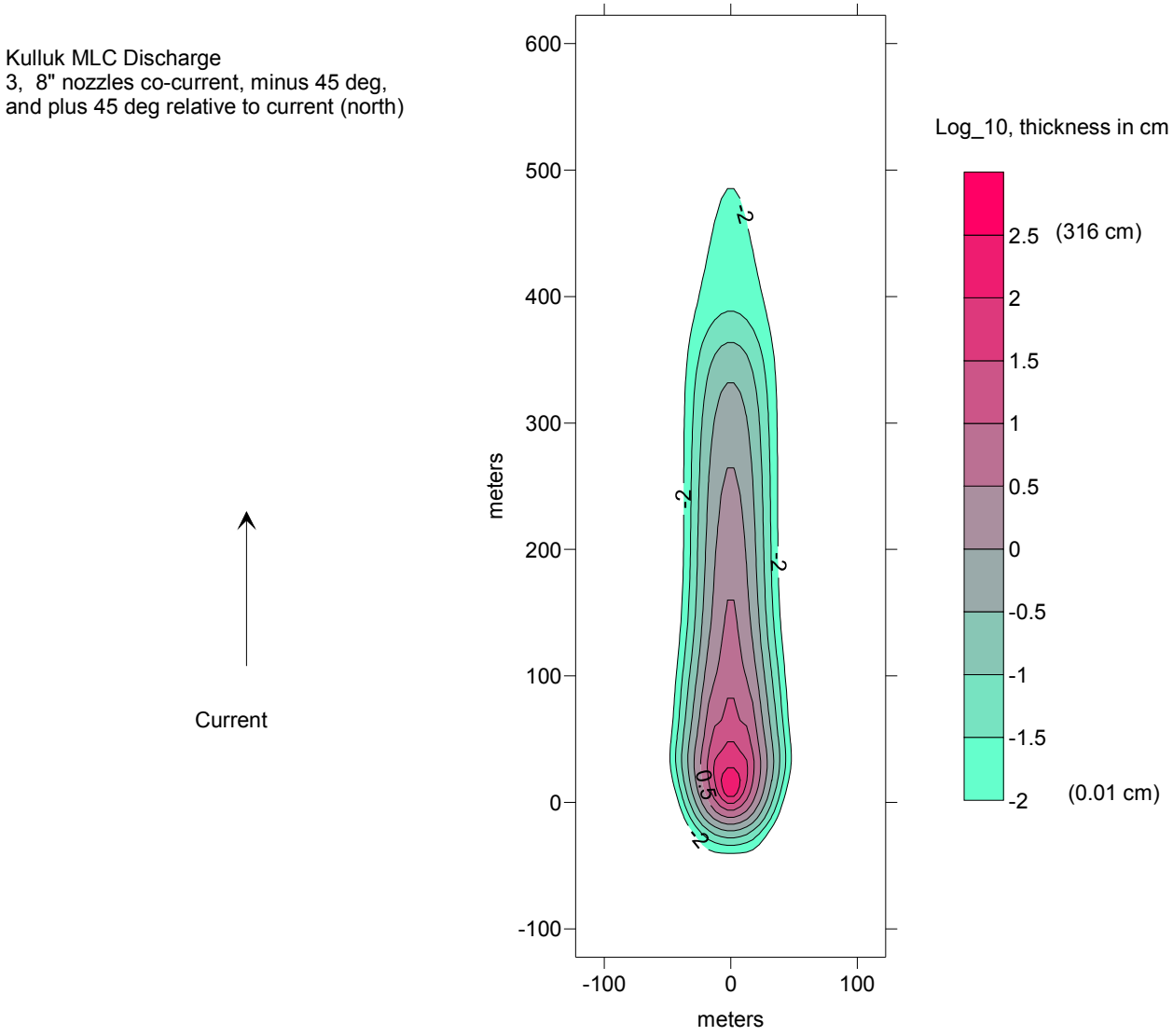


***Discoverer* and *Kulluk* MLC, 36-in. and 26-in. Cuttings at the Seafloor Modeling**

Shell has modeled the deposition of cuttings on the seafloor from a height of 10 ft (3 m) for each drilling vessel. The cuttings pile is thickest and widest approximately 66 ft (20 m) down-current from the MLC (Figure 6.c-6). At this point the cutting pile is approximately 10 ft (3m) thick and 328 ft (100 m) wide. Other cutting pile dimensions are:

- 295 ft (90 m) down-current: 246 ft (75 m) wide and 4 in. (10 cm) thick
- 886 ft (270 m) down-current: 246 ft (75 m) wide and 0.4 in. (1 cm) thick
- 1591 ft (485 m) down-current: end of plume

Figure 6.c-6 Cuttings Plume From Either Drilling Vessel



d) Projected Cooling Water Intake

Kulluk

The *Kulluk* will require a non-contact cooling water rate of 13,178 bbl/day. This volume may vary slightly as determined by the number of engines running and duration on a daily basis. The non-contact cooling water will be supplied by a salt water service pump able to pump at a rate of 23,505 gal/hr (559.6 bbl/hr or 13,431 bbl/day). This seawater intake is from a central sea chest containing four separate compartments (Table 6.d-1). This volume is mainly used for non-contact cooling water purposes and the remainder is used for other waste streams including toilet service, water maker source (desalination unit), fire water source or other accessory salt water needs (mud, chemical mix, and other seawater demands).

Table 6.d-1 Seawater Intake Mesh sizes on the *Kulluk*

Sea-suction	Screen Mesh Size	Compartment Size
Central Sea Chest – Compartment 1	0.2 in. (5.0 mm)	10.75-in. (273 mm) X 16-in. (406 mm)
Central Sea Chest – Compartment 2	0.2 in. (5.0 mm)	10.75-in. (273 mm) X 16-in. (406 mm)
Central Sea Chest – Compartment 3	0.2 in. (5.0 mm)	10.75-in. (273 mm) X 16-in. (406 mm)
Central Sea Chest – Compartment 4	0.2 in. (5.0 mm)	10.75-in. (273 mm) X 16-in. (406 mm)

mm – millimeter(s)

The calculated velocity of intake water across the screens is approximately 12 ft/min (6 cm/sec).

Discoverer

A saltwater service system supplies the *Discoverer's* requirement for saltwater, including that for drilling operations. The system is primarily used to supply cooling water to equipment heat exchangers. A piping flow diagram for *Discoverer* is provided with the NOIs in Appendix B.

The saltwater service system consists of saltwater pumps (Aurora 5-483-11C), four sea-suctions (each with strainer having holes 5 mm in diameter), and associated distribution piping. Screen mesh sizes on the water intakes, which have been reduced to minimize entrainment of larger fish eggs and larvae, are provided below in Table 6.d-2.

Table 6.d-2 Seawater Intake Mesh Sizes on the *Discoverer*

Sea-suction	Screen Mesh Size
Pumproom Sea Suction	0.2 in. (5.0 mm) diameter holes in plate
Lower Engine Room Sea Suction	0.2 in. (5.0 mm) diameter holes in plate
Upper Engine Room Sea Suction	0.2 in. (5.0 mm) diameter holes in plate
Generator Room Sea Suction	0.2 in. (5.0 mm) diameter holes in plate

The calculated velocity of intake water across the screens is approximately 40 ft/min (20 cm/sec).

SECTION 7.0 AIR EMISSIONS INFORMATION

a) Projected Emissions

***Kulluk* Emissions**

Shell is applying for a synthetic minor source operating air emissions permit from the EPA Region 10 for exploration drilling using the *Kulluk* on OCS leases in the Beaufort Sea, Alaska.

These leases are beyond the Alaska seaward boundary, which is three 3 mi (4.8 km) out from the shoreline, and air permits are therefore administered by EPA through the 40 CFR Part 55 rules, the "OCS rules". Most of the leases in the Beaufort Sea are also within 25 mi (40 km) of Alaska's seaward boundary, a region within which the EPA also applies the Alaska air rules. So, only the federal rules apply to the leases beyond this 25 mi (40 km) distance, but Alaska rules also apply within the 25 mi (40 km) distance.

In general, the *Kulluk*'s emissions are greater during construction of the MLC than the remainder of the well. Large air compressors and hydraulic power units (HPUs) must be used for construction of the MLC. The MLC only requires a few days to construct. Emissions are reduced during casing, logging and cementing. Support vessel emissions remain relatively constant throughout these exploration drilling activities.

Engine Size and Rating: Table 7.a-1 lists the emission source groups for the vessel types (or similar vessel) listed in the *Kulluk* air permit application that was submitted to the EPA February 28, 2011.

Projected Peak Hourly Emissions: The projected peak hourly emissions from sources on the *Kulluk* and support vessel sources are provided in Table 7.a-2 as required by 30 CFR 250.218(1)(i).

Total Annual Emissions: Total annual potential emissions from sources on the *Kulluk* and support vessel sources are provided in Table 7.a-3 as required by 30 CFR 250.218(1)(ii). These emissions are based on a maximum 120-day drilling season although it is likely that environmental conditions and the shutdown for the Kaktovik and Cross Island (Nuiqsut) whale hunts will limit the *Kulluk* to less than 120 drilling days.

Emissions over the Duration of the Exploration Drilling Activities: The annual emissions associated with the proposed exploration drilling activities planned in the revised Camden Bay EP, as required under 30 CFR 250.218(1)(iii), are presented in Table 7.a-3.

Frequency and Duration of Emissions: Proposed owner requested limits, listed in Table 7.a-4, include a high level summary of the frequency and duration of the listed emission sources as required under 30 CFR 250.218(1)(iv). The frequency and duration of source group emissions are listed in Table 7.a-5.

In addition, Shell anticipates that the ice management vessels will be operating at maximum emission rates for 38 percent of the 120 days. For modeling purposes, the ice management vessels are assumed to be operating at the maximum emission rates whenever the meteorology indicates that ice is present and assumed to be beyond the 25 mi radius when the data indicate open water.

Total of All Emissions: As required under 30 CFR 250.218(1)(v), the total of all annual emissions for the *Kulluk* emission sources, and for the associated vessels, are provided in Table 7.a-3 by pollutant.

Basis for Calculations: As required under 30 CFR 250.218(2), total annual emissions by pollutant for the *Kulluk* sources and for the associated vessels, are provided in Table 7a-3. These projected total annual emissions, including support vessel emissions, are based on the *Kulluk* being an OCS source for a maximum of 120 days. Emissions for all emission units associated with the *Kulluk* are estimated as potential to emit, which are the emissions assuming continuous operation at maximum rated capacity for the entire 120-day drilling season per year, unless limited by owner-requested restriction (Table 7.a-4). Engine size and rating are provided in Table 7.a-1.

The emissions for the ice management fleet propulsion engines are estimated for operation at maximum rate for 38 percent of the 120-day season. *Kulluk* emissions are estimated without the propulsion engines operating (drilling and propulsion are exclusive). The emergency and backup engines are only used during emergencies and maintenance of paired engines. Shell will purchase ultra-low sulfur diesel (ULSD;0.0015 percent sulfur) fuel for all vessels.

Emission factors used in the calculations of hourly and total emissions are found in Attachment A of the *Kulluk* Minor Source Air Permit application. A copy of the application has been submitted to BOEMRE.

Table 7.a-1 Source Size, Rating and Fuel Usage

Vessel and Source Group	Description	Make/Model	Rating	Fuel Usage
Kulluk				
Generation	Generator Engine			386 gal/hr
	Generator Engine			
	Generator Engine			
MLC HPUs	HPU Engine	Caterpillar/3306	250 hp	80 gal/hr
	HPU Engine	Caterpillar/3306	250 hp	
Air Compressors	Air Compressor	Hydraulic	500 hp	80 gal/hr
	Air Compressor	Hydraulic	500 hp	
	Air Compressor	Hydraulic	500 hp	
Cranes	Port Deck	Mercedes/OM404	293 kw	26 gal/hr
	Starboard Deck	Mercedes/OM404	293 kw	
	Aft Deck	Mercedes/OM404	293 kw	
Heaters and Boilers	Heat Boiler	unknown	2.4 MMBtu/hr	46 gal/hr
	Heat Boiler	unknown	2.4 MMBtu/hr	
	Hot Water Heat	unknown	0.54 MMBtu/hr	
	Hot Water Heat	unknown	0.54 MMBtu/hr	
Seldom Used Units	Rig Air Compressor	Lister TS-2	23 hp	566 gal/30-days
	ROV HPU	Cummins QSX15-G9	755 hp	
	Life Boat	Perkins 4154	50 hp	
	Life Boat	Perkins 4154	50 hp	
	Life Boat	Perkins 4154	50 hp	
	Life Boat	Perkins 4154	50 hp	
	Fast Rescue Boat	STEYR/144	144	
	LARS Diesel Drive	Unknown	150 kW	
Emergency Generator	Emergency Generator			77 gal/30-days
Incinerator	Incinerator	TeamTec/GS5000C	276 lb/hr	NA
Primary Ice Management				
Fennica/Nordica				
Propulsion and Generation	Main Prop Engine	Wartsila/16V32	6,000 kW	1,718 gal/hr
	Main Prop Engine	Wartsila/16V32	6,000 kW	
	Main Prop Engine	Wartsila/12V32	4,500 kW	
	Main Prop Engine	Wartsila/12V32	4,500 kW	
	Generator	ABB Stromberg Drives/HSG 1120 MP8	8,314 kVA*	
	Generator	ABB Stromberg Drives/HSG 1120 MP8	8,314 kVA*	
	Generator	ABB Stromberg Drives/HSG 900 LR8	6,235 kVA*	
	Generator	ABB Stromberg Drives/HSG 900 LR8	6,235 kVA*	
	Harbour Set Generator	Wärtsilä/VASA 4R22	710 hp	
	Bow Thrusters	Brunvoll FV-80 LTC-2250	1,150 kW*	

Table 7.a-1 Source Size, Rating and Fuel Usage

Vessel and Source Group	Description	Make/Model	Rating	Fuel Usage
	Bow Thrusters	Brunvoll FV-80 LTC-2250	1,150 kW*	
	Bow Thrusters	Brunvoll FV-80 LTC-2250	1,150 kW*	
Heaters and Boilers	Heat Boiler	unknown	4.44 MMBtu/hr	76 gal/hr
	Heat Boiler	unknown	4.44 MMBtu/hr	
Seldom Used Units	Emergency Generator	Caterpillar/3412	300 hp	100 gal/wk
Incinerator	Incinerator	unknown	154 lb/hr	NA
Secondary Ice Management/ Anchor Handler				
Tor Viking II				
Propulsion and Generation	Main Propulsion	MaK 8M32	5,046 hp	1,718 gal/hr
	Main Propulsion	MaK 8M32	5,046 hp	
	Main Propulsion	MaK 6M32	3,784 hp	
	Main Propulsion	MaK 6M32	3,784 hp	
	Harbor Generator	Caterpillar 3412	1,168 hp	
	Harbor Generator	Caterpillar 3412	1,168 hp	
Heaters and Boilers	Heat Boiler	Pyro/E1130	1.37 MMBtu/hr	76 gal/hr
Seldom Used Units	Skimmer			100 gal/wk
Incinerator	none			NA
Resupply Ship				
Harvey Spirit				
Propulsion and Generation	Main Engine	GE/7FDM12D5	3070 hp	1,200 gal/1-way during transit 4,800 gal/event during DP mode
	Main Engine	GE/7FDM12D5	3070 hp	
	Generator	Cummins/KTA19-D(M)	485 kW	
	Generator	Cummins/KTA19-D(M)	485 kW	
	Generator	Cummins/KTA19-D(M)	485 kW	
	Bow Thrusters	Cummins/KTA38-D(M)	1200 hp	
	Bow Thrusters	Cummins/KTA38-D(M)	1200 hp	
	Stern Thrusters	Cummins/KTA38-D(M)	1200 hp	
Seldom Used Units	Emergency Generator	Cummins/6BTAA5.9-G1	99 hp	20 gal/wk
	Skimmer			
OSR Vessel				
Pt. Oliktok Tug and Endeavor Barge				
Propulsion and Generation	Main Propulsion	Caterpillar 3512	1,050 hp	2,800 gal/day
	Main Propulsion	Caterpillar 3512	1,050 hp	
	Generator	Caterpillar 3304	150 hp	
	Generator	Caterpillar 3304	150 hp	

Table 7.a-1 Source Size, Rating and Fuel Usage

Vessel and Source Group	Description	Make/Model	Rating	Fuel Usage
	Generator	Caterpillar C4.4	80 hp	
	Generator	Caterpillar C4.4	80 hp	
Seldom Used Units	Crane	Manitowok NTA855-C360	350 hp	
	Light Plant	unknown	30 hp	
	HPU Engine	Caterpillar C6.6	158 kW	
	HPU Engine	Caterpillar C6.6	158 kW	100 gal/wk
	HPU Engine	Deutz F6L914	84 kW	
	Generator	Lugger M753W2	8 kW	
	Anchor Engine	John Deere	50 hp	
Incinerator	none			
OSR Work Boats				
Kvichaks 2 X 34 ft Rozema 1 X 47 ft	Propulsion	Cummins QSB 5.9	300 hp	
	Propulsion	Cummins QSB 5.9	300 hp	
	Generator	unknown	12 hp	
	Propulsion	Cummins QSB 5.9	300 hp	
	Propulsion	Cummins QSB 5.9	300 hp	3,789 gal/wk
	Generator	unknown	12 hp	
	Propulsion	Lugger 6140	600 hp	
	Propulsion	Lugger 6140	600 hp	
	Generator	unknown	12 hp	

* Electrical

Table 7.a-2 Projected Hourly Emissions From the Kulluk (Individual Source) and Support Vessels (Source Groups)

Vessel and Source Group	NOx lb/hr	$PM_{2.5}$ lb/hr	PM_{10} lb/hr	CO lb/hr	SO_2 lb/hr	VOC lb/hr
Kulluk						
Generation	19.0	3.0	3.0	8.6	5.4E-01	1.37
MLC HPUs	37.0	1.5	1.5	2.0	1.1E-01	1.10
Air Compressors	29.6	0.6	0.6	1.8	1.1E-01	0.28
Cranes	11.8	0.5	0.5	0.6	3.6E-02	0.35
Heaters and Boilers	0.9	0.2	0.2	0.2	6.4E-02	0.05
Seldom Used Units	0.4		2.9E-02	0.1	1.1E-03	0.04
Emergency Generator	17.8	1.4	1.4	4.8	5.4E-02	1.77
Incinerator	0.4	1.9	2.3	41.4	3.5E-01	13.80
Ice Management						
Propulsion and Generation	84.7	13.2	13.2	38.3	2.4E+00	6.09
Heaters and Boilers	1.5	0.2	0.2	0.4	1.1E-01	0.08
Seldom Used Units	0.3	2.2E-02	2.2E-02	0.1	8.3E-04	0.03
Incinerator	0.2	1.1	1.3	23.1	1.9E-01	7.70
Anchor Handler						
Propulsion and Generation	84.7	13.2	13.2	38.3	2.4E+00	6.09
Heaters and Boilers	1.5	0.2	0.2	0.4	1.1E-01	0.08
Seldom Used Units	0.3	2.2E-02	2.2E-02	0.1	8.3E-04	0.03
Incinerator	0.2	1.1	1.3	23.1	1.9E-01	7.70
Resupply Ship – transport mode *						
Propulsion and Generation	0	0	0	0	0	0
Seldom Used Units	0	0	0	0	0	0
Resupply Ship – Dynamic Positioning mode						
Propulsion and Generation	236.7	9.9	9.9	71.4	9.0E-01	7.56
Seldom Used Units	5.5E-02	4.4E-03	4.4E-03	1.5E-02	1.7E-04	5.5E-03
OSR Vessel						
Propulsion and Generation	44.4	1.8	1.8	13.0	1.6E-01	1.38
Seldom Used Units	2.8E-01	2.2E-02	2.2E-02	7.4E-02	8.3E-04	2.7E-02
Incinerator	0.2	0.9	1.0	18.8	1.6E-01	6.25
OSR Work Boats						
Kvichaks	10.4	0.8	0.8	2.8	3.2E-02	1.04

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

Table 7.a-3 Vessel Source Group Annual Maximum Emissions in Tons/Year

Vessel and Source Group	NO_x ton/yr	$PM_{2.5}$ ton/yr	PM_{10} ton/yr	CO ton/yr	SO_2 ton/yr	VOC ton/yr
Kulluk						
Generation	23.9	3.7	3.7	10.8	6.8E-01	1.72
MLC HPU's	8.9	0.4	0.4	0.5	2.7E-02	0.26
Air Compressors	7.1	0.1	0.1	0.4	2.7E-02	0.07
Cranes	6.6	0.3	0.3	0.4	2.0E-02	0.2
Heaters and Boilers	1.3	0.2	0.2	0.3	9.2E-02	0.07
Seldom Used Units	5.2E-01	4.2E-02	4.2E-02	1.4E-01	1.6E-03	5.2E-02
Emergency Generator	7.1E-02	5.7E-03	5.7E-03	1.9E-02	2.2E-04	7.1E-03
Incinerator	0.3	1.4	1.6	29.8	0.25	9.94
Ice Management						
Propulsion and Generation	46.3	7.2	7.2	21	1.3	3.33
Heaters and Boilers	0.8	0.1	0.1	0.2	5.8E-02	0.04
Seldom Used Units	1.5E-01	1.2E-02	1.2E-02	4.1E-02	4.6E-04	1.5E-02
Incinerator	0.1	0.6	0.7	12.6	0.11	4.21
Anchor Handler						
Propulsion and Generation	46.3	7.2	7.2	21	1.3	3.33
Heaters and Boilers	0.8	0.1	0.1	0.2	5.8E-02	0.04
Seldom Used Units	1.5E-01	1.2E-02	1.2E-02	4.1E-02	4.6E-04	1.5E-02

Table 7.a-3 Vessel Source Group Annual Maximum Emissions in Tons/Year

Vessel and Source Group	NO_x ton/yr	$PM_{2.5}$ ton/yr	PM_{10} ton/yr	CO ton/yr	SO_2 ton/yr	VOC ton/yr
Incinerator	0.1	0.6	0.7	12.6	0.11	4.21
Resupply Ship – transport mode						
Propulsion and Generation	10.6	0.4	0.4	3.2	4.0E-02	0.34
Seldom Used Units	7.9E-02	6.3E-03	6.3E-03	2.1E-02	2.4E-04	7.9E-03
Resupply Ship – Dynamic Positioning mode						
Propulsion and Generation	21.3	0.9	0.9	6.4	8.1E-02	0.68
Seldom Used Units	7.9E-02	6.3E-03	6.3E-03	2.1E-02	2.4E-04	7.9E-03
OSR Vessel						
Propulsion and Generation	37.3	1.6	1.6	11.2	1.4E-01	1.19
Seldom Used Units	4.0E-01	3.2E-02	3.2E-02	1.1E-01	1.2E-03	3.9E-02
Incinerator	0.3	1.3	1.5	27	0.2	9.00
OSR Work Boats						
Kvichaks	15.0	1.2	1.2	4.0	4.5E-02	1.49
Total Potential to Emit	**229**	**28**	**28**	**162**	**5**	**40**

Note: ton = short tons.

Table 7.a-4 Owner Requested Limits in the *Kulluk* Minor Source Air Permit Application

Owner Requested Limits	Value
MLC construction	480 hours per season (20 days)
MLC construction and well drilling combined	1,632 hours per season (68 days)
All OCS activities combined	2,880 hours per season (120 days)
Number of resupply/waste removal trips	24 per season
Kulluk incinerator	12 hours per day (8 a.m. – 8 p.m.)
Fuel sulfur content – *Kulluk* and fleet	Purchase ULSD (0.0015 percent sulfur); less than 0.01% during use
All internal combustion engine and heater groups	Emission limits (in lb/day) for each pollutant highlighted in Updated Tables 2-1, 2-2, and 2-3 of Kulluk Impacts Memo, May 4, 2011 (Air Sciences, 2011a)

Table 7.a-5 Frequency and Duration of Emission Source Groups - *Kulluk*

Source	Capacity			Operating Duration (hr/day)			Operating Frequency*
	Activity			Activity			
Kulluk	**MLC**	**Drill**	**C/L**	**MLC**	**Drill**	**C/L**	
Generation	85%	85%	60%	24	24	24	Every day of listed activity
MLC HPUs	100%	0%	0%	24	0	0	Every day of listed activity
Air Compressors	100%	0%	0%	24	0	0	Every day of listed activity
Cranes	40%	40%	40%	7	7	12	Every day of listed activity
Heaters and Boilers	100%	100%	100%	24	24	24	Every day
Incinerator	100%	100%	100%	12	12	12	Every day
Seldom Used Units**	100%	100%	100%	24	24	24	Based on weekly fuel limit
Emergency Generator	100%	100%	100%	2	2	2	Every 30 days
Fleet							
Resupply Ship-Transport							24 events per year
Resupply Ship-DP				24	24	24	24 events per year
Ice Management Vessels				24	24	24	On days when ice is present, 38% of season
OSR vessel							Based on daily fuel limit
OSR Workboats							Based on weekly fuel limit

*when source is operating

** The operating duration values listed in this table are specific to assumptions made for air quality modeling purposes. The emissions from the seldom used sources (several small engines; non-emergency generator) will occur at undefined times and are evenly spread over the 30-day period for modeling purposes. Emissions for the seldom used sources are based on a maximum fuel consumption rate for the source group of no more than 150 gallons per week which is based on the expectation that the seldom used sources operate only a few hours per week.

Discoverer Emissions

The air quality information provided herein is based on the drillship and associated support vessels. Shell submitted a major new source review Prevention of Significant Deterioration (NSR/PSD) application to

EPA Region 10 on 10 December 2008 and a revised application on 23 February 2009. Responses to additional EPA requests for information were submitted to BOEMRE on 18 May and 29 May 2009. The EPA prepared a Statement of Basis and issued PSD Permit No. R10OCS/PSD-AK-09-01 to Shell on 31 March 2010. Projected emissions, based on the Statement of Basis, are provided below in Tables 7.a-6 through 7.a-8. Air quality impacts are provided in Section 7(f) and Table 7.f-1 and 7.f-2, and are from the Statement of Basis (EPA 2010) and a revised modeling report (Air Sciences Inc. 2011b) provided to EPA in response to the remand.

Shell has provided the documents referenced above to BOEMRE, and BOEMRE should refer to these documents for additional information on the projected emissions, how emissions were calculated, and how impacts were modeled. Shell has proposed several emission reduction measures and owner-requested enforceable limits in the application including burning ULSD fuel; and installing diesel particulate filters, catalytic diesel particulate filters, and selective catalytic reduction (SCR) controls on the drillship emission units. These emission reduction measures satisfy the best available control technology (BACT) component of PSD permitting and EPA has incorporated these measures and other emission reduction measures as enforceable permit limitations. Shell's PSD application and subsequent submissions include emission unit spreadsheets that describe all of the source units of the drillship and support vessels; and an analysis of potential impacts to air quality based on the emissions and source descriptions. These are summarized below.

Sources: The *Discoverer* emission units are listed in Table 7.a-6 and consist of engines for electric generation, pneumatic compression and hydraulic compression, engines for movement of materials (cranes), heaters, and an incinerator primarily for domestic purposes. The primary emission units of the ancillary vessels are the propulsion engines.

Projected Peak Hourly Emissions [30 CFR 250.218(a)(1)(i)]: Projected peak hourly emissions from the emission sources are provided below in Table 7.a-7.

Total Annual Emissions [30 CFR 250.218(a)(1)(ii)] and Emissions over the Duration of the Exploration Drilling Program [30 CFR 250.218(a)(1)(iii)]: The annual emissions associated with the proposed exploration drilling activities planned in the revised Camden Bay EP, as required under 30 CFR 250.218(1)(iii), are presented in Table 7.a-8.

Frequency and Duration of Emissions [30 CFR 250.218(a)(1)(iv)] and Basis for Calculation of Emissions [30 CFR 250.218(a)(2)]: Total projected annual emissions by pollutant for the *Discoverer* sources and for the associated vessels, are provided in Table 7.a-8. These emissions are based on a maximum 120- day drilling season. Emissions for all emission units associated with the *Discoverer* are estimated as realistic maximum emissions, which are the emissions assuming continuous operation at capacity for the entire drilling season per year, unless limited by owner-requested restriction. Proposed owner-requested restrictions are provided in Table 7.a-9 and frequencies and duration of emission source groups are found in Table 7.a-10. These restrictions and the following text summarize the basis for the calculation of the maximum emissions. *Discoverer* emissions are estimated without the propulsion engines operating (drilling and propulsion are exclusive). The emergency and backup engines are only used during emergencies and maintenance of paired engines. Shell will purchase fuel for the *Discoverer* and support vessels that will have a sulfur content equal to or less than 0.0015 weight percent.

Additional details are provided in the permit (OCS PSD R10OCS/PSD-AK-09-01), Statement of Basis for the permit (EPA 2010), and Shell's application materials, available on-line at http://yosemite.epa.gov/R10/airpage.nsf/Permits/chukchiap/#comment and Shell's remand permit materials (*Discoverer* Drillship Impact Evaluation for SO2 and NO2 Using AERMOD).

Table 7.a-6 Description of *Discoverer* Drilling Vessel Emission Units and Associated Fleet

Vessel and Source Group	Unit Description	Make/Model	Rating		Fuel Usage
Discoverer					
Generation	Generator Engine	Cat / D399	1,325	hp	297 gal/hr
	Generator Engine	Cat / D399	1,325	hp	
	Generator Engine	Cat / D399	1,325	hp	
	Generator Engine	Cat / D399	1,325	hp	
	Generator Engine	Cat / D399	1,325	hp	
	Generator Engine	Cat / D399	1,325	hp	
Propulsion	Propulsion Engine*	MI / 6UEC65	7,200	hp	NA
MLC Compressors	MLC Compressor	Caterpillar C – 15	540	hp	57 gal/hr
	MLC Compressor	Caterpillar C – 15	540	hp	
	MLC Compressor*	Caterpillar C – 15	540	hp	
HPU Engines	HPU Engine	TBD	250	hp	26 gal/hr
	HPU Engine	TBD	250	hp	
Cranes	Port Deck Crane	Cat / D343	365	hp	15 gal/hr
	Starboard Deck Crane	Cat / D343	365	hp	
Cementing/Logging	Cementing Unit	Detroit / 8V-71N	335	hp	320 gal/day
	Cementing Unit	Detroit / 8V-71N	335	hp	
	Cementing Unit	GM 3-71	147	hp	
	Logging Winch**	Caterpillar/C7	250	hp	
	Logging Winch**	John Deere/PE4020TF270D	35	kW	
Heaters & Boilers	Heat Boiler	Clayton 200 Boiler	7.97	MMBtu/hr	120 gal/hr
	Heat Boiler	Clayton 200 Boiler	7.97	MMBtu/hr	
Seldom Used Units	To Be Determined	Various			150 gal/wk
Emergency Generator	Emergency Generator*	Caterpillar / 3412	639	hp	67 gal/month
Incinerator	Incinerator	TeamTec/GS500C	276	lb/hr	NA

Table 7.a-6 Description of Discoverer Drilling Vessel Emission Units and Associated Fleet

Vessel and Source Group	Unit Description	Make/Model	Rating	Fuel Usage
Primary Ice Management				
Fennica/Nordica				
Propulsion and Generation	Main Prop Engine	Wartsila/16V32	6,000 kW	1,313 gal/hr
	Main Prop Engine	Wartsila/16V32	6,000 kW	
	Main Prop Engine	Wartsila/12V32	4,500 kW	
	Main Prop Engine	Wartsila/12V32	4,500 kW	
	Generator	ABB Stromberg Drives/HSG 1120 MP8	8,314 kVA*	
	Generator	ABB Stromberg Drives/HSG 1120 MP8	8,314 kVA*	
	Generator	ABB Stromberg Drives/HSG 900 LR8	6,235 kVA*	
	Generator	ABB Stromberg Drives/HSG 900 LR8	6,235 kVA*	
	Harbour Set Generator	Wärtsilä/VASA 4R22	710 hp	
	Bow Thrusters	Brunvoll FV-80 LTC-2250	1,150 kW*	
	Bow Thrusters	Brunvoll FV-80 LTC-2250	1,150 kW*	
	Bow Thrusters	Brunvoll FV-80 LTC-2250	1,150 kW*	
Heaters and Boilers	Heat Boiler	unknown	4.44 MMBtu/hr	75 gal/hr
	Heat Boiler	unknown	4.44 MMBtu/hr	
Seldom Used Units	Emergency Generator	Caterpillar/3412	300 hp	100 gal/wk
Incinerator	Incinerator	unknown	154 lb/hr	NA
Secondary Ice Management/ Anchor Handler				
Tor Viking II				
Propulsion and Generation	Main Propulsion	MaK 8M32	5,046 hp	1,353 gal/hr
	Main Propulsion	MaK 8M32	5,046 hp	
	Main Propulsion	MaK 6M32	3,784 hp	
	Main Propulsion	MaK 6M32	3,784 hp	
	Harbor Generator	Caterpillar 3412	1,168 hp	
	Harbor Generator	Caterpillar 3412	1,168 hp	
Heaters and Boilers	Heat Boiler	Pyro/E1130	1.37 MMBtu/hr	30 gal/hr
Seldom Used Units	Skimmer			100 gal/wk
Incinerator	none			NA

Table 7.a-6 Description of *Discoverer* Drilling Vessel Emission Units and Associated Fleet

Vessel and Source Group	Unit Description	Make/Model	Rating	Fuel Usage
Resupply Ship				
Harvey Spirit				
Propulsion and Generation	Main Engine	GE/7FDM12D5	3,070 hp	1,200 gal/1-way during transit 4,800 gal/event during DP mode
	Main Engine	GE/7FDM12D5	3,070 hp	
	Generator	Cummins/KTA19-D(M)	485 kW	
	Generator	Cummins/KTA19-D(M)	485 kW	
	Generator	Cummins/KTA19-D(M)	485 kW	
	Bow Thrusters	Cummins/KTA38-D(M)	1,200 hp	
	Bow Thrusters	Cummins/KTA38-D(M)	1,200 hp	
	Stern Thrusters	Cummins/KTA38-D(M)	1,200 hp	
Seldom Used Units	Emergency Generator	Cummins/6BTAA5.9-G1	99 hp	100 gal/wk
	Skimmer			
Offshore Management / Skimmer Vessel				
Pt. Barrow Tug and Endeavor Barge				
Propulsion and Generation	Main Propulsion	Caterpillar 3512	1,050 hp	2,800 gal/day
	Main Propulsion	Caterpillar 3512	1,050 hp	
	Generator	Caterpillar 3304	150 hp	
	Generator	Caterpillar 3304	150 hp	
	Generator	Caterpillar C4.4	80 hp	
	Generator	Caterpillar C4.4	80 hp	
Seldom Used Units	Crane	Manitowok NTA855-C360	350 hp	100 gal/wk
	Light Plant	unknown	30 hp	
	HPU Engine	Caterpillar C6.6	158 kW	
	HPU Engine	Caterpillar C6.6	158 kW	
	HPU Engine	Deutz F6L914	84 kW	
	Generator	Lugger M753W2	8 kW	
	Anchor Engine	John Deere	50 hp	
Incinerator	none			

Table 7.a-6 Description of *Discoverer* Drilling Vessel Emission Units and Associated Fleet

Vessel and Source Group	Unit Description	Make/Model	Rating	Fuel Usage
OSR Vessel				
Propulsion and Generation	Propulsion Engine	Caterpillar/3608	2,710 kW	3,800 gal/day
	Propulsion Engine	Caterpillar/3608	2,710 kW	
	Electrical Generator	Caterpillar/3508	1,285 hp	
	Electrical Generator	Caterpillar/3508	1,285 hp	
Seldom Used Units	Emergency Generator	John Deere	166 hp	100 gal/wk
Incinerator	Incinerator	ASC / CP100	125 lb/hr	NA
OSR Work Boats				
Kvichaks 2 X 34 ft Rozema 1 X 47 ft	Propulsion	Cummins QSB 5.9	300 hp	3,789 gal/wk
	Propulsion	Cummins QSB 5.9	300 hp	
	Generator	unknown	12 hp	
	Propulsion	Cummins QSB 5.9	300 hp	
	Propulsion	Cummins QSB 5.9	300 hp	
	Generator	unknown	12 hp	
	Propulsion	Lugger 6140	600 hp	
	Propulsion	Lugger 6140	600 hp	
	Generator	unknown	12 hp	

Notes:
*Not used during drilling
** Logging winch operation combined with cementing units

Table 7.a-7 Projected Peak Hourly Emissions of Discoverer Drilling Vessel Emission Units and Associated Fleet

Vessel and Source Group	NOx lb/hr	$PM_{2.5}$ lb/hr	PM_{10} lb/hr	CO lb/hr	SO_2 lb/hr	VOC lb/hr
Discoverer						
Generation	4.6	1.2	1.2	1.7	6.30E-02	0.2
MLC Compressors	7.1	0.2	0.2	3.3	1.2E-02	7.1
HPU Engines	3.3	2.47E-02	2.47E-02	0.6	5.58E-03	3.3
Cranes	5.0	3.43E-02	3.43E-02	0.1	3.26E-03	3.07E-02
Cement / Logging	6.6	0.2	0.2	0.4	2.83E-03	0.2
Heaters and Boilers	3.2	0.4	0.4	1.2	2.54E-02	2.23E-02
Seldom Used Units	5.24E-01	3.68E-02	3.68E-02	1.13E-01	1.89E-04	4.16E-02
Emergency Generator	19.7	1.4	1.4	4.2	7.13E-03	1.6
Incinerator	0.7	1.0	1.1	4.3	3.45E-01	0.4
Ice Management						
Propulsion and Generation	65.7	10.3	10.3	29.7	2.78E-01	4.7
Heaters and Boilers	1.5	0.2	0.2	0.4	1.59E-02	2.55E-02
Seldom Used Units	3.49E-01	2.46E-02	2.46E-02	7.53E-02	1.26E-04	2.77E-02
Incinerator	0.4	0.7	1.0	23.1	1.93E-01	7.7
Anchor Handler						
Propulsion and Generation	67.7	10.6	10.6	30.6	2.87E-01	4.9
Heaters and Boilers	0.6	0.1	0.1	0.2	6.37E-03	1.02E-02
Seldom Used Units	3.49E-01	2.46E-02	2.46E-02	7.53E-02	1.26E-04	2.77E-02
Incinerator	0.4	0.7	1.0	23.1	1.93E-01	7.7
Resupply Ship – transport mode*						
Propulsion and Generation	0.0	0.0	0.0	0.0	0.0	0.0
Resupply Ship – Dynamic Positioning mode						
Propulsion and Generation	370.4	9.9	9.9	79.8	1.34E-01	29.4
Offshore Management / Skimmer Vessel						
Propulsion and Generation	49.7	0.9	0.9	13.2	2.47E-02	1.4
Seldom Used Units	3.49E-01	2.46E-02	2.46E-02	7.53E-02	1.26E-04	2.77E-02
Incinerator	0.3	0.6	0.8	18.8	1.56E-01	6.3
OSR Vessel						
Propulsion and Generation	67.4	0.1	0.1	0.4	3.36E-02	0.5
Seldom Used Units	3.49E-01	2.46E-02	2.46E-02	7.53E-02	1.26E-04	2.77E-02
Incinerator	0.3	0.6	0.8	18.8	1.56E-01	6.3
OSR Work Boats						
Kvichaks	13.2	0.9	0.9	2.9	4.78E-03	1.1

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

Table 7.a-8 Annual Potentials to Emit for the *Discoverer* Emission Units and Associated Fleet

Vessel and Source Group	NO_x ton/yr	$PM_{2.5}$ ton/yr	PM_{10} ton/yr	CO ton/yr	SO_2 ton/yr	VOC ton/yr
Discoverer						
Generation	5.8	1.5	1.5	2.1	7.90E-02	0.3
MLC Compressors	1.7	4.26E-02	4.26E-02	7.93E-01	2.89E-03	1.7
HPU Engines	0.8	5.92E-03	5.92E-03	1.38E-01	1.34E-03	0.8
Cranes	2.8	1.91E-02	1.91E-02	5.88E-02	1.81E-03	1.71E-02
Cementing / Logging	4.1	0.1	0.1	0.2	1.76E-03	1.30E-01
Heaters and Boilers	4.6	0.5	0.5	1.8	3.66E-02	3.21E-02
Seldom Used Units	0.8	5.30E-02	5.30E-02	1.63E-01	2.73E-04	5.99E-02
Emergency Generator	0.1	5.55E-03	5.55E-03	1.70E-02	2.85E-05	6.26E-03
Incinerator	0.2	0.3	0.3	1.2	9.75E-02	1.17E-01
Ice Management						
Propulsion and Generation	36.0	5.6	5.6	16.3	1.52E-01	2.6
Heaters and Boilers	0.8	1.36E-01	1.36E-01	2.06E-01	8.72E-03	1.40E-02
Seldom Used Units	0.2	1.34E-02	1.34E-02	4.12E-02	6.91E-05	1.52E-02
Incinerator	0.2	0.4	0.6	12.6	1.05E-01	4.2
Anchor Handler						
Propulsion and Generation	37.1	5.8	5.8	16.8	1.57E-01	2.7
Heaters and Boilers	0.3	5.43E-02	5.43E-02	8.22E-02	3.49E-03	5.59E-03
Seldom Used Units	0.2	1.34E-02	1.34E-02	4.12E-02	6.91E-05	1.52E-02
Incinerator	0.2	0.4	0.6	12.6	1.05E-01	4.2
Resupply Ship – transport mode						
Propulsion and Generation	16.9	0.5	0.5	3.6	6.11E-03	1.3
Resupply Ship – Dynamic Positioning mode						
Propulsion and Generation	33.8	0.9	0.9	7.3	1.22E-02	2.7
Offshore Management / Skimmer Vessel						
Propulsion and Generation	71.6	1.3	1.3	19.0	3.56E-02	2.0
Seldom Used Units	0.5	3.54E-02	3.54E-02	1.08E-01	1.82E-04	3.99E-02
Incinerator	0.5	0.8	1.2	27.0	2.25E-01	9.0
OSR Vessel						
Propulsion and Generation	97.1	0.2	0.2	0.5	4.83E-02	0.7
Seldom Used Units	0.5	3.54E-02	3.54E-02	1.08E-01	1.82E-04	3.99E-02
Incinerator	0.5	0.8	1.2	27.0	2.25E-01	9.0
OSR Work Boats						
Kvichaks	19.1	1.3	1.3	4.1	6.89E-03	1.5
	336	**21**	**22**	**154**	**1**	**43**

Table 7.a-9 Owner-Requested Restrictions and Permit Conditions from Shell's PSD Air Quality Permit for the *Discoverer* in Camden Bay

Source	Owner-requested Restriction	Permit Condition
Stationary source engines on drilling vessel and support fleet	Restrict annual greenhouse gas (GHG) emissions to less than 70,000 tons	
Discoverer	Seldom used units limited to 150 gallons per week	
Primary Ice Management	Seldom used units limited to 100 gallons per week	
Secondary Ice Management	Seldom used units limited to 100 gallons per week	
Offshore Management / Skimmer Vessel	Seldom used units limited to 100 gallons per week	
OSR Vessel	Seldom used units limited to 100 gallons per week	

Table 7.a-9 Owner-Requested Restrictions and Permit Conditions from Shell's PSD Air Quality Permit for the *Discoverer* in Camden Bay

Source	Owner-requested Restriction	Permit Condition
Stationary source engines on drilling vessel and support fleet	--	Sulfur content on all stationary source engines on drilling vessel 0.0015% by weight
Discoverer Generators FD 1-6	--	Aggregate electrical power not to exceed 3,872 kWe for any hour used
Discoverer Propulsion Engine FD 7	--	Will not be used when *Discoverer* is an OCS source
Discoverer Emergency Generator FD 8	--	Operation of source will not exceed 120 minutes / day, and/or total of 48 hr / 12-month period
Discoverer MLC Compressors FD 9-11	--	Max fuel use of 81,346 gallons in all 3 units in aggregate during any 12-month period
Discoverer HPU Engines FD 12-13	--	Max fuel use of 44,338 gallons in both units in aggregate during any 12-month period
Discoverer Deck Cranes FD 14-15	--	Max fuel use of 63,661 gallons in both units in aggregate during any 12-month period
Discoverer Cementing & Logging Winches FD 16-20	--	Max fuel use of 320 gallons per day and 53,560 gallons during any 12-month period in all units in aggregate
Discoverer Incinerator FD 23	--	Max of 50,400 lbs of all types of trash in any 12-month period
Supply Ship Generator FD 31	--	Max use of 184 gal / day, 1,472 / 12-month period, 8 events / 12-month period

Table 7.a-10 Frequency and Duration of Emission Source Groups - *Discoverer*

Source	Capacity			Operating Duration (hr/day)			Operating Frequency
	Activity			Activity			
Discoverer	**MLC**	**Drill**	**C/L**	**MLC**	**Drill**	**C/L**	
Generation	71%	71%	50%	24	24	24	Every day of listed activity
MLC Compressors	67%	0%	0%	24	0	0	Every day of listed activity
HPU Engines	100%	0%	0%	24	0	0	Every day of listed activity
Cranes	40%	40%	40%	7.2	7.2	12	Every day of listed activity
Cementing / Logging							Based on daily fuel limit
Heaters and Boilers	100%	100%	100%	24	24	24	Every day
Seldom Used Units*	100%	100%	100%	24	24	24	Based on weekly fuel limit

Table 7.a-10 Frequency and Duration of Emission Source Groups - *Discoverer*

Source	Capacity			Operating Duration (hr/day)			Operating Frequency
	Activity			Activity			
Emergency Generator	100%	100%	100%	2	2	2	Every 30 days
Incinerator	20%	20%	20%	5	5	5	Every day
Fleet							
Resupply Vessels – Transit mode				1			8 events per year
Resupply Vessels – DP mode				24			8 events per year
Ice Management Vessels				24			On days when ice is present, 38% of Season
Offshore Management							Based on daily fuel limit
OSR vessels							Based on daily fuel limit
OSR Workboats							Based on weekly fuel limit

* The operating duration values listed in this table are specific to assumptions made for air quality modeling purposes. The emissions from the seldom used sources (several small engines; non-emergency generator) will occur at undefined times and are evenly spread over the 30-day period for modeling purposes. Emissions for the seldom used sources are based on a maximum fuel consumption rate for the source group of no more than 150 gallons per week which is based on the expectation that the seldom used sources operate only a few hours per week.

b) Emissions Reduction Measures

Kulluk

Shell offers the following emission reduction measures, 30 CFR 250.218(b), and restrictions on its operation for the purposes of limiting emissions and air quality impacts from the *Kulluk*:

- The *Kulluk* will have selective catalytic reduction (SCR) as a nitrogen oxide (NOx) tailpipe emission control on its primary engines, reducing NOx emissions to less than 1.6 g/kW-hr. The primary generators will also have oxidation catalysts installed for control of particulate matter less than 2.5 microns ($PM_{2.5}$), volatile organic compounds (VOC), and carbon monoxide (CO). Oxidation Catalysts are assumed to control engine emissions to 50 percent for $PM_{2.5}$, 80 percent for CO, and 70 percent for VOC.
- The other engines normally used in the drilling activities (the air compressors, the MLC, hydraulic power units (HPU), and cranes) will also have oxidation catalysts as tailpipe control for oxidizing all oxidize-able substances, including $PM_{2.5}$, VOC, and CO. Control of engine emissions is assumed to be 50 percent for $PM_{2.5}$, 80 percent for CO, and 70 percent for VOC.
- Ice management vessels and anchor handlers will have SCR as a nitrogen oxide (NOx) tailpipe emission control, and oxidation catalyst on its primary propulsion and generation engines with the same reduction efficiencies as the Kulluk primary engines.
- ULSD (0.0015 percent sulfur) fuel will be purchased for the *Kulluk* and support vessels to reduce sulfur dioxide (SO_2) emissions.

Discoverer

Shell offers the following emission reduction measures, 30 CFR 250.218(b), and restrictions on its operation for the purposes of limiting emissions and air quality impacts from the *Discoverer*:

- Primary generators on the *Discoverer* are retrofitted with selective catalytic reduction devices to reduce NOx emissions to under 0.5 g/kW-hr, and catalytic oxidation devices to reduce CO, VOCs and particulate matter less than 10 microns (PM10).
- All other engines on the *Discoverer* will either be Tier 3 (low emissions) or will be retrofitted with Catalytic Diesel Particulate Filters devices to reduce CO, VOCs, and hazardous air pollutants (HAPs) and fine particulate matter.
- ULSD (0.0015 percent sulfur) fuel will be purchased for the *Discoverer* and support vessels to reduce sulfur dioxide (SO2) emissions.
- Ice management vessels and anchor handlers will have SCR as a nitrogen oxide (NOx) tailpipe emission control, and oxidation catalyst on its primary propulsion and generation engines.

c) Processes, Equipment, Fuels, and Combustibles

Kulluk

Per 30 CFR 250.218(c), the following summarize equipment, fuels, and combustibles associated with the project. Emission units on the *Kulluk* are primarily associated with the generation of electricity, compressed air, and hydraulic energy to support drilling. All others are secondary and related to general purpose heating, transfer of materials about the deck, pumping of cement, incineration of (primarily) domestic waste, and other small emission sources. All emission source groups aboard the *Kulluk* are listed in Table 7.a-1.

Shell will purchase only ULSD fuel for use in the *Kulluk* and all of the associated fleet while the *Kulluk* is an OCS source. This fuel is produced with a sulfur content of 0.0015 percent (15 ppm) by weight or less.

Discoverer

The processes of the *Discoverer* are focused on the generation of electrical, compressed air, and hydraulic energy for operation of the drill. All others are secondary and related to general purpose heating, transfer of materials about the deck, pumping of cement, incineration primarily of domestic waste, and other small emission source. Fuel for all stationary source engines on the *Discoverer* will be purchased with sulfur content at or below 0.0015 weight percent.

d) Distance to Shore

Per requirements set forth in 30 CFR 250.218(b), distances from the drill sites to the mainland shore are as follows:

- Sivulliq G – 16.6 mi (26.7 km)
- Sivulliq N – 16.2 mi (26.1 km)
- Torpedo H – 20.8 mi (33.5 km)
- Torpedo J – 23.1 mi (37.2 km)

e) Non-exempt Drilling Vessels

Kulluk

As required by 30 CFR 250.218(e), the following describes how Shell's program complies with the requirements of 30 CFR 250.303. The drilling vessel and associated support vessels are exempt using the exemption formula found at 30 CFR 250.303(d). The following table lists the emission totals based on the BOEMRE formula at 30 CFR 250.303(d) and the yearly totals projected by Shell.

Table 7.e-1 BOEMRE Exemption Results

Parameter	BOEMRE formula at 30 CFR 250.303(d)*	BOEMRE Value (V in tons/yr)	Shell Projected Annual Total (tons/yr)	Exempt?
CO	$V=3400D^{2/3}$	21,971	162	Yes
TSP ($PM_{2.5}$ & PM_{10})	V=33.3D	539	28	Yes
SO_2	V=33.3D	539	5	Yes
NOx	V=33.3D	539	229	Yes
VOC	V=33.3D	539	40	Yes

*D=distance from drill site to the closest onshore area; in this case the Sivulliq N drill site is used since it is the drill site closest to shore (16.2 mi)

Shell has applied for a Synthetic Minor Source Permit from EPA. The proposed program will minimize air quality impacts by employing selective catalytic reduction and oxidation catalyst emissions control technology.

Discoverer

As required by 30 CFR 250.218(e), the following describes how Shell's program complies with the requirements of 30 CFR 250.303. The drillship and associated support vessels are exempt using the exemption formula found at 30 CFR 250.303(d). Modeled concentrations do not exceed significance concentrations identified in 30 CFR 250.303(e) for all pollutants.

Shell is applying for a PSD permit from the EPA, and BACT has been applied to all pollutants. The BACT is described in Shell's air permit application (Preconstruction Permit Application for the Frontier (now owned by Noble) *Discoverer* Drilling Vessel in Chukchi Sea, beyond the 25 mile Alaska Seaward Boundary), prepared by Air Sciences Inc. Impacts are estimated using dispersion modeling procedures provided by EPA Region 10.

f) Modeling Report

Kulluk

Per requirements set forth in 30 CFR 250.218(f), information on air emissions modeling can be found in Shell's air permit application. Portions of this modeling report are repeated here.

Results of the modeling and impact analysis are provided in Shell's air permit application. Table 7.f-1 displays the maximum estimated concentrations of NO_2, $PM_{2.5}$, PM_{10} and SO_2 near the drilling vessel. The concentrations do not exceed National Ambient Air Quality Standards (NAAQS) or Alaska Ambient Air Quality Standards (AAAQS) at or beyond 500m from the hull of the *Kulluk*.

A summary of the maximum modeled impacts of the *Kulluk* and associated fleet plus background concentrations for comparison to the NAAQS/AAAQS for the Beaufort Sea analysis is provided in Table 7f-2. These results show that Shell's proposed *Kulluk* Camden Bay exploration drilling program will comply with the NAAQS/AAAQS. Note that all maximum impacts are located on the ambient air boundary.

The nearest coastal villages to the OCS lease blocks are Nuiqsut, Deadhorse, and Kaktovik, which are located 23, 20 and 9 mi (37, 32, and 14 km) from the nearest OCS lease blocks, respectively. Modeling from the nearest lease block was done since the permit application was drafted to cover the Kulluk if it were permitted to drill on any lease block currently valid in the Beaufort Sea. Table 7f-2 provides a summary of the modeled impacts from the proposed Kulluk project at the nearest coastal village locations and shows that impacts are well below the NAAQS/AAAQS. Shell-only impacts are no higher than 5 percent of the NAAQS/AAAQS for any pollutant.

Table 7.f-1 Summary of Maximum Estimated Concentrations

	Averaging	Utilize Emissions	Pair Background	Max. Modeled Impact - Shell Only at or Beyond Ambient Air Boundary [1A, 2A]	Background Concentration	Max. Total Impact [3, 1B, 2B]	AAAQS/ NAAQS	
Pollutant	Period	Sequence?	In Time?	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$ (or ppm where noted)	Comply?
NO_2	1-hour	Yes	Yes	60.0	48.7	108.7	0.10 ppm	Yes
	Annual [1B]	Yes	Yes	9.8	2.4	5.6	100	Yes
$PM_{2.5}$	24-hour	Yes	Yes	7.0	7.0	14.0	35	Yes
	Annual [1B]	Yes	Yes	2.5	4.7	5.5	15	Yes
PM_{10}	24-hour	Yes	No	20.6	55.1	75.7	150	Yes
SO_2	1-hour	No	No	23.5	13.0	36.5	0.075 ppm	Yes
	3-hour	No	No	16.0	11.4	27.4	1,300	Yes
	24-hour	No	No	10.8	4.2	15.0	365	Yes
	Annual [2B]	No	No	5.5	1.7	4.0	80	Yes
CO	1-hour	No	No	1,136	1,746	2,882	40,000	Yes
	8-hour	No	No	714	862	1,576	10,000	Yes
NH_3	8-hour	No	No	6.6	---	6.6	2,100	Yes

[1A] Impact analyses for NO_2, $PM_{2.5}$, and PM_{10} span all 5 months of potential drilling activity (July 1 through November 30) using two 120-day emissions sequences to eliminate bias in the meteorological data; The highest impacts from the two 120-day sequences are shown.

[1B] For the total annual impact values, the 120-day period average impacts for NO_2 and $PM_{2.5}$ are adjusted to annual impacts by taking into account the periods of the year when Shell operations don't occur (i.e., multiply the 120-day average impacts by 0.329 (120 drilling days out of 365 days in a year)).

[2A] Impact analyses for SO_2, CO, and NH_3 span all 5 months (153 days) of potential drilling activity (July 1 through November 30) using a single, worst-case configured model run (153 days) without consideration of emissions sequencing or intermittent source operations.

[2B] The 153-day period average impacts for SO_2 are adjusted to annual impacts by taking into account the periods of the year when Shell operations don't occur (i.e., multiply the 153-day average impacts by 0.419 (153 drilling days out of 365 days in a year)).

[3] Total modeled impact is the sum of the highest modeled impact (from either 2009 or 2010) plus background concentrations. For NO_2 and $PM_{2.5}$, the 98^{th} percentile values consistent with the form of the NAAQS are presented. For all other pollutants, the maximum modeled impacts are presented.

Table 7.f-2 Summary of Maximum Impacts at the Nearest Villages on the Beaufort Sea Coast

	Averaging	Shell Only Contribution to Maximum Total Impact ($\mu g/m^3$) [1A, 2A]			Maximum Total Impact - Background Included [3, 1B, 2B]			AAAQS/ NAAQS		Highest Shell - Only Impact, Percentage of NAAQS/AAAQS
Pollutant	Period	Nuiqsut	Deadhorse	Kaktovik	Nuiqsut	Deadhorse	Kaktovik	$\mu g/m^3$ (or ppm where noted)	Comply?	(%)
NO_2	1-hour	6.6	0.02	0.01	22.2	24.5	26.0	0.10 ppm	Yes	4%
	Annual [1B]	0.1	0.2	0.2	0.8	0.9	0.9	100	Yes	0.2%
$PM_{2.5}$	24-hour	0.003	0.1	0.1	7.0	7.1	7.1	35	Yes	0.3%
	Annual [1B]	0.01	0.02	0.02	1.5	1.6	1.5	15	Yes	0.2%
PM_{10}	24-hour	0.3	0.6	0.5	55.4	55.7	55.6	150	Yes	0.4%
SO_2	1-hour	6.4	6.9	10.1	19.5	19.9	23.1	0.075 ppm	Yes	5%
	3-hour	4.8	5.2	8.1	16.2	16.6	19.5	1,300	Yes	1%
	24-hour	2.7	2.9	4.2	5.3	5.4	5.9	365	Yes	1%
	Annual [2B]	0.5	0.6	0.9	1.9	1.9	2.1	80	Yes	1%
CO	1-hour	230	251	379	1,976	1,997	2,125	40,000	Yes	1%
	8-hour	137	150	227	999	1,012	1,089	10,000	Yes	2%
NH_3	8-hour	1.6	1.8	2.6	1.6	1.8	2.6	2,100	Yes	0.1%

[1A] Impact analyses for NO_2, $PM_{2.5}$, and PM_{10} span all 5 months of potential drilling activity (July 1 through November 30) using two 120-day emissions sequences to eliminate bias in the meteorological data;

The highest impacts from the two 120-day sequences are shown: Sequence "A" = July 1 through October 28, Sequence "B" = August 3 through November 30.

[1B] For the total annual impact values, the 120-day period average impacts (Shell only impact plus background) for NO_2 and $PM_{2.5}$ are adjusted to annual impacts by taking into account the periods of the year when Shell operations don't occur (i.e., multiply the 120-day average impacts by 0.329 (120 drilling days out of 365 days in a year)).

[2A] Impact analyses for SO_2, CO, and NH_3 span all 5 months (153 days) of potential drilling activity (July 1 through November 30) using a single, worst-case configured model run (153 days) without consideration of emissions sequencing or intermittent source operations.

[2B] The 153-day period average impacts for SO_2 are adjusted to annual impacts by taking into account the periods of the year when Shell operations don't occur (i.e., multiply the 153-day Shell-only average impacts by 0.419 (153 drilling days out of 365 days in a year))and are then added to the background concentration.

[3] Total modeled impact is the sum of the highest modeled impact (from either 2009 or 2010) plus background concentrations.

For NO_2 and $PM_{2.5}$, the 98^{th} percentile values consistent with the form of the NAAQS are presented. For all other pollutants, the maximum modeled impacts are presented.

Discoverer

Results of the modeling and impact analysis are provided in Shell's air permit application and are summarized below in Table 7.f-3 and 7.f-4. The impacts were remodeled using the AERMOD model for SO_2 and NO_2. The EPA-acceptable dispersion modeling indicates that the NAAQS and PSD increments will be met at and beyond 500m from the hull of the *Discoverer*.

Table 7.f-3 Summary of Impacts on Air Quality

Pollutant	Averaging Period	NAAQS/ AAAQS [1] μg/m³ (or ppm where noted)	Background Concentration (μg/m³)	Max. Modeled Impact With Background Concentration [2] (μg/m³)	PSD Class II Increment [4,5] (μg/m³)	Max. Modeled Impact Without Background Concentration [3] (μg/m³)	Data Source for Modeled Impact and Background Concentrations
Nitrogen Dioxide (NO_2)	1-hour	0.10 ppm	0.0	74.9	NE	74.9	March 18, 2011 Report, Table 3-9 [8]
	Annual	100	11.3	31.0	25	19.7	EPA Statement of Basis, Table 5-14 [7]
Particulate Matter (PM_{10})	24-hour	150	55.1	75.8	30	20.7	EPA Statement of Basis, Table 5-14 [7]
Fine Particulate Matter ($PM_{2.5}$)	24-hour	35	10.0	29.2	NA [6]	19.2	EPA Statement of Basis, Table 5-14 [7]
	Annual	15	2.0	3.1	NA [6]	1.1	EPA Statement of Basis, Table 5-14 [7]
Sulfur Dioxide (SO_2)	1-hour	0.075 ppm	13.0	35.0	NE	22.0	March 18, 2011 Report, Table 3-9 [8]
	3-hour	1,300	41.6	66.6	512	25.0	EPA Statement of Basis, Table 5-14 [7]
	24-hour	365	13.0	16.2	91	3.2	EPA Statement of Basis, Table 5-14 [7]
	Annual	80	2.6	6.0	20	3.39	EPA Statement of Basis, Table 5-14 [7]
Carbon Monoxide (CO)	1-hour	40,000	1,750	2,977.1	NA	1,227.1	EPA Statement of Basis, Table 5-14 [7]
	8-hour	10,000	1,070	1,527.5	NA	457.5	EPA Statement of Basis, Table 5-14 [7]

[1] National Ambient Air Quality Standards and Alaska Ambient Air Quality Standards.

[2] Maximum modeled impacts plus background concentration are compared to the NAAQS/AAAQS.

[3] Maximum modeled impacts only without background concentration are compared to the PSD Increments.

[4] NE = not established.

[5] NA = not applicable.

[6] NA = $PM_{2.5}$ increments have been established, but are not yet in effect.

[7] From EPA's Statement of Basis for the Proposed Outer Continental Shelf Prevention of Significant Deterioration Permit No. R10OCS/PSD-AK-2010-01, Shell Gulf of Mexico Inc., Frontier Discoverer Drillship, Beaufort Sea Exploratory Drilling Program (February 2010), Table 5-14.

[8] Air Sciences Inc., Discoverer Drillship Impact Evaluation for SO2 and NO2 Using AERMOD Chukchi and Beaufort Seas, Shell Alaska Exploratory Drilling Program Prepared for Shell Offshore Inc., March 18, 2011, Table 3-9.

Table 7.f-4 Summary of Maximum Modeled Impacts – Beaufort Sea

Receptor	Distance from Drilling Location (km)	Max. Total Impact - Background Included ($\mu g/m^3$) *	Shell-Only Contribution to Max. Total Impact ($\mu g/m^3$)	NAAQS (ppm)	Comply?	Shell-Only Impact, Percentage of NAAQS (%)
1-hour NO_2						
At or Beyond Ambient Air Boundary	0.5	74.9	74.9	0.10	Yes	40%
Kaktovik	14	25.9	0.001	0.10	Yes	0.001%
Deadhorse (as represented by 50 km from nearest leases)	50	23.7	0.0002	0.10	Yes	0.0001%
Deadhorse	84	23.4	9.4	0.10	Yes	5%
1-hour SO_2						
At or Beyond Ambient Air Boundary	0.5	35.0	22.0	0.075	Yes	11%
Kaktovik	14	15.9	2.9	0.075	Yes	1%
Deadhorse (as represented by 50 km from nearest leases)	50	14.4	1.4	0.075	Yes	1%
Deadhorse	84	14.0	1.0	0.075	Yes	1%

* For NO_2, the 98th percentile impacts consistent with the form of the NAAQS are presented.
For SO_2, maximum impacts are presented.

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SECTION 8.0 OIL SPILL RESPONSE PLANNING

a) Oil Spill Response Planning

Shell's Beaufort Sea Regional Exploration ODPCP was unconditionally approved on 11 March 2010 and is a fundamental component for the planned exploration drilling program. The latest revision (ODPCP Revision 1) has been submitted to BOEMRE as a separate document and the full text version is not included in this EP. Revision 1 reflects the inclusion of using either the *Kulluk* or the *Discoverer* as the drilling vessel and updates the WCD information and the oil spill response based on the new WCD.

BOEMRE has revised and increased the requirements for WCD scenario calculations through NTL No. 2010-N06. Lessees are now required to incorporate all potential hydrocarbon-bearing intervals in each open hole section into the WCD volume calculation. The hole section with the highest uncontrolled flow scenario is to be considered the basis of the WCD scenario. Shell has revised the ODPCP to address this increase in the WCD volume. The ODPCP is a regional oil spill response plan that demonstrates Shell's capabilities to prevent or rapidly and effectively manage oil spills that may result from exploration drilling operations. Despite the very low likelihood of a large oil spill event, Shell has designed their response program based upon a regional capability of responding to an increasing range of spill volumes, from small operational spills up to and including the WCD from an exploration well blowout. Shell's program is based upon a WCD planning scenario that meets the response planning requirements of the state and federal oil spill planning regulations.

The ODPCP includes information regarding Shell's regional oil spill organization and dedicated response assets, potential spill risks, and local environmental sensitivities. Details of Shell's spill prevention programs, including personnel training and the procedures and management practices to prevent discharges are also provided. The ODPCP's response information addresses personnel and equipment mobilization from various locations, equipment operating characteristics, and the availability of additional response resources both on and off site.

b) Location of Primary Oil Spill Equipment Base and Staging Area

Shell is planning to conduct an exploration drilling program located north of Point Thomson in the Camden Bay area. The *Discoverer* or *Kulluk* is expected to transit into Camden Bay and begin exploration drilling approximately July 10. During the planned exploration drilling program, the *Kulluk* or *Discoverer* will be accompanied by an ice management vessel, an anchor handler, and other support vessels that include two oil spill response (OSR) barges with associated tugs. One OSR barge and tug will provide the primary oil spill response platform along with the assistance of the anchor handler, and one Offshore Supply Vessel (OSV) as Vessel of Opportunity Skimming Systems (VOSS). Ice conditions will determine the proximity of the OSR vessels to the *Kulluk* or *Discoverer*. Shell will station and maintain its OSR vessels to ensure timely response to any spill event.

The dedicated OSR barge, VOSS, and other equipped support vessels would possess sufficient onboard storage capacity to provide containment, recovery, and storage for the initial 42-hour operational period. An Arctic OST would be staged within 240 mi (384 km) of the Camden Bay drill sites and would arrive at the recovery site within 24 hours of departure from its staging location. At hour 42, the Chukchi OSR barge and OSR vessel, or a similar vessels, would be available to relieve the on-site OSR barge and OSR vessels to lighter their recovered fluids to the OST. The two OSR barges, VOSS and OSR vessel would work in conjunction to maintain containment and skimming operations and to lighter recovered fluids to the OST for the duration of the response. The OST will possess a minimum liquid storage capacity of 513,000 bbl, sufficient capacity to store all recovered liquids for 20 days of recovery operations. Another

OST with similar liquid storage capacity will arrive within 20 days with adequate minimum storage capacity for the remainder of the 30-day blowout event.

Additional personnel may also be transported via helicopter or vessel from a land- or vessel-based staging area.

c) Name(s) of Spill Removal Organization(s) for Both Equipment and Personnel

Shell's primary response action contractor for Beaufort Sea offshore, nearshore, and onshore spill response program is Alaska Clean Seas (ACS). ACS provides program oversight and spill management team assistance, oil spill management and response training, and spill response support through provision of equipment and personnel. Additionally, Shell augments ACS and the spill response program with dedicated vessels and equipment carried onboard the OSR barge. Response activities will be conducted using ACS or Shell tactics as defined in the ACS's *Technical Manual* and/or Shell's *Beaufort and Chukchi Seas Regional Tactics Manual*, or as otherwise defined in the ODPCP.

The ODPCP emphasizes the prevention of oil pollution by employing the best control mechanisms for blowout prevention and fuel transfer, and by implementing mandatory programs for personnel training. All project personnel, including employees and contractors, involved in oil spill contingency response would receive discharge prevention and response training as described in the ODPCP. Training drills also would be conducted periodically to familiarize personnel with on-site equipment, proper deployment techniques, and maintenance procedures.

d) Volume of Worst Case Discharge Scenario [30 CFR 254.26(a)]

A planning volume WCD scenario for the Beaufort Sea Regional ODPCP is provided in Table 8.d-1.

Table 8.d-1 Oil Volume of a Worst Case Discharge Planning Scenario for the Beaufort Sea Regional ODPCP

Element	Capacity (bbl)	Reference
Possible Daily Volume of Highest Capacity Well	16,000	30 CFR 254.47(b)
Total Worst Case Discharge (Daily Volume X 30-day Duration of Blowout)	480,000	30 CFR 254.47(b)
Total Storage Capacity Requirements	480,000	30 CFR 254.47(b)

Shell has calculated the WCD from each of the four wells described in this EP (Table 2.g-1). Of the four wells, Torpedo H has the highest calculated WCD at 9,468 bbl/day, significantly less than the 16,000 bbl/day assumed in the ODPCP planning scenario.

Description of Worst Case Discharge Scenario

Under the requirements of the BOEMRE, the plan must include a WCD scenario. A full discussion of the WCD scenario is found in the ODPCP, Section 1.6.13. For exploration or development drilling operations, the WCD scenario is equal to, or greater than, the daily volume (BOEMRE NTL-No. 2010-N06) possible from an uncontrolled blowout for a period of 30 days. In order to address BOEMRE requirements for a 30-day blowout, the total WCD planning volume was calculated based upon BOEMRE's planning requirement, resulting in a WCD scenario volume of 480,000 bbl (76,312 m^3) of oil during the 30 days.

In addition to the response fleet description, WCD description and the WCD modeling report detailed in this portion of the EP, this information can also be found in Sections 1.6.7 (Recovery Strategies) and 1.6.13 (Spill Response Scenarios) of the ODPCP.

There are three scenarios in the unlikely event of a WCD (Table 8.d-2). Scenario 3 results in the largest volume of oil spilled – 407,124 bbl. Shell will have an OST tanker available (at least 513,000 bbl liquid capacity) to take on lightered recovered liquids within 24 hours (hrs), and an additional tanker of similar liquid capacity would be onsite within 20 days if needed. Therefore, Shell's OSR fleet capacity for recovered liquids is more than sufficient to cover the unlikely WCD event.

Table 8.d-2 Comparison of the WCD Planning Scenario Developed for the Beaufort Sea Regional ODPCP with the WCD Calculated for the revised Camden Bay EP for Three Relief Well Scenarios

Element	ODPCP Planning WCD	WCD SCENARIO 1 Revised Beaufort Sea EP - *Kulluk* or *Discoverer* Drill its own Relief Well	WCD SCENARIO 2 Revised Beaufort Sea EP – *Discoverer* as the secondary relief well drilling vessel	WCD SCENARIO 3 Revised Beaufort Sea EP – *Kulluk* as the secondary relief well drilling vessel
Maximum flow rate (bopd)	16,000	9,468[1]	9,468[1]	9,468[1]
Total Duration	30 days	25 days	34 days (includes 9 transit days)	43 days (includes 18 transit days)
Total Oil Volume (bbl)	480,000	236,700[2]	321,912[2]	407,124[2]

[1] calculated WCD for Torpedo H
[2] flow diminishes over time but diminishment is not reflected in these totals

e) Modeling Report

The WCD scenario is based upon a spill simulation model of a well blowout at the sea floor (or mudline) in approximately 100 ft (30 m) of water that rises and spreads on the surface. Oil on the water surface is assumed to move as a function of ocean currents and wind for the duration of the release. Section 1.6.13 of the ODPCP outlines and details the spill response scenarios.

The regional ocean current used to model trajectories for the Torpedo and Sivulliq drill site locations was 0.87 mi/hr (1.4 km/hour) to the west-northwest (WNW). The wind data used for the trajectory modeling were collected from the nearest National Weather Service weather station at Barter Island from readings tabulated from August 1 through August 30 between 1971 and 1988. The predominant wind directions were determined as the 16 cardinal compass directions with a frequency greater than 10 percent of the time. These four wind directions were then normalized to 100 percent resulting in the following set of prevailing winds:

- East wind = 34.3 percent frequency
- WNW wind = 22.4 percent frequency
- West wind = 21.9 percent frequency
- East-southeast (ESE) wind = 21.3 percent frequency

The trajectory simulation applied these predominant winds in two 15-day cycles to equal the 30-day simulation. The duration of the wind pattern was calculated from the frequency percent of each wind direction. For purposes of the scenario, the model employs an east wind at the initial time of the blowout. This is the most conservative approach, as the principal wind and the ocean current are both from the east,

resulting in the quickest movement of the leading edge of the oil plume from the drill site. The resulting wind pattern for the trajectory model would be as follows:

- Day 1 through Day 5, Hour 4: wind from the east
- Day 5, Hour 4 through Day 8, Hour 13: wind from the WNW (292.5°)
- Day 8, Hour 13 through Day 11 Hour 20: wind from the west
- Day 11, Hour 20 through Day 15: wind from the ESE (112.5^{o})
- Day 16 through Day 21, Hour 4: wind from the east
- Day 21, Hour 4 through Day 24, Hour 13: wind from the WNW (292.5^{o})
- Day 24, Hour 13 through Day 27 Hour 20: wind from the west
- Day 27, Hour 20 through Day 30: wind from the ESE (112.5^{o})

The above winds and currents were applied in oil spill trajectory modeling for two locations, the Torpedo Prospect and the Sivulliq Prospect, since the prospects are close to one another. For the Torpedo drill site location, the trajectory analysis revealed that a majority of the oil would move under the influence of wind and current offshore with a slight potential for lesser amounts impacting the mainland and barrier islands between Cross Island and Barrow. From Day 1 through Day 5, Hour 4, oil movement is controlled by a 0.86 miles per hour (mph) WNW current and a 15 mph wind from the east. Left unrecovered, the oil plume travels almost due west across open ocean north of Cross Island. By Day 19, the oil would have reached the shorelines of Barrow and would then move to open ocean north of land.

The trajectory analysis for the Sivulliq drill site is similar to that for Torpedo with a low potential for contacting barrier islands and shorelines between Cross Island and Barrow. The analysis revealed that a majority of the oil would move under the influence of the 15 mph east wind and 0.86 mph WNW current offshore with no impacts to the mainland and barrier islands through Day 3. Left unrecovered, the oil slick is predicted to travel to the WNW potentially contacting Barrow shorelines by Day 19 moving north of land into open ocean.

Both trajectory simulations are consistent with the results presented in the BOEMRE Final Environmental Impact Statement (FEIS) for the Beaufort Sea Planning Area Oil and Gas Lease Sales (OCS EIS/ES MMS 2003-001). The BOEMRE FEIS included a trajectory analysis based upon the Oil-Spill-Risk Analysis (OSRA) model. Using collected Beaufort Sea environmental data and modeled currents, this OSRA model estimated the summer conditional probabilities of contact to be typically <0.5 percent to 4 percent within the region near Milne Point, Point Brower, Bullen Point, Arey Island, Barter Island, and Beaufort Lagoon (Land Segments 37 through 39 and 41 through 49) during summer conditions. Probabilities were based upon the movement of oil without interception by containment or recovery activities for a period of 30 days, from source locations (Hypothetical Launch Area #15) that include Shell's planned drill sites in the revised Camden Bay EP.

SECTION 9.0 ALASKA PLANNING INFORMATION

a) Oil Discharge Prevention and Contingency Plan

The following parameters are detailed in the approved Beaufort Sea Regional ODPCP (March 11, 2010) that was submitted separately to BOEMRE with the approved, initial 2010 Camden Bay EP:

- Response Action Plan
- Emergency Action Checklist
- Reporting and Notification
- Safety
- Communications
- Deployment Strategies
- Response Strategies
- Non-mechanical Response Options
- Prevention Plan
- Prevention Inspection & Maintenance Program
- Bulk Storage Containers
- Command System
- Best Available Technology

This plan is routinely updated and revised to match anticipated conditions and circumstances and to comply with existing regulations. The revised ODPCP will be submitted concurrent with this revised EP as appropriate.

b) Well Control Plan

A regional WCP (Appendix L) outlining emergency procedures for dealing with a blowout situation was also submitted with the initial 2010 Camden Bay EP. This plan still remains in effect from a broad area-wide perspective. The WCP includes a general section on relief well planning including drilling trajectory, special homing, or ranging, tools and blowout kill procedures.

Shell prepared and submitted site specific well control plans for the Sivulliq N and Torpedo H locations in the initial 2010 Camden Bay EP. Similar site specific well control plans are submitted with this revised Camden Bay EP. Shell also prepared site specific relief well drilling and blowout kill plans for each individual drill site. The Relief Well Plan includes the strategy for dealing with the loss or disablement of the *Kulluk* or *Discoverer*. In the event that the *Kulluk* is the drilling vessel on site drilling the Sivulliq or Torpedo wells and is capable of drilling the relief well, it will be used as the primary relief well drilling vessel. If the *Kulluk* is disabled for any reason, the *Discoverer* will immediately deploy to the relief well site in the Camden Bay area to initiate relief well drilling operations. The opposite case is true if the *Discoverer* is the drilling vessel on site. It will act as the primary relief well drilling vessel with the *Kulluk* acting as a back-up secondary drilling vessel.

c) Critical Operations and Curtailment Plan and Ice Management Plan

A COCP and an IMP have been prepared to support the planned exploration drilling program (see Appendices J and K). These plans are complementary documents that address the methods by which Shell will cease, limit, or not initiate specific critical operations due to environmental conditions that may be encountered at the exploration well drill site. However, scope of the IMP is limited to approaching hazardous ice and its potential effects on exploration drilling operations and safety. Both plans discuss general procedures that could be employed depending on circumstances to cease certain operations (or not initiate them), secure the well to prevent flows, recover or abandon moorings, as appropriate, and move off the location in advance of an approaching hazardous condition.

d) Fuel Transfer Plan

While not an emergency response plan, the Fuel Transfer Plan (FTP) is also attached for information (see Appendix M). The FTP outlines the procedures used to move fuel from vessel-to-vessel and dock-to-vessel in such a way that transfers are performed safety and prevent fuel spills onto the water's surface. During all fuel transfers, regardless of volume, Shell requires that the area downwind of the transfer points are pre-boomed to capture any fugitive spills of diesel fuel.

Beaufort Sea Lease Sale 195 and 202 Stipulation No. 6 includes the statement that "*The fuel barge must be surrounded by an oil-spill-containment boom during the entire transfer operation to help reduce any adverse effects from a fuel spill.*" Fuel transfers during the planned exploration drilling operations will involve vessels using dynamic positioning (DP). DP vessels use thrusters to maintain position, and oil spill booms in the vicinity of the vessels can be pulled into the thrusters leaving the supplying vessels disabled near the drilling vessel. Thus, pre-booming downwind of the refueling vessel provides the best and safest method for capturing any spilled fuel resulting from refueling operations.

e) Partial Well Scenario

Several scenarios exist that could impact exploration drilling plans and result in partial wells being drilled during execution of this revised Camden Bay EP:

- Drilling has not yet been completed through the deepest primary objective on the initial well prior to August 25 when, by agreement with subsistence whalers and other hunters, Shell will cease drilling operations and suspend the well before leaving the area for the fall Kaktovik and Cross Island (Nuiqsut) whale hunts
- Drilling has been completed on the initial well, but there is ample time remaining before the whale hunt to start, but not finish, drilling the second planned well under the revised Camden Bay EP
- Drilling must be suspended although the final well has not yet been finished (i.e. the deepest primary objective has not been penetrated and or evaluated) by the end of the drilling season on October 31
- A hazardous condition (e.g., approaching ice) forces suspension of drilling operations, temporary abandonment of a wellbore in a safe and secure manner and demobilization from the Camden Bay area with no opportunity to return before the end of the drilling season to finish drilling operations on the final well

Each of these is discussed more fully below:

INITIAL DRILLING SEASON

If drilling and/or evaluation of the initial or second well of a drilling season has not been concluded (*i.e.*, the deepest primary objective has not been penetrated and/or evaluated) and the well plugged and permanently abandoned before the start of the Kaktovik and Nuiqsut whaling season (set as August 25 each year), Shell plans to suspend drilling operations, temporarily abandon (TA) the well in compliance with BOEMRE regulations and leave the drill site for the duration of the hunts.

Once the whaling season has concluded, the drilling vessel will return to the drill site, re-enter the well and continue drilling and/or evaluating the wellbore. Once the well has been evaluated, it will be plugged and permanently abandoned in compliance with BOEMRE regulations before the rig recovers the subsea BOP stack and moorings.

After its initial exploration well, depending on operational consideration (including the time remaining in the drilling season before the October 31 cessation of operations), Shell may begin work on a second well as described herein. This work could include MLC construction, drilling additional hole sections and cementing casing strings. If operational considerations limit Shell's ability to drill the well to objective depth and evaluate the reservoir section, the well will be suspended before penetrating objective hydrocarbon-bearing zones. Suspension of the well will be done in compliance with applicable regulations and in consultation with BOEMRE. One method of suspending the well could include running casing, cementing it in the hole, setting a mechanical plug near the top of the well and capping the well. The proposed suspension procedure on any unfinished, or partial well, will be provided via submission of an APM for BOEMRE approval.

In the succeeding exploration drilling season, the drilling vessel will return to this unfinished drill site, re-enter the well and continue drilling or evaluation as described in the revised Camden Bay EP and APD. Once all objectives have been satisfied, the well will be plugged and permanently abandoned according to BOEMRE regulations before the drilling vessel moves to a new drill site to initiate drilling operations.

If a hazardous condition requires curtailment of critical operations (or prevents initiating them, depending on time available) per the provisions of the COCP (see Appendix J), the well will be suspended and secured using a BOEMRE-approved procedure, moorings will be recovered if possible and the drilling vessel will move to a safe area. Once the hazardous condition has passed, the drilling vessel will return to the drill site and conclude drilling operations, evaluation, permanent plugging and abandonment operations.

If, however, the hazardous condition (e.g., ice) does not permit moving back over the well, re-mooring, re-entering and continuing drilling/evaluation operations before the end of the drilling season, on October 31, the well will remain TA'd until the next drilling season. The drilling vessel will return to the suspended well and conclude drilling/evaluation operations during the next drilling season prior to permanently abandoning the well.

SUBSEQUENT DRILLING SEASON(S)

A partial well will not be left at the end of the last exploration drilling season under the revised Camden Bay EP. All wells will be plugged and permanently abandoned before the drilling fleet demobilizes. The only exception would involve a situation where Shell is unable to plug and abandon the well due to an emergency evacuation caused by an approaching hazard such as ice. If a well cannot be permanently abandoned due to ice, it will be properly suspended before the drilling vessel evacuates. At the beginning

of the next drilling season, the drilling vessel will return to the drill site to permanently abandon the unfinished well or continue drilling/evaluation of the well under another approved EP.

f) Surface Intervention – Capping Stack and Containment System

Containment capability in the unlikely event of a blowout in Camden Bay is provided by a combination of a subsea capping stack, positioned on an ice management vessel, and surface separation equipment on a containment vessel.

Surface intervention involves work done on the wellhead of a subsea well. Surface intervention in the OCS, involves subsea devices used on the top of the well or some device connected thereto (e.g., the BOP stack or wellhead).

A set of subsea devices is being assembled for the drilling seasons to provide direct surface intervention capability with the following priorities:

1. Attaching a device or series of devices to the well to affect a seal capable of withstanding the maximum anticipated wellhead pressure (MAWP) and closing the assembly to completely seal the well against further flows (commonly called “capping and killing”)
2. Attaching a device or series of devices to the well and diverting flow to surface vessel(s) equipped for separation and disposal of hydrocarbons (commonly called “capping and diverting”)

These devices form what is generally known as a capping stack. The devices include ram-type BOP bodies equipped with blind and/or pipe rams, spacer spools, flow crosses (or mud crosses) for pumping kill weight fluid into the well or for flowing the well in a controlled manner through piping to the surface and connectors to attach to the upper H4 connector mandrel, the high-pressure wellhead housing if the entire BOP stack has been removed or the flanged connection on top of the lower marine riser package (LMRP). This equipment will be stored aboard a designated vessel in Alaska with a marine crew aboard, warm-stored and ready for use. It is anticipated that surface intervention efforts will successfully stop the flow from a blowout in less time than is required to drill a relief well.

Various crossovers and spools, ram sets and other equipment (including demolition tools for clearing debris away from the well) will be included on the designated vessel. Extra studs, nuts, gaskets, hydraulic wrenches and other tools will be available to allow the capping stack to be modified aboard the vessel as necessary to provide flexibility to deal with a wide variety of capping situations.

All of the separation equipment on the containment vessel will be designed for conditions found in the Arctic including ice and cold temperatures. This equipment will also be designed for maximum reliability, ease of operation, flexibility and robustness so it could be used for a variety of blowout situations. The capping stack located on an ice management vessel and the separation equipment, located on the containment vessel will be available for inspection by BOEMRE prior to the drilling season.

Efforts to contain the blowout will begin immediately after the containment vessel arrives to clear debris from the well and attach a capping stack. If these efforts fail to capture all the oil, Shell’s OSR fleet will still be available at the blowout well site to collect and recover fugitive oil emissions from the surface. This equipment will be positioned downwind and down current from the blowout well and will not interfere with either containment efforts or relief well drilling. Containment efforts will continue during relief well drilling operations unless it is unsafe or futile to do so. The surface oil spill response fleet would remain and oil spill cleanup would continue, as necessary, until the blowout is under control.

SECTION 10.0 ENVIRONMENTAL MONITORING INFORMATION

a) Monitoring Systems

The following Tables 10a-1 and 10a-2 list the navigational and environmental monitoring systems aboard the *Kulluk* and *Discoverer*.

Table 10.a-1 *Kulluk* Monitoring Equipment

Instrument	Make /Model
Navigation Radar	Seles Mar Selux. Model T-340 ARPA
Navigation Receiver	Navtex NCR 333
Satellite Communications	Sailor System 4000 GMDSS Console
Gyro Compass	Navigat X MK 1
Echo Sounder, fathometer	ELAC STG 721 Digitizer
Roll and Pitch Monitors	Moeller Instrument Co. Inclinometers
Anchor Tensions	Bailey
Anemometer	RM Young Company Model 04503 N
Meteorological Thermometer	RM Young Model 46203
Meteorological Barometer	Weems and Plath Barometer

Table 10.a-2 *Discoverer* Monitoring Equipment

Instrument	Make /Model
Navigation Radar	Furuno ARPA FAR - 28 X 7 SERIES
	Furuno FAR - 21 X 7 (-BB) SERIES
Satellite Communications	GMDSS EQUIPMENT
	Sailor HC 4500 MF / HF control unit (2 units)
	System 4000 GMDSS
	Sailor HF SSB 250W PEP
	Thrane &Thrane TT - 3020C / TT - 3022D Capsat Transceiver
	JMC Dual Frequency Navtex Receiver Model NT - 1800
	Sat Phone Sailor TT3622B
Navigation Receiver	Furuno GPS Navigator GP - 150
	AIS L3 Communications
Gyro Compass	Simrad GL 80 / 85
Magnetic Compass	Cassen & Plath GmbH Type 12 Reflector compass
Echo sounder	Furuno FE 700
Pitch & Roll	Standard clinometer model MOELLER 5 / 15 degs
Anchor Tensions	Plimsoll Anchor tension monitoring system, needs to be calibrated, efforts to integrate it are in progress
Wind	Young Marine Wind Tracker Model 06206; Mounted on Cranes System for Helicopter flights
Air Temperature	1 pair of wet & dry thermometers
Water Temperature	Laser mounted flute to measure seawater inlet temperature
Barometric Pressure	Sato Sigma - II Barograph model NS II - BR
	Barometer Hanseatic Instruments
Helicopter landing information	Philips 190S, SMC Ship Motion Control Recording Roll, Pitch, Helideck Inclination, Max Heave, Heave Period.
	Philips 170 S, Observation Instruments BV. Wind obs.: Actual, Average, Minimum, Maximum, Gust, Air Temp, Air Pressure, Humidity.

Air Emissions

On April 9, 2010, the EPA issued Shell an OCS PSD Permit to Construct (permit number – R10OCS/PSD-AK-2010-01) for the *Discoverer* to operate in the Camden Bay area. The permit was challenged and the Environmental Appeals Board (EAB) has remanded the permit back to the EPA, where it currently resides. After the EPA addresses the remanded issues, and a final permit is issued to Shell, the *Discoverer* and support vessels air emissions will be monitored in compliance with the permit conditions.

A synthetic minor operating air permit application for the *Kulluk* was submitted to the EPA on February 28, 2011. When a final permit is issued to Shell, the air emissions from the *Kulluk* and its support fleet will be monitored in compliance with the permit conditions.

Ocean Discharges

Authorization for the *Discoverer* to operate under NPDES GP AKG-28-0000 was issued to Shell for lease block 6610 and 6658 on April 20, 2010 (authorization AKG-28-0005). Sivulliq N and G drill sites are located within lease block 6658 and the Torpedo H drill site is located within lease block 6610. On October 12, 2010, Shell submitted a new NOI for the *Discoverer* to discharge waste on lease block 6658, updating the EPA regarding the selected waste streams that would not be discharged, but collected, temporarily stored onsite and then shipped for final disposal at an approved disposal site. Shell submitted a NOI for the *Discoverer* to discharge under GP AKG-28-0000 for lease block 6559 on December 16, 2010. Supplemental NOI information for the *Kulluk* to discharge under GP AKG-28-0000 for lease blocks 6559, 6610 and 6658 was submitted to the EPA on April 8, 2011.

Shell will adhere to the monitoring terms and conditions of the NPDES GP AKG-28-0000. The required waste monitoring equipment will be aboard the drilling vessel and Shell will adhere to its Quality Assurance Plan, which outlines sampling procedures and protocols.

Ice

The Shell Ice and Weather Advisory Center (SIWAC) will be based in Anchorage and will monitor ice and weather conditions for the Camden Bay exploration drilling operations. As stated in the IMP, SIWAC will forecast the arrival of ice hazards based on ice and weather predictions from satellite data combined with observations from vessels supporting the *Kulluk* or *Discoverer*.

Information for developing ice loading predictions is provided through the consideration of actual on-site conditions in conjunction with forecasted weather advisory information from the SIWAC. The IMP outlines how the arrival of ice hazards in particular are predicted, based on observations of ice features by Ice Advisors on support vessels and on the drilling vessel, combined with ice and weather predictions provided by the SIWAC in Anchorage.

Environmental Monitoring at Drill Sites While Drilling

In addition to monitoring of marine mammals, a comprehensive environmental monitoring program will be implemented during exploration drilling operations. A dedicated science vessel staffed by a team of physical and biological oceanographers will be responsible for assessing pre-, during, and post drilling conditions in both biota and water and sediment quality. All drilling locations have been sampled at multiple times during the last three years to provide a baseline understanding of pre-existing conditions and interannual variability at these sites.

Physical oceanography characteristics that will be monitored continuously at the each location throughout the drilling process include: surface wind direction and speed, ambient air temperature, current speed and direction throughout the water column, water temperature through the water column and salinity through the water column.

Water chemistry and characteristics that will be monitored will include assessment of metals and organics through the water column at multiple fixed and random locations around the drilling operation. These measurements will be made regularly before, during, and after drilling and will capture conditions during all significant phases of drilling operations and potential discharge. Physical characteristics of the water column will also be assessed including turbidity, temperature, and oxygen content in an effort to document and model plumes of released discharges.

Biological observations will include assessments of benthos, epibenthos, zooplankton and phytoplankton, and fishes. In addition to characterization of the communities of these organisms at and near the drillsites before, during, and after operations, samples of biota will be collected before and after operations for tissue analysis for metals and organics.

Bird and mammal observations will be made from all surface operation vessels throughout the exploration drilling activity in accordance with the 4MP and Bird Strike Lighting and Avoidance Plan (Appendix I).

b) Incidental Takes

Applications will be submitted contemporaneously for the following MMPA authorizations:

- IHA from NMFS – Non-lethal, Incidental Take of Whales and Seals (Appendix C)
- LOA from USFWS – Non-lethal, Incidental and Intentional Take of Polar Bear and Pacific Walrus (Appendix E)

During the planned exploration drilling program, the *Kulluk* or *Discoverer* and support vessels will each have MMOs aboard to observe for marine mammals and record all observations. In addition, MMOs may act as avian observers and the observation data will also be recorded. Complete details of the MMO program are presented in the 4MP (Appendix D) submitted in support of the NMFS IHA and the USFWS LOA applications. The 4MP is valid for when either the *Kulluk* or the *Discoverer* is drilling.

NMFS IHA Application

Species for which an IHA is sought from NMFS are:

- Mysticetes: bowhead gray, humpback and minke whales
- Odontocetes: beluga, narwhal, and harbor porpoise
- Pinnipeds: bearded, ringed, ribbon and spotted seals

The only anticipated impacts to marine mammals associated with the exploration drilling program are propagation of sounds from the drilling vessel , ice management and support vessels, aircraft, and a short duration ZVSP survey at each well. Any impacts to whales and seals would be temporary and result in only short-term displacement of seals and whales from within ensonified zones produced by such energy sources and will not result in impacts of biological significance. Lists of protected species listed under the MMPA and the ESA are found in Section 12 b). Discussion regarding potential impacts to marine mammals is located in the EIA (Appendix F).

Estimated incidental takes from the sound modeling results (Table 10.b-1) for the *Kulluk, Discoverer* and the ZVSP are shown in Tables 10.b-2 through -7.

Many animals exposed to sound levels near 120 dB rms would not react to those sound levels, particularly pinnipeds, and exposure to this sound level should not be considered as "takes by harassment". Even for species that may change their behavior or alter their migration route, those changes are likely to be within the normal range of activities for the animals and may not rise to the level of "taking" based on guidance in NMFS (2001). Animals that divert around the activity at the lower sound levels would not approach close enough that they would alter their behavior to the degree that they would be "taken by harassment." The actual number of animals that will be "taken" lies somewhere between the number exposed to ≥120 and ≥160 dB rms.

In regard to the subsistence hunt of bowhead whale in the Beaufort Sea, as a consequence of Shell's planned mitigation measures (see Section 12.0) any effects on the bowhead whale as a subsistence resource also will be negligible.

Table 10.b-1 Sound Propagation Modeling Results of Drilling and ZVSP Activities Near Camden Bay in the Beaufort Sea

Source	Received Level (dB re 1 µPa)	Modeling Results (km)	Used in Calculations (km)
Kulluk	120	13.27	19.91
Discoverer	120	3.32	4.98
ZVSP	160	3.67	5.51

Table 10.b-2 Estimates of the Numbers of Beluga and Bowhead Whales in Areas Where Maximum Received Sound Levels in the Water Would Be ≥120 dB

Season	Number of Exposure to Sound Levels ≥120 dB from *Kulluk*					
	Nearshore		Ice Margin		Total	
Species	Avg.	Max.	Avg.	Max.	Avg.	Max.
Summer						
Beluga	3	10	1	5	4	15
Bowhead whale	16	60	8	29	23	89
Fall						
Beluga	2	9	2	9	4	18
Bowhead whale [a*]	5,575	11,150	*N/A*	*N/A*	5,575	11,150

[a] See IHA Application text (Appendix C) for description of bowhead whale estimates for the Fall in the Beaufort Sea

Note: Estimates From operations conducted by *Kulluk* During Shell's Planned Exploration Drilling Program in Summer (July – August) and Fall (September – October) near Camden Bay in the Beaufort Sea, Alaska, 2012. Not All Marine Mammals Will Change Their Behavior When Exposed to these Sound Levels.

Table 10.b-3 Estimates of the Numbers of Beluga and Bowhead Whales in Areas Where Maximum Received Sound Levels in the Water Would Be ≥120 dB

Season	Number of Exposure to Sound Levels ≥120 dB from *Discoverer*					
	Nearshore		Ice Margin		Total	
Species	Avg.	Max.	Avg.	Max.	Avg.	Max.
Summer						
Beluga	0	1	0	0	0	5
Bowhead whale	1	4	0	2	1	6
Fall						
Beluga	0	1	0	1	0	5
Bowhead whale [a]	1,387	2,774	*N/A*	*N/A*	1,387	2,774

[a] See IHA Application text (Appendix C) for description of bowhead whale estimates for the Fall in the Beaufort Sea

Note: Estimates From operations conducted by *Discoverer* During Shell's Planned Exploration Drilling Program in Summer (July – August) and Fall (September – October) near Camden Bay in the Beaufort Sea, Alaska, 2012. Not All Marine Mammals Will Change Their Behavior When Exposed to these Sound Levels.

Table 10.b-4 Estimates of the Numbers of Beluga and Bowhead Whales in Areas Where Maximum Received Sound Levels in the Water Would Be ≥160 dB from ZVSP Activities

Season	Number of Exposure to Sound Levels ≥160 dB from ZVSP					
	Nearshore		Ice Margin		Total	
Species	Avg.	Max.	Avg.	Max.	Avg.	Max.
Summer						
Beluga	0	1	0	0	0	5
Bowhead whale	1	4	1	2	2	7
Fall						
Beluga	0	1	0	1	0	5
Bowhead whale [a]	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*	*N/A*

[a] See IHA Application text for description of bowhead whale estimates for the Fall in the Beaufort Sea. Estimates for VSP activities have been included in the calculations from drilling (Table 6-6 or 6-7)

Note: Estimates During Shell's Planned Exploration Drilling Program in Summer (July – August) and Fall (September – October) near Camden Bay in the Beaufort Sea, Alaska, 2012. Not All Marine Mammals Will Change Their Behavior When Exposed to these Sound Levels.

Table 10.b-5 Estimates of the Numbers of Marine Mammals (Excluding Beluga and Bowhead Whales, Which are Shown in Table 10.b-2) in Each Offshore area where maximum received sound levels in the water would be ≥120 dB

	Number of Exposure to Sound Levels ≥120 dB from *Kulluk*					
	Nearshore		Ice Margin		Total	
Species	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
Odontocetes						
Monodontidae						
Narwhal	0	0	0	0	0	5
Phocoenidae						
Harbor porpoise	0	1	0	0	0	5
Mysticetes						
Gray whale	0	1	0	0	0	5
Pinnipeds						
Bearded seal	30	121	11	42	41	163
Ribbon seal	0	1	0	0	0	5
Ringed seal	592	2367	206	825	798	3192
Spotted seal	6	25	0	0	6	25

Note: from the *Kulluk* during Shell's Planned Exploration Drilling Program near Camden Bay in the Beaufort Sea, Alaska, July – October 31, 2012. Not All Marine Mammals Will Change Their Behavior When Exposed to these Sound Levels.

Table 10.b-6 Estimates of the Numbers of Marine Mammals (Excluding Beluga and Bowhead Whales, Which are Shown in Table 10.b-3) in Each Offshore area where maximum received sound levels in the water would be ≥120 dB

	Number of Exposure to Sound Levels ≥120 dB from *Discoverer*					
	Nearshore		Ice Margin		Total	
Species	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
Odontocetes						
Monodontidae						
Narwhal	0	0	0	0	0	5
Phocoenidae						
Harbor porpoise	0	0	0	0	0	5
Mysticetes						
Gray whale	0	0	0	0	0	5
Pinnipeds						
Bearded seal	2	7	1	3	3	10
Ribbon seal	0	0	0	0	0	5
Ringed seal	37	146	13	52	49	198
Spotted seal	0	2	0	0	0	5

Note: from the *Discoverer* during Shell's Planned Exploration Drilling Program near Camden Bay in the Beaufort Sea, Alaska, July – October 31, 2012. Not All Marine Mammals Will Change Their Behavior When Exposed to these Sound Levels.

Table 10.b-7 Estimates of the Numbers of Marine Mammals (Excluding Beluga and Bowhead Whales, Which are Shown in Table 10.b-4) in Each Offshore area where maximum received sound levels in the water would be ≥160 dB

	Number of Exposure to Sound Levels ≥160 dB from ZVSP					
	Nearshore		Ice Margin		Total	
Species	**Avg**	**Max**	**Avg**	**Max**	**Avg**	**Max**
Odontocetes						
Monodontidae						
Narwhal	0	0	0	0	0	5
Phocoenidae						
Harbor porpoise	0	0	0	0	0	5
Mysticetes						
Gray whale	0	0	0	0	0	5
Pinnipeds						
Bearded seal	2	9	1	3	3	12
Ribbon seal	0	0	0	0	0	5
Ringed seal	44	178	16	63	60	241
Spotted seal	0	2	0	0	0	5

Note: from ZVSP Activities during Shell's Planned Exploration Drilling Program near Camden Bay in the Beaufort Sea, Alaska, July – October 31, 2012. Not All Marine Mammals Will Change Their Behavior When Exposed to these Sound Levels.

USFWS LOA Application

The LOA application submitted to the USFWS provides an outline of the Camden Bay exploration drilling activities and includes an updated, drilling program specific bear and Pacific walrus plan titled: *Polar Bear, Pacific Walrus and Grizzly Bear Avoidance and Human Encounter/Interaction Plan, Outer Continental Shelf Exploration Plan, Camden Bay, Alaska.* The LOA application does not require the inclusion of take estimates for polar bears or Pacific walrus. Discussion regarding potential impacts to polar bear and Pacific walrus is located in the EIA (Appendix F).

The bear and walrus interaction plan ensures that workers are familiar with the issues and safety precautions associated with working in bear and walrus territory. The goal of this interaction plan is to standardize bear interaction and avoidance protocol and wildlife reporting efforts for the project. With proper knowledge and training, workers will detect the presence of bears and walrus quickly and respond appropriately through monitoring, avoidance, and/or, if necessary, active deterrence by USFWS certified bear hazers. The awareness and prevention of human/bear and human/walrus interactions will ensure the safety of workers as well as wildlife.

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SECTION 11.0 LEASE STIPULATIONS INFORMATION

In compliance with 30 CFR 250.222 *What lease stipulations information must accompany the EP?,* the following section describes what measures Shell's planned Camden Bay exploration drilling program will take to meet the lease sale stipulations of Beaufort Sea Lease Sale EIS 186, 195 and 202.

Stipulation No. 1 - Protection of Biological Resources

If biological populations or habitats that may require additional protection are identified in the lease area by the RS/FO, the RS/FO may require the lessee to conduct biological surveys to determine the extent and composition of such biological populations or habitats. The RS/FO shall give written notification to the lessee of the RS/FO's decision to require such surveys.

Shell Actions:

Marine surveys for site clearance of the planned drill sites have not identified any biological populations or habitats that may require additional protection. As required by 30 CFR 250.33 (b)(1)(ix), and as specified in BOEMRE Alaska OCS Region Notice to Lessee No. 05-A01, Shell acquired shallow hazards surveys over these planned drill sites (reports submitted previously under separate cover). The survey data includes detailed bathymetry through the use of subbottom profilers and side scan sonar methods.

Shell acquired shallow hazards survey data over the Sivulliq and Torpedo drill sites in 2008. The shallow hazards data did not identify any special benthic communities at these planned drill sites. Hard-bottom biological communities (e.g. "boulder patch" areas) have high species diversity and provide valuable habitat for fish and invertebrates. No confirmed boulder patch-type habitat has been identified at any of the planned drill sites.

The most recent published biological studies commissioned by Shell for the Beaufort Sea are from surveys completed in 2008. Shell commissioned both biological and chemical studies of water and sediment samples in an around the Sivulliq Prospect and in the near vicinity of the Torpedo Prospect (Dunton et al, 2009 Trefry and Trocine, 2009 - see also Section 5.0 a) and 17.0).

During 2008, benthic and water column sampling was completed at 45 designated stations in the Camden Bay area to help establish a baseline data set in advance of future oil and gas exploration. Two benthic grab samples were collected at each station, one for biology (infaunal abundance and biomass) and one for chemistry (sediment parameters and selective collection of biota for determination of trophic structure). Vertical profiles of water column characteristics were assayed at seven selected stations.

Samples were collected in and around the Sivulliq Prospect (12 locations), around the 1985 Hammerhead well (9 locations), along a possible pipeline corridor (5 locations), and several samples were taken at random in the study area (19 locations).

The following sample types were collected in 2008:

- Seafloor surface sediment samples
- Sediment cores, 3 to 4 in. (8-10 cm) in length
- Hydrographic profiles and water samples

No biological resources that require additional protection were found. The sample locations and a more detailed account of the results of the sampling are discussed in the EIA (Appendix F).

Stipulation No. 2 - Orientation Program

The lessee shall include in any exploration or development and production plans submitted under 30 CFR 250.203 and 250.204 a proposed orientation program for all personnel involved in exploration or development and production activities (including personnel of the lessee's agents, contractors, and subcontractors) for review and approval by the RS/FO. The program shall be designed in sufficient detail to inform individuals working on the project of specific types of environmental, social, and cultural concerns that relate to the sale and adjacent areas. The program shall address the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals and provide guidance on how to avoid disturbance. This guidance will include the production and distribution of information cards on endangered and/or threatened species in the sale area. The program shall be designed to increase the sensitivity and understanding of personnel to community values, customs, and lifestyles in areas in which such personnel will be operating. The orientation program shall also include information concerning avoidance of conflicts with subsistence, commercial fishing activities, and pertinent mitigation.

Shell Actions:

Shell has developed and is currently implementing an orientation program for all Shell and contractor personnel involved in Shell's Alaska Venture exploration drilling activities.

All Shell and contractor personnel involved in on-lease exploration drilling activities will attend the orientation training annually. All other Shell and contractor personnel will attend the orientation program at least once at the time they join the team. Shell will maintain a record, not to exceed five years, of all personnel who attend the program, including relevant attendee and program information. Copies of the orientations programs have been submitted to BOEMRE.

Shell has designed a specific program that addresses environmental, social, and cultural concerns related to the project area. The program is designed to increase sensitivity and understanding by Shell and its contractors of community values, customs, and lifestyles in the area they will be working, and how to avoid conflicts with subsistence activities. The program stresses the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals, and provides guidance on how to avoid disturbance.

Shell's Cultural Awareness Program addresses the following:

- Alaska Native Ethnic Composition
- Brief history of land claims
- Formation of regional corporations, and regions within which Shell is working
- History of the North Slope
- Cultural diversity
- Comparison of cultural values of Alaska Natives vs. non-Natives
- Patterns of language
- Communication skills and body language
- Guidelines on cultural artifacts
- Local community values and customs
- Whaling

Shell has further developed a Health, Safety, Security and Environment (HSSE) Awareness Program, which addresses the following:

- Shell's HSSE Commitment
- Intervention policy
- Journey Management Travel requirements
- Personal Protective Equipment requirements
- General Alaska Venture Hazards, such as earthquakes and volcanoes
- Medical emergencies
- Security
- North Slope Safety requirements
- Shell Alaska Venture Standards and Procedures
  - Cold Climate Work Standard
  - Firearms Use in Wildlife Confrontations
  - Procedure for Vessel-to-Vessel Personnel Transfers
- Incident Reporting
- Environmental Awareness
  - Endangered Species Act (ESA) – Major Provisions
  - Endangered and threatened species
  - MMPA of 1972
  - Marine mammal interactions
  - Sensitive Habitats on the North Slope
  - Wildlife interactions
  - Prohibited activities of hunting, trapping and fishing
  - Environmental requirements, for air, spills and waste
  - Environmental training

Stipulation No. 3 - Transportation of Hydrocarbons

Pipelines will be required: (a) if pipeline rights-of-way can be determined and obtained; (b) if laying such pipelines is technologically feasible and environmentally preferable; and (c) if, in the opinion of the lessor, pipelines can be laid without net social loss, taking into account any incremental costs of pipelines over alternative methods of transportation and any incremental costs of pipelines over alternative methods of transportation and any incremental benefits in the form of increased environmental protection or reduced multiple-use conflicts. The lessor specifically reserves the right to require that any pipeline used for transporting production to shore be placed in certain designated management areas. In selecting the means of transportation, consideration will be given to recommendations of any advisory groups and Federal, state, and local governmental and industry.

Following the development of sufficient pipeline capacity, no crude oil production will be transported by surface vessel from offshore production sites, except in the case of any emergency. Determinations as to emergency conditions and appropriate responses to these conditions will be made by the RS/FO.

Shell Actions:

Not applicable to the activities described in the revised Camden Bay EP.

Stipulation No. 4 - Industry Site-Specific Bowhead Whale Monitoring Program

Lessees proposing to conduct exploratory drilling operations, including seismic surveys, during the bowhead whale migration will be required to conduct a site-specific monitoring program approved by the RS/FO; unless, based on the size, timing, duration, and scope of the proposed operations, the RS/FO, in consultation with the North Slope Borough (NSB) and the Alaska Eskimo Whaling Commission (AEWC), determine that a monitoring program is not necessary. The RS/FO will provide the NSB, AEWC, and the State of Alaska a minimum of 30 but no longer than 60 calendar days to review and comment on a proposed monitoring program prior to approval. The monitoring program must be approved each year before exploratory drilling operations can be commenced.

Shell Actions:

Shell submits with this revised Camden Bay EP a copy of the 4MP (Appendix D) which also accompanies Shell's application for an IHA (Appendix C) and the LOA (Appendix E). The 4MP describes a site-specific bowhead whale monitoring program as a component of compliance with the issuance of an IHA from NMFS. Shell understands that BOEMRE will accept Shell's application for an IHA to cover this exploration drilling program, which is required to have a 4MP, as meeting the requirements of Stipulation No. 4. Also, Shell understands that BOEMRE will coordinate with NMFS to ensure that Shell's IHA, monitoring program, peer review and oversight of Shell's exploration drilling program will satisfy the requirements of Stipulation No. 4.

Shell has and will continue to be an active participant in pre-season NMFS Arctic Open Water meetings and an active participant in the independent review of other monitoring and mitigation plans and reports generated for future activities. These Open Water meetings provide a venue for peer review of Shell's plans and allow constructive critique of Shell's procedures.

A summary of key components of the program is presented below.

Marine Mammal Observers

The presence of MMOs aboard all vessels will be a core component of compliance with the 4MP. The MMOs will be responsible for collecting basic data on observations of marine mammals and birds and for advising on appropriate mitigation measures. Observations made by MMOs serve as the primary basis for estimation of impacts to marine mammals and birds. Because their ranks may include representatives of the Alaska Native community, the MMO program also serves as a means of providing local hire and local oversight of the monitoring program.

One of the MMOs aboard each vessel will be able to speak Inupiaq. This will allow communication with whaling crews should the need arise.

In support of drilling, the *Kulluk* or *Discoverer*, ice management vessels, and all other support vessels will require MMOs to be available during operations to monitor for marine mammals and to advise on mitigation measures. All support vessels will staff MMOs during transit and other drilling related activities as stipulated by federal authorizations for incidental takes of marine mammals.

Subsistence Advisors (SA) Program

The SA program was developed to address the concerns of the North Slope residents regarding impacts to subsistence activities since Shell has active offshore exploration drilling programs in the Beaufort and Chukchi Seas. Objectives of the SA program include: preserve the subsistence lifestyle of North Slope residents; establish and maintain frequent communications between Shell and subsistence users; communicate the program objectives to community members and; attend community meetings relevant to subsistence use on Shell's behalf. During the SA program, subsistence questionnaires were designed and each SA was asked to fill in one questionnaire for each resident that participates in subsistence hunting/fishing activities. In addition, subsistence hunters and fishers were asked to draw subsistence use locations on regional maps of their respective areas. The maps are intended to define spring and fall hunting/fishing areas, migratory routes, calving routes, calving areas, mating areas and feeding ground locations. These various locations were digitally transferred onto maps for each village.

SA reports have been generated documenting the results of the SA work in the villages. These reports are:

- ASRC Energy Services. 2009. *Subsistence Advisor Program Summary, North Slope, Alaska*. Report prepared by ASRC Energy Services, Anchorage, AK for Shell Exploration and Production Company, Houston, TX
- UIC UMIAQ. 2011. *2010 Subsistence Advisor Program, North Slope Alaska*. Report prepared by UIC UMIAQ for Shell Exploration and Production Company, Anchorage Alaska.

Community Liaison Officers

The CLO program involves direct hiring of community liaisons that serve as Shell's point-of-contact for questions regarding Shell programs in the area.

Cultural Awareness Program

Shell and contractor personnel involved in on-lease operations during the planned exploration drilling program will attend the orientation training annually, which addresses environmental, social, and cultural concerns related to the project area. The program is designed to increase sensitivity and understanding by Shell and its contractors of community values, customs, and lifestyles in the area they will be working, and how to avoid conflicts with Native Alaskans and their subsistence activities. The program stresses the importance of not disturbing archaeological and biological resources and habitats, including endangered species, fisheries, bird colonies, and marine mammals and provides guidance on how to avoid disturbance.

Com Center Program

The Com Center program involves hiring individuals from the coastal Beaufort and Chukchi Sea villages to monitor and relay radio transmissions between subsistence vessels and industry vessels. The sharing of information is intended to reduce or eliminate the potential conflict between subsistence users and industry vessels.

Aerial Monitoring Program

The main goal of the aerial monitoring program is to monitor marine mammal populations and movements during each season of exploration drilling proposed in this revised Camden Bay EP. Aerial monitoring will use aircraft in support of the vessel-based 4MP during the revised Camden Bay EP. The

aerial monitoring program is projected to begin 5-7 days before exploration drilling begins and continue 5-7 days after exploration drilling ceases.

For marine mammal monitoring flights, aircraft will be flown at approximately 120 knots ground speed and usually at an altitude of 1,000 ft (305 m) over a predefined grid. The transect lines in the grid will be oriented north-south, equally spaced at 5 mi (8 km), and randomly shifted in the east-west direction for each survey by no more than the transect spacing. The survey grid will total about 1300 km in length, requiring approximately 6 hours to survey at a speed of 120 knots, plus ferry time. Exact lengths and durations will vary somewhat depending on the position of the exploration drilling operation and thus of the grid, the sequence in which lines are flown (often affected by weather), and the number of refueling/rest stops.

More information can be found in the 4MP (Appendix D).

Acoustic Recorders

A combination of acoustic recorder technologies will be employed to document the overall distribution of marine mammals in the area; the distribution of marine mammals in relation to exploration drilling activities; to add clarity to exploration drilling sound levels, character, and propagation; and to document presence of marine mammals. This will be accomplished by deploying several acoustic recorder buoys in a wide area surrounding the planned drill sites. Shell has deployed acoustic monitoring recorder from Harrison Bay to Kaktovik, encompassing Camden Bay since 2007.

Sound Modeling

Sound modeling will be required for the planned exploration drilling program in the Camden Bay area, and will take place during each exploration drilling season. The sound data will enable Shell to refine sound level thresholds and use the thresholds to more accurately define marine mammal take estimates.

Sound Source Verification

The drilling vessel and each support vessel listed in the revised Camden Bay EP will have a sound source verification done within five days of arriving at the first drill site. In addition, Shell will have acoustic recorders in the area of exploration drilling activities during the duration of the exploration drilling program.

Additional Studies

Shell may participate in additional studies of marine resources in the Beaufort Sea in an effort to further understand baseline conditions and the distribution of critical resources, to enhance understanding of interactions between industry activities and marine resources, and to contribute to enhanced understanding of resource status and conservation/management needs. The list of potential studies and monitoring projects includes:

- Offshore bird (eider) distribution and use of project areas in Beaufort Sea
- Benthic biota survey
- Pinniped distribution and response to industry activities
- Participation in bowhead tagging study
- Analysis of subsistence harvest data with respect to industry activities supplemented by Traditional Knowledge compilation and analysis

Stipulation No. 5 - Plan of Cooperation

Exploration and development and production operations shall be conducted in a manner that prevents unreasonable conflicts between the oil and gas industry and subsistence activities (including, but not limited to, bowhead whale subsistence hunting). Prior to submitting an exploration plan or development and production plan (including associated oil-spill contingency plans) to BOEMRE for activities proposed during the bowhead whale migration period, the lessee shall consult with the directly affected subsistence communities, Barrow, Kaktovik, or Nuiqsut, the NSB, and the AEWC to discuss potential conflicts with the siting, timing, and methods of proposed operations and safeguards or mitigating measures which could be implemented by the operator to prevent unreasonable conflicts. Through this consultation, the lessee shall make every reasonable effort, including such mechanisms as a conflict avoidance agreement, to assure that exploration, development, and production activities are compatible with whaling and other subsistence hunting activities and will not result in unreasonable interference with subsistence harvests.

Shell Actions:

A POC Addendum identifies the measures Shell has developed in consultation with potential affected communities and subsistence user groups and will implement during its planned revised Camden Bay exploration drilling program to minimize any adverse effects on the availability of marine mammals for subsistence uses. In addition, the POC Addendum details Shell's communications and consultations with local communities concerning its proposed exploration drilling program, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR § 18.128(d) and 50 CFR § 216.104(a) (12) (i), (ii), (iv)). Shell has documented its contacts with North Slope communities (Table 11-1), as well as the substance of its communications with subsistence stakeholder groups. Tables summarizing the substance of Shell's communications, and responses thereto, are included in the POC Addendum (Appendix H). This POC Addendum may be supplemented, as appropriate, to reflect additional engagements with local subsistence users and any additional or revised mitigation measures that are adopted as a result of those engagements.

The results of the POC meetings (Appendix H) have been documented and submitted to BOEMRE in the revised Camden Bay EP, and contemporaneously to NMFS, and USFWS in applications for MMPA authorizations of incidental takes of the trust species for which these agencies are responsible. The requirements of BOEMRE Stipulation No. 5 parallel requirements of the USFWS LOA and the NMFS IHA. Both the USFWS and NMFS require an applicant to implement a POC to mitigate the potential for conflicts between the proposed activity and traditional subsistence activities (50 CFR § 18.124(c)(4) and 50 CFR § 216.104(a)(12)). The POC must identify the measures that will be taken to minimize any adverse effects on the availability of marine mammals for subsistence uses. In addition, both USFWS and NMFS require an applicant to communicate and consult with local subsistence communities concerning the proposed activity, potential conflicts with subsistence activities, and means of resolving any such conflicts (50 CFR § 18.128(d) and 50 CFR § 216.104(a) (12) (i), (ii), (iv)).

Table 11-1 POC Meeting Dates and Locations and Attendees

2009	Meeting Location	Meeting Attendees – Position
12-13 January	Barrow	Harry Brower – Whaling Captain, AEWC Chairman and Assistant Director of the NSB Wildlife Department Edward Itta – Whaling Captain and Mayor of the NSB Eugene Brower – Whaling Captain, ASRC Board Member and President of the NSB Assembly Anthony Edwardsen – Whaling Captain and President of UIC Andy Mack – NSB Assistant to the Mayor Harold Curran – NSB Chief Administrative Officer Robert Suydam – NSB Wildlife Department Biologist Cheryl Rosa – NSB Wildlife Department Research Biologist Craig George – NSB Wildlife Department Biologist
21 January	Point Hope	Steve Oommittuk - Mayor of Point Hope
21 January	Barrow	Charlie Hopson – Whaling Captain Representative, LCMF employee, and AEWC alternate commissioner in Barrow Adeline Hopson – NSB Assembly Member Deano Oleuman – NSB Assembly Member
21 January	Barrow	Roy Koonuk – AEWC Commissioner and Point Hope Whaling Captain
21 January	Barrow	George Edwardson – ICAS President Juanita Smith – ICAS Natural Resource Director
21 January	Point Hope	Rex Rock Sr.; NSB Assembly Member and Tikiqag Representative
27 January	Kotzebue	Jackie Hill – Maniilaq Association Representative
27 January	Kotzebue	Martha Whiting – Mayor of the NWAB
27 January	Kotzebue	NWAB Assembly Meeting
27 January	Kotzebue	Chuck Greene, EJ Doll Garoutte, Walter Sampson, Gladys Pungowiyi - NANA Representatives
27 January	Kaktovik	Fenton Rexford NSB Assembly Member and Native Village of Kaktovik Executive Director
28 January	Kaktovik	Carla Sims – Kaktovik Vice Mayor
2 February	Barrow	NSB Assembly Workshop
2 February	Barrow	Plan of Cooperation Public Meeting
3 February	Barrow	Janice Meadows – AEWC Executive Director
3 February	Barrow	Vera Williams – Native Village of Barrow Realty Director Joseph Sage – Native Village of Barrow Wildlife Director
5 February	Kaktovik	Plan of Cooperation Public Meeting
4-5 March	Anchorage	AEWC 2009 CAA Negotiations
24 March	Point Hope	Plan of Cooperation Public Meeting
25 March	Kotzebue	Plan of Cooperation Public Meeting
25 March	Kotzebue	NSB/NWAB Joint Planning Commission Meeting
26 March	Wainwright	Plan of Cooperation Public Meeting
2 April	Barrow	ICAS Monthly Meeting
20 April	Barrow	Native Village of Barrow Meeting
22 April	Point Lay	Plan of Cooperation Public Meeting
23 April	Kivalina	Community Meeting
2010	**Meeting Location**	**Meeting Attendees – Position**
14 January	Barrow	ICAS Monthly Meeting
15 January	Anchorage	Eugene Brower – Barrow Whaling Captains Association President
22 January	Anchorage	George Oleuman – Deputy Mayor Eugene Brower – NSB Assembly President Taqulik Hepa – NSB Wildlife Director Bessie O'Rouke – NSB Law Department Marvin Olson – NSB Director Public Works Dan Forster – NSB Planning Director

Table 11-1 POC Meeting Dates and Locations and Attendees

24 February	Barrow	Plan of Cooperation Public Meeting
25 February	Point Hope	Plan of Cooperation Public Meeting
26 February	Kaktovik	Plan of Cooperation Public Meeting
26 February	Barrow	Edward Itta – Mayor of the NSB
1 March	Wainwright	Plan of Cooperation Public Meeting
2 March	Kotzebue	Community Meeting
5 March	Point Hope	Plan of Cooperation Public Meeting
1 April	Point Lay	Plan of Cooperation Public Meeting
8 April	Barrow	Martha Whiting – Mayor of the NWAB Walter Sampson – NWAB Assembly President
30 April	Barrow	Edward Itta – Mayor of the NSB
1 June	Barrow	NSB Assembly Meeting
1 June	Point Lay	Point Lay Community Meeting
2 June	Barrow	Barrow Community Meeting
3 June	Kaktovik	Kaktovik Community Meeting
8 June	Barrow	Utqiagvik Agviqsiuqtit Aganangich Meeting
8 June	Barrow	Barrow Whaling Captains Association Meeting
24 June	Barrow	NWAB/NSB Joint Planning Commission Meeting
19 July	Barrow	Edward Itta – Mayor of the NSB
3 August	Barrow	NSB Assembly Meeting
7 September	Barrow	NSB Assembly Meeting
23 September	Nuiqsut	Nuiqsut Whaling Captains Association Meeting
23 September	Nuiqsut	Plan of Cooperation Public Meeting
24 September	Barrow	Plan of Cooperation Public Meeting
25 September	Kaktovik	Plan of Cooperation Public Meeting
8 November	Anchorage	Alaska Beluga Whale Committee Meeting
6 December	Anchorage	Alaska Beluga Whale Committee Members Ice Seal Committee Members Alaska Nanuuq Commission Members Eskimo Walrus Commission Members
2011	**Meeting Location**	**Meeting Attendees – Position**
27 January	Barrow	Barrow Whaling Captains Association Meeting
27 February – 2 March	Dutch Harbor	Edith Vorderstrasse – UIC UMIAQ Consulting Division Manager Ray Koonuk, Sr. – Whaling Captain Christopher Oktollik – Whaling Captain John Long, Jr. – Native Village of Point Hope Council Member Joseph Frankson – Whaling Captain Franklin Sage – Native Village of Point Hope Council Member Caroline Cannon – Native Village of Point Hope President Luke Koonook, Sr. – Elder and Whaling Captain Alzred Oomittuk – City of Point Hope Council Member Bessie Kowunna – Shell Point Hope Community Liaison, Tikigaq Board Member, and City Council Member Theodore Frankson – Native Village of Point Hope Staff Aaron Oktollik – AEWC Commissioner for Point Hope and Whaling Captain Carl Brower – Whaling Captain Dora Leavitt – City of Nuiqsut Council Member Thomas Napageak – City of Nuiqsut Mayor and Whaling Captain Edgar Kagak – Wainwright Health Board Oliver Peetook – City of Wainwright Vice Mayor Sandra Peetook – City of Wainwright Council Member Joseph Kaleak – AEWC Commissioner for Kaktovik and Whaling Captain George Tagarook – NSB Fire Department Fire Chief and Whaling Captain
28 February – 3 March	Dutch Harbor	William Tracey, Sr. – NSB Planning Commissioner and Point Lay Fire Chief Marie Tracey – NSB Village Liaison Emma Ahvakana – NWAB Assembly Member

Table 11-1 POC Meeting Dates and Locations and Attendees

		Enoch Mitchell – Noatak IRA President Ronald Moto, Sr. – Nana Board Member and City of Deering Mayor Cole Schaeffer – Kikiktagruk Inupiat Corporation President & CEO Nellie Wesley – NWAB Planning Commission EPA Assistant Anthony Edwardsen – UIC President/CEO Troy Izat – Tikigaq Corporation COO Susan Harvey – Harvey Consulting, LLC and Consultant to the NSB Thomas Nageak – Barrow Whaling Captain and NSB Cultural Resource Specialist Roy Nageak Jr. – Native Village of Barrow Natural Resource Technician Michael Shults – Barrow City Council Mary Sage – NSBSD School Board Member, Ilisagvik College Board Member, and Native Village of Barrow Council Member Robert Suydam – NSB Wildlife Biologist Qaiyaan Opie – ICAS Environmental Director Lloyd Leavitt – City of Barrow Council Member Robert Nageak – City of Barrow Council Member Johnny Aiken – AEWC Executive Director Harry Brower, Jr. – AEWC Chairman
7-8 March	Anchorage	Arctic Open Water Meeting
21 March	Barrow	Plan of Cooperation Public Meeting
22 March	Kaktovik	Plan of Cooperation Public Meeting
23 March	Wainwright	Plan of Cooperation Public Meeting
23 March	Wainwright	Rossman Peetok – AEWC Commissioner for Wainwright Jason Ahmaogak – Wainwright Whaling Captain
24 March	Nuiqsut	Plan of Cooperation Public Meeting
24 March	Nuiqsut	Isaac Nukapigak – AEWC Commissioner for Nuiqsut Herbert Ipalook – President of the Nuiqsut Whaling Captains Association Thomas Napageak – Nuiqsut Whaling Captain Carl Brower – Nuiqsut Whaling Captain Eli Nukapigak – Nuiqsut Whaling Captain
25 March	Point Lay	Plan of Cooperation Public Meeting
28 March	Point Hope	Plan of Cooperation Public Meeting
29 March	Kiana	Community Meeting
30 March	Kotzebue	Community Meeting
31 March	Kivalina	Community Meeting
2 April	Nome	Vera Metcalf – Eskimo Walrus Commission Charlie Johnson – Alaska Nanuuq Commission
5 April	Barrow	NSB Assembly Meeting
7 April	Kotzebue/ Anchorage (Teleconference)	Willie Goodwin – Alaska Beluga Whale Committee
8 April	Anchorage	John Goodwin – Ice Seal Committee
15 April	Anchorage	Vera Metcalf – Eskimo Walrus Commission
25 April	Savoonga	Community Meeting
26 April	Shishmaref	Community Meeting
27 April	Gambell	Community Meeting

Notes:
ASRC = Arctic Slope Regional Corporation
CAA = Conflict Avoidance Agreement
ICAS = Inupiat Community of the Arctic Slope
LCMF = LCMF Incorporated. A subsidiary of Ukpeagvik Iñupiat Corporation
NSBSD = North Slope Borough School District
UIC = Ukpeagvik Iñupiat Corporation

Stipulation No. 6 - Pre-Booming Requirements for Fuel Transfers

Fuel transfers (excluding gasoline transfers) of 100 barrels or more occurring 3 weeks prior to or during the bowhead whale migration will require pre-booming of the fuel barge(s). The fuel barge must be surrounded by an oil-spill-containment boom during the entire transfer operation to help reduce any adverse effects from a fuel spill. This stipulation is applicable to the blocks and migration times listed in the stipulation on Industry Site-Specific Bowhead Whale-Monitoring. The lessee's oil-spill-contingency plans must include procedures for the pre-transfer booming of the fuel barge(s).

Shell Actions:

Shell developed a fuel transfer plan titled: *Alaska Fuel Transfer Operating Conditions and Procedures*. The fuel transfer plan is designed to establish special operating conditions and procedures to ensure that vessel-to-vessel fuel transfers are in full compliance with this lease stipulation as well as the USCG requirements. Shell's fuel transfer plan will be adhered to for all fuel transfer, including transfers less than 100 bbl. The fuel transfer plan is included in Appendix M of the revised Camden Bay EP.

Fuel transfers during the planned drilling operations will involve vessels using DP instead of fuel barges. DP vessels use thrusters to maintain position, and oil spill booms in the vicinity of the vessels can be pulled into the thrusters leaving the supplying vessels disabled near the drilling vessel. Thus, instead of pre-booming completely around the DP vessel, Shell's plan to pre-booming downwind of the refueling vessel provides the best and safest method for capturing any spilled fuel resulting from refueling operations.

Stipulation No. 7 - Lighting of Lease Structures to Minimize Effects to Spectacled and Steller's Eider

In accordance with the Biological Opinion for the Beaufort Sea Lease Sale 186 issued by the U.S. Fish and Wildlife Service (USFWS) on October 22, 2002, and USFWS's subsequent amendment of the Incidental Take Statement on September 21, 2004, lessees must adhere to lighting requirements for all exploration or delineation structures so as to minimize the likelihood that migrating spectacled or Steller's eiders will strike these structures. Lessees are required to implement lighting requirements aimed at minimizing the radiation of light outward from exploration/delineation structures to minimize the likelihood that spectacled or Steller's eiders will strike those structures. These requirements establish a coordinated process for a performance based objective rather than pre-determined prescriptive requirements. The performance based objective is to minimize the radiation of light outward from exploration/delineation structures.

Shell Actions:

Lighted vessels and structures in open waters and on-ice pose a collision risk to many species of birds. Growing scientific evidence indicates some bird species are attracted to light sources, which may increase the risk of bird strikes. Most related studies conclude that increased darkness, coupled with inclement weather, increases attraction by birds to lighted vessels and structures. Birds drawn to light often become disoriented and collide with these structures, which may result in injury or death.

Shell presents the attached Bird Strike Avoidance and Lighting Plan, Camden Bay, Alaska (lighting plan) to outline the Shell bird strike avoidance strategy for exploration drilling operations in Camden Bay (Appendix I). Emphasis is on the prevention of bird strikes into the drilling vessel and support vessels by threatened spectacled eiders (Somateria fischeri) and Steller's eiders (Polysticta stelleri) whose habitat

includes the Beaufort Sea, including Camden Bay. Three of the four planned exploration drill sites are outside the area stipulated where a lighting plan is required by BOEMRE (i.e. between 146° W and 156° W), and one is at the eastern boundary, therefore the chances of bird strikes to the drilling vessel and support vessels are considered to be low. This low probability of bird strikes will be further reduced by implementing lighting modifications as specified in this lighting plan. In addition, if a bird strike is observed, and the cause is believed to be at least in part due to lighting of the drilling vessel and support vessels, then reporting the bird strike and the conditions under which it occurred will help in better understanding the risks of bird strikes.

SECTION 12.0 ENVIRONMENTAL MITIGATION MEASURE INFORMATION

a) Proposed Measures

The permits and authorizations table included in Section 2.0 lists the authorizations and necessary permits to conduct the planned exploration drilling program. Shell will adopt the mitigation measures written into these authorizations, and will therefore be working within regulatory requirements.

In addition to meeting all regulatory requirements, Shell is committed to other mitigation measures including those that will decrease any potential conflicts between exploration drilling activities and subsistence harvests. For the revised Camden Bay EP exploration drilling program, these mitigation measures include:

Communications

- Shell has developed a Communication Plan and will implement this plan before initiating exploration drilling operations to coordinate activities with local subsistence users, as well as Village Whaling Captains' Associations, to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale hunt and other subsistence hunts. The Communication Plan includes procedures for coordination with Com Centers to be located in coastal villages along the Chukchi and Beaufort Seas during Shell's proposed exploration drilling activities.
- Shell will employ local SAs from the Beaufort and Chukchi Sea villages that are potentially impacted by Shell's exploration drilling activities. The SAs will provide consultation and guidance regarding the whale migration and subsistence activities. There will be one per village, working approximately 8-hr per day and 40-hr weeks during the drilling seasons. The subsistence advisor will use local knowledge (Traditional Knowledge) to gather data on subsistence lifestyle within the community and to advise in ways to minimize and mitigate potential negative impacts to subsistence resources during the drilling season. Responsibilities include reporting any subsistence concerns or conflicts; coordinating with subsistence users; reporting subsistence-related comments, concerns, and information; coordinating with the Com and Call Center personnel; and advising how to avoid subsistence conflicts. Subsistence advisors will have a handbook that will specify work tasks in more detail.

Aircraft Travel

- Aircraft shall not operate below 1,500 ft (457 m) unless the aircraft is engaged in marine mammal monitoring, approaching, landing or taking off, in poor weather (fog or low ceilings) in an emergency situation. Aircraft engaged in marine mammal monitoring shall not operate below 1,500 ft (457 m) in areas of active whaling; such areas to be identified through communications with the Com Centers. Except for airplanes engaged in marine mammal monitoring, aircraft shall use a flight path that keeps the aircraft at least 5 mi (8 km) inland until the aircraft is south of its offshore destination, then at that point it shall fly directly north through the Mary Sachs Entrance to its destination. Shell reserves the option to use an alternate flight route in the event that transit through the Mary Sachs Entrance is unsafe due to weather, other environmental conditions, or in the event of an emergency.
- Aircraft and vessels will not operate within 0.5 mi (0.8 km) of walrus or polar bears when observed on land or ice.

- Shell will also implement non-MMO flight restrictions prohibiting aircraft from flying within 1,000 ft (300 m) of marine mammals or below 1,500 ft (457 m) altitude (except during takeoffs and landings or in emergency situations) while over land or sea. This flight will also help avoid disturbance of and collisions with birds.

Vessel Travel

- The *Kulluk* or *Discoverer* and support vessels will enter the Chukchi Sea through the Bering Strait on or after July 1, minimizing effects on marine mammals and birds that frequent open leads and minimizing effects on spring and early summer bowhead whale hunting.
- Exploration drilling activities at the Sivulliq or Torpedo drill sites are planned to begin on or about July 10 following transit into the Beaufort Sea and run through October 31, with a suspension of all operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. During the suspension for the whale hunts, the drilling fleet will leave the Camden Bay project area and move to an area north of latitude 71° 25'N and west of longitude 146° 4'W. Shell does not plan to anchor during this suspension. Shell will return to resume activities after the subsistence bowhead whale hunts conclude. Exploration drilling activities will be completed by October 31, depending on ice and weather.
- The drilling support fleet transit route will avoid known fragile ecosystems, including the Ledyard Bay Critical Habitat Unit, and will include coordination through Com Centers.
- To minimize impacts on marine mammals and subsistence hunting activities, the drilling vessel and support fleet will transit through the Chukchi Sea along a route that lies offshore of the polynya zone. In the event the transit outside of the polynya zone results in Shell having to break ice (as opposed to managing ice by pushing it out of the way), the drilling vessel and support vessels will enter into the polynya zone far enough so that ice breaking is not necessary. If it is necessary to move into the polynya zone, Shell will notify the local communities of the change in the transit route through the Com Centers. As soon as the fleet transits past the ice, it will exit the polynya zone and continue a path in the open sea toward the Camden Bay drill sites.
- MMOs will be aboard the *Kulluk* or *Discoverer* and all support vessels (see the 4MP in Appendix D of the revised Camden Bay EP).
- When within 900 ft (274 m) of marine mammals, vessels will reduce speed, avoid separating members from a group and avoid multiple changes of direction.
- Vessel speed is to be reduced during inclement weather conditions in order to avoid collisions with marine mammals.
- All vessels must maintain cruising speed not to exceed nine knots while transiting the Beaufort Sea. This measure would reduce the risk of ship-whale collisions.
- Shell will communicate and coordinate with the Com Centers regarding all vessel transit.

Drilling Operations

- Shell will collect all drilling mud and cuttings with adhered mud from all well sections below the 26-in. (20-in. casing) hole section, as well as treated sanitary waste water, domestic wastes, bilge water and ballast water, and transport them outside the Arctic for proper disposal in an EPA-licensed TDS. These waste streams will not be discharged to the ocean.

- Drilling mud will be cooled to mitigate any potential permafrost thawing or thermal dissociation of any methane hydrates encountered during drilling, if such materials are present at the drill site.
- Drilling muds will be recycled to the extent practicable based on operational considerations (e.g., whether mud properties have deteriorated to the point where they cannot be used further) so that the volume of the spent mud is reduced.
- Critical operations will not be started if potential hazards (ice floe, inclement weather, etc.) are in the vicinity and there is not sufficient time to complete the critical operation before the arrival of the hazard at the drill site (see COCP in Appendix J of the revised Camden Bay EP).
- All casing and cementing programs will be certified by a registered professional engineer.
- Airguns arrays will be ramped up slowly during ZVSPs to warn cetaceans and pinnipeds in the vicinity of the airguns and provide time for them to leave the area and avoid potential injury or impairment of their hearing abilities. Ramp ups from a cold start when no airguns have been firing will begin by firing a single airgun in the array. A ramp up to the required airgun array volume will not begin until there has been a minimum of 30 min of observation of the safety zone by MMOs to assure that no marine mammals are present. The safety zone is the extent of the 180 dB radius for cetaceans and 190 dB for pinnipeds. The entire safety zone must be visible during the 30-min lead-in to an array ramp up. If a marine mammal(s) is sighted within the safety zone during the 30-min watch prior to ramp up, ramp up will be delayed until the marine mammal(s) is sighted outside of the safety zone or the animal(s) is not sighted for at least 15-30 min: 15 min for small odontocetes and pinnipeds, or 30 min for baleen whales and large odontocetes.
- The blowout prevention program will be enhanced through the use of two sets of blind/shear rams, increased frequency of BOP performance tests from 14 days to 7 days, a remotely operated vehicle (ROV) control panel on the seafloor with sufficient pressured water-based fluid to operate the BOP, a containment system that includes treatment and flaring capabilities, capping stack equipment, a fully-designed relief well drilling plan and provisions for a second relief well drilling vessel (*Discoverer* or *Kulluk*) to be available to drill the relief well if the primary drilling vessel is disabled and not capable of drilling its own relief well.
- Lighting on the drilling vessel will be shaded and has been replaced with ClearSky lighting. ClearSky lighting is designed to minimize the disorientation and attraction of birds to the lighted drilling vessel to reduce the possibility of a bird collision (see the Bird Strike Avoidance and Lighting Plan in Appendix I of the revised Camden Bay EP).

Ice Management

- Ice management will involve preferentially redirecting, rather than breaking, ice floes while the floes are well away from the drill site (see the Ice Management Plan in Appendix K of the revised Camden Bay EP).
- Real time ice and weather forecasting will be from the SIWAC.

Oil Spill Response

- The primary OSR vessel will be on standby at all times when drilling into zones containing oil to ensure that oil spill response capability is available within one hour, if needed.
- Shell will deploy an OSR fleet that is capable of collecting oil on the water up to the calculated WCD flowrate of a blowout in the unlikely event that one should occur. The primary OSR vessel will be on standby when drilling into zones containing oil to ensure that oil spill response

capability is available within one hour, if needed. The remainder of the OSR fleet will be fully engaged within 72 hours.

- In addition to the OSR fleet, an oil spill containment system will be available for use in the unlikely event of a blowout. The containment system barge will be centrally located in the Beaufort Sea and supported by an Invader Class Tug and possibly an anchor handler. The containment system will be designed for conditions found in the Arctic including ice and cold temperatures. This equipment will also be designed for maximum reliability, ease of operation, flexibility and robustness so it could be used for a variety of blowout situations.

- Capping stack equipment will be stored aboard one of the ice management vessels and will be available for immediate deployment in the unlikely event of a blowout. Capping stack equipment consist of subsea devices assembled to provide direct surface intervention capability with the following priorities:

    - Attaching a device or series of devices to the well to affect a seal capable of withstanding the maximum anticipated wellhead pressure (MAWP) and closing the assembly to completely seal the well against further flows (commonly called "capping and killing")
    - Attaching a device or series of devices to the well and diverting flow to surface vessel(s) equipped for separation and disposal of hydrocarbons (commonly called "capping and diverting")

- A polar bear culvert trap has been constructed in anticipation of OSR needs and will be deployed near Point Thomson or Kaktovik prior to drilling.

- Pre-booming is required for all fuel transfers between vessels.

Air Emissions

Kulluk

- The *Kulluk* will have selective catalytic reduction (SCR) as a nitrogen oxide (NOx) tailpipe emission control on its primary engines. The primary generators will also have oxidation catalysts installed for control of particulate matter less than 2.5 microns ($PM_{2.5}$), volatile organic compounds (VOC), and carbon monoxide (CO).

- The other engines normally used in the exploration drilling activities (the air compressors, the MLC, hydraulic power units (HPU), and cranes) will also have oxidation catalysts as tailpipe control for oxidizing all oxidize-able substances, including $PM_{2.5}$, VOC, and CO. Control of engine emissions is assumed to be 50 percent for $PM_{2.5}$, 80 percent for CO, and 70 percent for VOC.

- Ice management vessels and anchor handlers will have SCR as a nitrogen oxide (NOx) tailpipe emission control on its primary engines..

- ULSD (0.0015 percent) fuel will be purchased for the *Kulluk* and support vessels to reduce sulfur dioxide (SO_2) emissions.

Discoverer

- Primary generators on the *Discoverer* are retrofitted with selective catalytic reduction devices to reduce NO_x emissions to under 0.5 g/kW-hr, and catalytic oxidation devices to reduce CO, VOCs and PM_{10}.

- All other engines on the *Discoverer* will either be Tier 3 (low emissions) or will be retrofitted with Catalytic Diesel Particulate Filters devices to reduce CO, VOCs, and HAPs and fine particulate matter.
- Installation of selective catalyst reduction and oxidation catalyst emission controls on all propulsion and generation engines on the primary ice management vessel.
- ULSD (0.0015 percent) fuel will be purchased for the *Discoverer* and support vessels to reduce SO_2 emissions.

b) Protected Species

Species that occur within the Beaufort Sea and are listed under the ESA as either threatened or endangered are listed below in Table 12.b-1. The following table is a list of marine mammals found in the Beaufort Sea that are covered under the MMPA.

Table 12.b-1 Species Found in the Beaufort Sea and Protected Under the ESA

Common Name	Scientific Name	ESA Status	Extralimital (Yes/No)
Spectacled eider	*Somateria fischeri*	Threatened	No
Steller's eider	*Polysticta stelleri*	Threatened	No
Yellow-billed loon[1]	*Gavia adamsii*	Candidate	No
Pacific walrus[1]	*Odobenus rosmarus divergens*	Candidate	Yes
Polar bear	*Ursus maritimus*	Threatened	No
Bowhead whale	*Balaena mysticetus*	Endangered	No
Fin whale	*Balaenoptera physalus*	Endangered	Yes
Humpback whale	*Megaptera novaeangliae*	Endangered	Yes
Bearded seal[1]	*Erignathus barbatus*	Candidate	No
Ringed seal[1]	*Phoca hispida*	Candidate	No

[1] These are candidate species only and presently receive no protection under the ESA

Table 12.b-2 Marine Mammals Found in the Beaufort Sea and Protected Under the MMPA

Common Name	Scientific Name	ESA Status	Extralimital (Yes/No)
Beluga whale	*Delphinapterus leucas*	Not listed	No
Narwhal	*Monodon monoceros*	Not listed	Yes
Killer whale	*Orcinus orca*	Not listed	Yes
Harbor Porpoise	*Phocoena phocoena*	Not listed	Yes
Bowhead whale	*Balaena mysticetus*	Endangered	No
Gray whale	*Eschrichtius robustus*	Not listed	Yes
Minke whale	*Balaenoptera acutorostrata*	Not listed	Yes
Humpback whale	*Megaptera novaeangliae*	Endangered	Yes
Pacific walrus	*Odobenus rosmarus divergens*	Candidate	Yes
Bearded seal	*Erignathus barbatus*	Candidate	No
Spotted seal	*Phoca largha*	AK population segment not listed	No
Ringed seal	*Phoca hispida*	Candidate	No
Ribbon Seal	*Histriophoca fasciata*	Not listed	No
Polar bear	*Ursus maritimus*	Threatened	No

The planned exploration drilling program may involve the non-lethal incidental take of certain marine mammals. Shell has applied to NMFS for an IHA for the incidental take of whales and seals, and to USFWS for an LOA for the incidental take of polar bear and Pacific walrus and intentional take (by deterrence) of polar bears. The IHA and LOA applications each contain a copy of the 4MP. The LOA application contains a bear and walrus avoidance and human encounter / interaction plan. Shell has also developed and will implement a Bird Strike Avoidance and Lighting Plan (Appendix I). All three of these documents describe mitigation measures that Shell will implement to minimize any effects on protected species. The resulting authorizations, when issued, may also contain additional mitigation measures to help avoid or minimize incidental takes. A summary of mitigation measures that will be undertaken by Shell is provided in the previous section.

The IHA application is located in Appendix C, the LOA application is located in Appendix E, and the 4MP is located in Appendix D.

Mitigation measures that will be taken so to avoid or minimize the incidental take of the species listed in Table 12.b-2 are listed under the various drilling activities in Section 12 a).

SECTION 13.0 SUPPORT VESSELS AND AIRCRAFT INFORMATION

a) General

Table 13.a-1 lists the vessels proposed during all or part of the revised Camden Bay EP exploration drilling program. Fixed-wing aircraft and helicopters will be employed, but neither is currently under contract. If the specific vessels listed in Table 13.a-1 are not available, vessels of similar size and/or rating will be used.

Table 13.a-1 Specifications of Support Vessels (Not Including OSR Vessels)

Specification	Nordica[1]	Hull 247[1]	Carol Chouest[1,2]	Harvey Spirit[1,3]	Arctic Seal[1,4]	Southeast Provider Barge & Ocean Ranger Tug[1]		Waste Storage Barge[1]	
						Barge	Tug	Barge	Tug
Length	380.5 ft (116 m)	360.6 ft (110 m)	280 ft (85.34 m)	280 ft (85.4 m)	134 ft (50.3 m)	360 ft (110 m)	117 ft (35.7 m)	500 ft (152.4 m)	126.75 ft (38.6 m)
Width	85 ft (26 m)	80 ft (24.4 m)	60 ft (18.29)	60 ft (18.3 m)	32 ft (11.6 m)	100 ft (30.5 m)	32 ft (.8 m)	74 ft (22.6 m)	42 ft (12.8 m)
Draft	27.5 ft (8.4 m)	24 ft (7.3 m)	19.24 ft (5.87 m)	16.5 ft (5.0 m)	7 ft (2.1 m)	14 ft	-	27.5 ft (8.4 m)	19 ft (5.8 m)
Berths	82	64	29	26	17	-	10	-	-
Maximum Speed	16 knots (30 km/hr)	15 knots (27.8 km/hr)	15 knots (27.8 km/hr)	13.5 knots (25 km/hr)	10 knots (18.5 km/hr)	-	10 knots (18.5 km/hr)	-	12 knots (22.2 km/hr)
Fuel Capacity	11,070 bbl	12,575 bbl	8,411 bbl (normal)11,905 bbl (max)	6,235 bbl (normal)	667 bbl	-	2,381 bbl	155,000 bbl	3,810 bbl

[1] or similar vessel

[2]Dutch Harbor supply vessel

[3]Dutch Harbor supply vessel/waste removal

[4]West Dock supply vessel

Photo - *M/V Nordica*

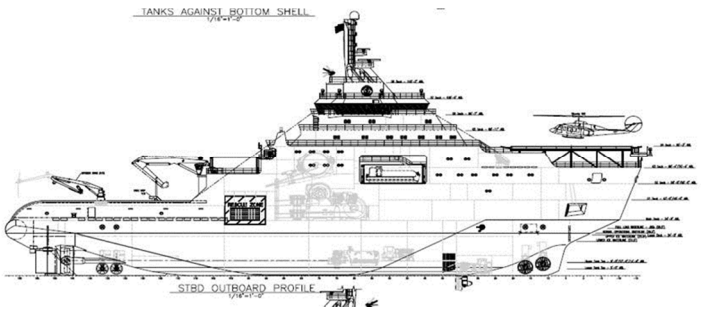


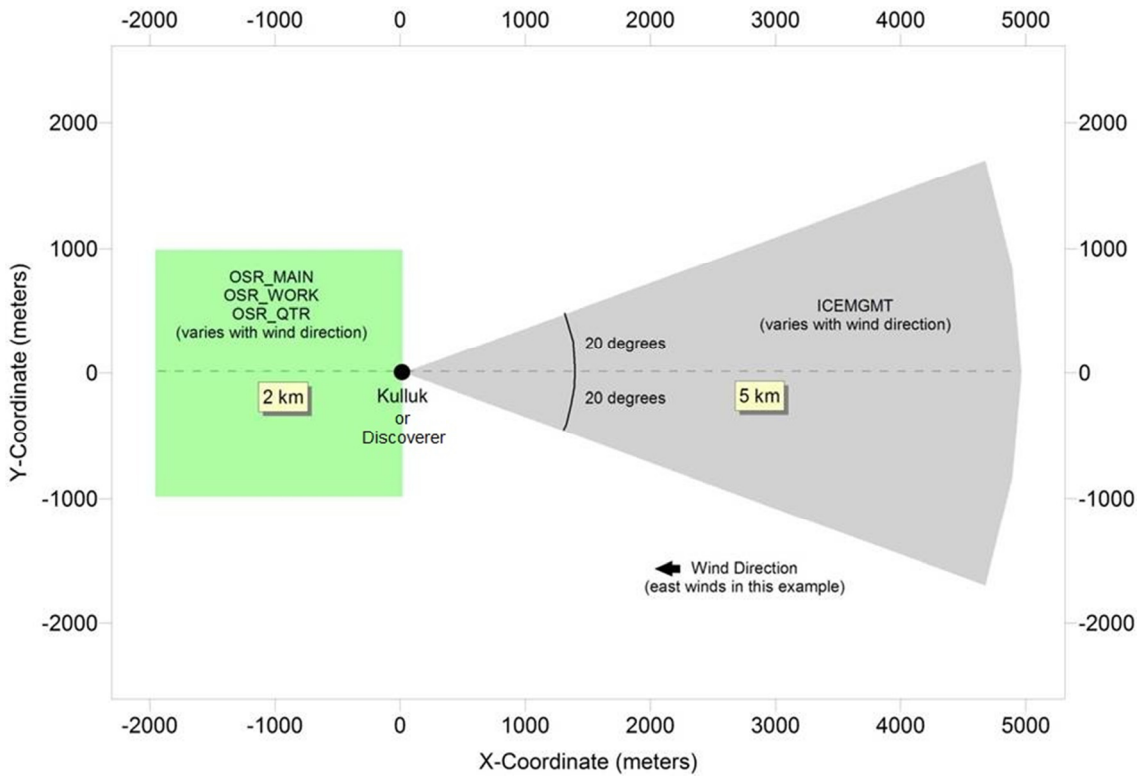
Diagram – Hull 247

Ice Management

The M/V *Nordica* or a similar vessel, will serve as the primary ice management vessel in support of the *Kulluk* or *Discoverer*. *Hull 247* will provide anchor handling duties, serve as the berthing (accommodations) vessel and will also serve as a secondary ice management vessel. When managing ice, the *Nordica* (or similar vessel) and *Hull 247* will generally be confined to a 40° arc up to 3.1 mi (5 km) upwind originating at the drilling vessel (Figure 13a-1). It is anticipated that the ice management vessels will be managing ice for up to 38 percent of the time when within 25 mi (40 km) of the *Kulluk* or *Discoverer*. Active ice management involves using the ice management vessel to steer larger floes so that their path does not intersect with the drill site. In some instances, the ice management vessel may have to break ice that is an immediate safety hazard for the drill site. Around-the-clock ice forecasting using realtime satellite coverage (available through SIWAC) will support the ice management duties. When the *Nordica* is not needed for ice management, it will reside outside the 25 mi (40 km) radius from the *Kulluk* or *Discoverer* if it is safe to do so. The vessel will enter and exit the Beaufort Sea with the *Kulluk* or *Discoverer*.

As anchor handler, *Hull 247*'s duties include setting and removing anchors, berthing (accommodations) vessel, providing supplemental oil recovery capability (VOSS) and managing smaller ice floes that may pose a potential safety issue to the *Kulluk* or *Discoverer* and the support vessels that will service the *Kulluk or Discoverer*.

Figure 13.a-1 Ice Management Vessels Configuration for the *Kulluk* or *Discoverer*



Resupply and Waste Removal

The exploration drilling operations will require the transfer of supplies between the Deadhorse/Westdock shorebase and Dutch Harbor with the *Kulluk* or *Discoverer*. While the *Kulluk* or *Discoverer* is anchored at a drill site as an OCS-source under the EPA air permit, Shell has allowed for 24 visits/tie-ups (if the *Kulluk* is the drilling vessel being used) or 8 visits/tie-ups (if the *Discoverer* is being used) throughout the drilling season from support vessels. The *Harvey Spirit* (or similar vessel) will shuttle supplies from the *Arctic Seal* (or similar vessel) and/or the *Southeast Provider* (or similar vessel) to the *Kulluk* or *Discoverer.* During the resupply trips, the *Harvey Spirit,* or similar vessel, will be used to remove the mud/cuttings and other waste streams. The mud/cuttings will be transported to the *Southeast Provider* (aka deck barge; or similar vessel) or the waste barge for storage. Other waste streams (sanitary waste, domestic waste, bilge water, ballast water) will also be transferred to the *Southeast Provider* (deck barge; or similar vessel), or the waste barge for temporary storage. All waste streams will be barged south for disposal at the end of the drilling season.

Photo – *Harvey Spirit*

While the *Kulluk* or *Discoverer* leaves Camden Bay temporarily during the Kaktovik and Nuiqsut (Cross Island) subsistence whale hunts, Shell will resupply the *Kulluk* or *Discoverer* with drilling supplies and equipment brought in from Dutch Harbor and stored on the *Carol Chouest* (or similar vessel) or the *Harvey Spirit* (or similar vessel). Approximately 10 resupply trips from Dutch Harbor to the resupply barge will be needed during each drilling season. The *Carol Chouest* (or similar vessel), will be used as a backup supply vessel and shuttle between Camden Bay and Dutch Harbor. When drilling starts up again after the bowhead whaling hunt has concluded, additional resupply may be required from West Dock via the *Arctic Seal* (or similar vessel) via transfer to the *Harvey Spirit* (or similar vessel) to the drilling vessel. Each support vessel will require refueling 4-6 times during the drilling season depending on fuel consumption based on utilization.

Removal of waste and resupply to the drilling vessel will be conducted the same way regardless of drilling vessel.

Photo - M/V *Arctic Seal*

Photo - M/V *Carol Chouest*

Oil Spill Response

The OSR vessels will include a primary OSR barge (the *Arctic Endeavor* and Point Class Tug, or similar vessel), *Hull 247* will act as a berthing (quartering) vessel and a VOSS and an oil storage tanker (OST - M/V *Mikhail Ulyanov* or a similar vessel). The *Harvey Spirit* (or similar vessel) will also act as a VOSS.

The OSR barge will have associated smaller workboats called Kvichaks. There are three 34-ft (10.4 m) Kvichaks that will support the OSR barge by laying out booms. One 47-ft (14.3 m) Rozema will provide skimming services. The Berthing Vessel (*Hull 247*) will be dedicated to the revised Camden Bay EP exploration drilling program and remain in the vicinity of the *Kulluk* or *Discoverer*, with the OSR barge and the OST being staged to respond as needed to a discharge. Specifications for these vessels are provided below in Table 13.a-2.

An additional barge housing the oil spill containment system will be centrally located in the Beaufort Sea. The barge will be supported by an Invader Class Tug and possibly an anchor handler. The tug tending the OSR containment system barge will either drift or motor under "slow-steam" movement with the barge. An anchor handler is included in this plan only as an additional tending option for the OSR containment system barge, if Shell deems it necessary in advance of the season to anchor the OSR containment system barge. Shell does not assume the OSR containment system barge will be anchored or that the anchor handler is necessary, but includes the option of anchoring the barge and it being also tended by an anchor handler in case that option is chosen.

Oil spill capping stack equipment will be housed on one of the ice management vessels in the unlikely event of a blowout.

Table 13.a-2 Specifications of the Major Oil Spill Response Vessels

Specification	OSR Barge and Tug		OST (*Mikhail Ulyanov*[1])	OSR Containment System		
	Arctic Endeavor Barge[1]	Point Class Tug[1]		Barge[1]	Tug[1] (invader class specifications provided)	Anchor Handler[1] (support for the Containment System barge)
Length	205 ft (62.5 m)	90 ft (27.4 m)	853 ft (260 m)	400 ft (122 m)	136.2 ft (41.5 m)	274 ft (83.5 m)
Width	90 ft (27.4 m)	32 ft (9.8 m)	112 ft (34 m)	100 ft (30.5 m)	36.5 ft (11.1 m)	59 ft (18 m)
Draft	NA	8.5 ft (2.6 m)	44.6 ft (13.6 m)	12 ft (3.7 m)	20 ft (6.1 m) loaded	20 ft (6.1 m)
Accommodations	NA	8	25 berths	NA	8 berths	23 berths
Maximum Speed	NA	7 knots (13 km/hr)	16 knots (30 km/hr)	NA	8 knots (15 km/hr)	16 knots (30 km/hr)
Fuel Capacity	NA	1,428 bbl (227 m^3)	440,000 bbl (69,952 m^3)	NA	3,690 bbl (587 m^3)	7,485 bbl (1,190 m^3)
Liquid Storage	18,636 bbl	NA	543,000 bbl (86,328 m^3)	80,000 bbl (12,719 m^3)	NA	37,462 bbl (5,956 m^3)
Workboats	(1) 47 ft (14 m) skim boat (3) 34 ft (10 m) work boats (4) mini-barges	NA	NA	NA	NA	NA

Notes:
[1] or similar vessel
NA – not applicable
1m^3 = 6.29 bbl

Photo – M/V *Mikhail Ulyanov*

The *Mikhail Ulyanov* or similar vessel with similar liquid storage capacity will be the OST and will be staged such that it would arrive at a recovery site, if needed, within 24 hours of departure from their staging location.

The purpose of the OST would be to provide a place to store large volumes of recovered crude oil, emulsion and free water. Surplus storage capacity aboard the OST beyond what is required for response at a recovery site may be allocated to store other liquid commodities consumed by the drilling vessel and support vessels, including diesel fuel. Refueling will be done per the fuel transfer plan in appendix M of the revised Camden Bay EP. Each vessel will require refueling four to six times during the season, depending on fuel consumption based on utilization.

Photo - *Endeavor Barge* and Point Class Tug

Aircraft

An AW139 or Sikorsky S-92 helicopter based in Deadhorse will be used for flights between the shorebase and drill sites (Table 13.a-3). It is expected that on average, up to two flights per day (approximately 12 flights per week) will be necessary to transport supplies and rotate crews. A Sikorsky S-92 based in Barrow will be used for search and rescue operations.

MMO overflights will utilize a de Havilland Twin Otter aircraft. The de Havilland Twin Otter is expected to fly daily.

Table 13.a-3 Aircraft Flights and Frequency

Aircraft*	Flight	Trip Frequency	Duration per trip	Flight Speed
AW139 or Sikorsky S-92 (based in Deadhorse)	Return trip Deadhorse to drilling vessel	12/week	2 hrs	125 knots
Sikorsky S-92 SAR (based in Barrow)	training	1/month	2 hrs	125 knots
De Havilland DHC-6 (based in Deadhorse)	MMO flights centered around the drilling vessel	daily	6 hrs	120 knots

*or similar aircraft

b) Air Emissions

Details concerning the source, composition, frequency and duration of air emissions for the *Kulluk* and *Discoverer,* and support vessels are summarized in Section 7.0. Maximum emission in tons per year for support vessel source groups for the *Kulluk* and *Discoverer* are summarized in Table 13.b-1 and -2 respectively.

Table 13.b-1 *Kulluk* Support Vessel Source Group Annual Maximum Emissions in Tons/Year

Vessel and Source Group	NO_x ton/yr	$PM_{2.5}$ ton/yr	PM_{10} ton/yr	CO ton/yr	SO_2 ton/yr	VOC ton/yr
Ice Management						
Propulsion and Generation	46.3	7.2	7.2	21	1.3	3.33
Heaters and Boilers	0.8	0.1	0.1	0.2	5.8E-02	0.04
Seldom Used Units	1.5E-01	1.2E-02	1.2E-02	4.1E-02	4.6E-04	1.5E-02
Incinerator	0.1	0.6	0.7	12.6	0.11	4.21
Anchor Handler						
Propulsion and Generation	46.3	7.2	7.2	21	1.3	3.33
Heaters and Boilers	0.8	0.1	0.1	0.2	5.8E-02	0.04
Seldom Used Units	1.5E-01	1.2E-02	1.2E-02	4.1E-02	4.6E-04	1.5E-02
Incinerator	0.1	0.6	0.7	12.6	0.11	4.21
Resupply Ship – transport mode						
Propulsion and Generation	10.6	0.4	0.4	3.2	4.0E-02	0.34
Seldom Used Units	7.9E-02	6.3E-03	6.3E-03	2.1E-02	2.4E-04	7.9E-03
Resupply Ship – Dynamic Positioning mode						
Propulsion and Generation	21.3	0.9	0.9	6.4	8.1E-02	0.68
Seldom Used Units	7.9E-02	6.3E-03	6.3E-03	2.1E-02	2.4E-04	7.9E-03
OSR Vessel						
Propulsion and Generation	37.3	1.6	1.6	11.2	1.4E-01	1.19
Seldom Used Units	4.0E-01	3.2E-02	3.2E-02	1.1E-01	1.2E-03	3.9E-02
Incinerator	0.3	1.3	1.5	27	0.2	9.00
OSR Work Boats						
Kvichaks	15.0	1.2	1.2	4.0	4.5E-02	1.49
Total Potential to Emit	**229**	**28**	**28**	**162**	**5**	**40**

Note: ton = short tons.

Table 13.b-2 *Discoverer* Support Vessel Source Group Annual Maximum Emissions in Tons/Year

Vessel and Source Group	NO_x	$PM_{2.5}$	PM_{10}	CO	SO_2
Primary Ice Management					
Propulsion and Generation	36.0	5.6	5.6	16.3	0.152
Heaters and Boilers	0.8	0.1	0.1	0.2	0.0872
Seldom Used Units	0.2	0.0	0.0	0.0	0.00007
Incinerator	0.2	0.4	0.6	12.6	0.105
Secondary Ice Management / Anchor Handler					
Propulsion and Generation	37.1	5.8	5.8	16.8	0.157
Heaters and Boilers	0.3	0.1	0.1	0.1	0.00349
Seldom Used Units	0.2	0.0	0.0	0.0	0.00007
Incinerator	0.2	0.4	0.6	12.6	0.105
Resupply Ship – Transport mode					
Propulsion and Generation	16.9	1.2	1.2	3.6	0.00611
Resupply Ship – Dynamic Positioning mode					
Propulsion and Generation	33.8	2.4	2.4	7.3	0.0122
OSR Vessel					
Propulsion and Generation	97.1	0.2	0.2	0.5	0.0483
Seldom Used Units	0.5	0.0	0.0	0.1	0.00018
Incinerator	0.5	0.8	1.2	27.0	0.225
Offshore Management / Skimmer Vessel					
Propulsion and Generation	71.6	1.3	1.3	19.0	0.0356
Seldom Used Units	0.5	0.0	0.0	0.1	0.00018
Incinerator	0.5	0.8	1.2	27.0	0.225
OSR Work Boats					
Kvichaks*	19.1	1.3	1.3	4.1	0.00689

Note: ton = short tons.

On February 28, 2011Shell sent an application to the EPA requesting a Synthetic Minor Source Permit for exploration drilling using the *Kulluk* on OCS leases in the Beaufort Sea.

The *Discoverer* is currently issued a PSD Permit (authorization R10OCS/PSD-AK-2010-01, issued April 7, 2010) to operate in the Beaufort Sea. This permit was remanded to the EPA on 30 December 2010 for the EPA to address certain outstanding issues.

Air emissions from aircraft will be minimal.

c) Drilling Fluids and Chemical Products Transportation

The *Kulluk* or *Discoverer* will be preloaded with drilling muds and other chemicals to be used during the drilling process. The *Kulluk* or *Discoverer* will have additional materials supplied by support vessels during the drilling season and between wells (planned to occur during the Kaktovik and Nuiqsut [Cross Island] subsistence whaling blackout period outside of the Camden Bay area). The types and drilling program totals for these muds and chemicals are presented in Section 6.0. No chemical will be stored above reportable quantities.

During each drilling season, the West Dock Supply Vessel (*Arctic Seal* or similar vessel) may make several resupply runs to and from West Dock or other port. Shell anticipates that there will be 24 visits/tie-ups by support vessels to the *Kulluk* while the *Kulluk* is anchored as an OCS-source under the EPA air permit, or 8 visits/tie-ups to the *Discoverer* while the *Discoverer* is anchored as an OCS-source under the EPA air permit, these include the vessel resupply and waste removal.

d) Solid and Liquid Wastes Transportation

Shell has applied to the EPA for authorization under GP AKG-28-0000 for the *Kulluk* and *Discoverer* to discharge various waste streams into the ocean at each proposed drill site. Shell has made a commitment to not discharge any drilling mud, cuttings with adhered mud, treated sanitary waste (black water), domestic waste (gray water), bilge water and ballast water. These wastes are permitted discharges under the GP AKG-28-0000; however, Shell will store these wastes and transport them to a licensed facility (see Section 6 or 14 for a list of the facilities). Shell will also store and dispose of solid trash and debris, used oil and hazardous wastes, none of which are allowed to be released into the ocean. Table 13.d-1 identifies the waste streams that will be transported for proper disposal.

Table 13.d-1 Anticipated Wastes Generated During Drilling to be Transported From Area

Type of Waste Approximate Composition	Total Amount	Name/Location	Transport Method
WBM and Cuttings with adhered WBM*	Sivulliq G – 2,926 bbl Sivulliq N – 2,926 bbl Torpedo H – 4,545 bbl Torpedo J – 4,507 bbl	Waste Management Inc., Arlington OR**	Hauled aboard ocean going barge to Seattle for transport to Oregon.
Treated Sanitary Waste (black water)	Sivulliq G – 20 bbl (*Kulluk*); 1,020 bbl (*Discoverer*) Sivulliq N – 20 bbl *Kulluk*); 1,020 bbl (*Discoverer*)	Waste Management Inc., Arlington OR **	Hauled aboard ocean going barge to Seattle for transport to Oregon.

Table 13.d-1 Anticipated Wastes Generated During Drilling to be Transported From Area

Type of Waste Approximate Composition	Total Amount	Name/Location	Transport Method
	Torpedo H – 20 bbl (*Kulluk*); 1,320 bbl (*Discoverer*) Torpedo J – 20 bbl (*Kulluk*); 1,320 bbl (*Discoverer*)		
Domestic Waste (gray water)	Sivulliq G – 8,742 bbl (*Kulluk*); 11,333 bbl (*Discoverer*) Sivulliq N – 8,742 bbl (*Kulluk*); 11,333 bbl (*Discoverer*) Torpedo H – 11,314 bbl (*Kulluk*); 14,667 bbl (*Discoverer*) Torpedo J –11,314 bbl (*Kulluk*); 14,667 bbl (*Discoverer*)		Hauled aboard ocean going barge to Seattle for transport to Oregon.
Bilge Water	Sivulliq G –170 bbl (*Kulluk*); 442 bbl (*Discoverer*) Sivulliq N – 170 bbl (*Kulluk*); 442 bbl (*Discoverer*) Torpedo H – 220 bbl (*Kulluk*); 572 bbl (*Discoverer*) Torpedo J – 220 bbl (*Kulluk*); 572 bbl (*Discoverer*)		Hauled aboard ocean going barge to Seattle for transport to Oregon.
Ballast Water	Sivulliq G –10,200 bbl (*Kulluk*); 170 bbl (*Discoverer*) Sivulliq N – 10,200 bbl (*Kulluk*); 170 bbl (*Discoverer*) Torpedo H – 13,200 bbl (*Kulluk*); 220 bbl (*Discoverer*) Torpedo J – 13,200 bbl (*Kulluk*); 220 bbl (*Discoverer*)		Hauled aboard ocean going barge to Seattle for transport to Oregon.
Used Oil	50 bbl/well	Waste Management Inc., Arlington OR ** and/or Emerald Services Inc*	Ocean going barge to Seattle
Chemical products and general hazardous waste	10 bbl/year		
Trash and debris (non-recyclables & recyclables)	300 bbl/month	Waste Management Inc., Arlington OR**	Hauled aboard supply vessel to West Dock or by ocean going barge to Seattle for transport to Oregon.

*each well includes the addition of 1,500 bbl of mud from an active mud pit; this 1,500 bbl volume will be recycled from well to well and disposed of at the end of the drilling season
** or other EPA-permitted facility

All WBM, cuttings from below the 20-in. casing, treated sanitary waste, domestic waste, bilge water and ballast water will be collected aboard the *Kulluk* or *Discoverer,* temporarily stored aboard the deck and/or waste barges, then transported to a facility licensed for disposal of this type of waste. Mud chemicals will be stored in recyclable bags and the mud additives will be contained in sacks stored aboard the drilling vessel. The mud chemicals and additives will be mixed onboard. The sacks will be incinerated or backhauled to an approved disposal site and the recyclable bags stored for later return to the supplier.

No drilling wastes will be transported via aircraft.

e) Vicinity Map and Travel Routes

Figure 13.e-1 outlines the proposed transit route for the *Kulluk* or *Discoverer* through the Chukchi Sea then into the Beaufort Sea. The aircraft and resupply vessel routes are shown in Figure 13.e-2. All of the scheduled flights associated with the planned exploration drilling program will be from the Deadhorse airport. The airport at Kaktovik, Alaska may be used only in emergencies.

The vessel transit route through the Bering Strait into the Chukchi Sea will occur on or after July 1. To minimize impacts on marine mammals and subsistence hunting activities, the drilling vessel and support fleet will transit through the Chukchi Sea along a route that lies offshore of the polynya zone. In the event the transit outside of the polynya zone results in Shell having to break ice (as opposed to managing ice by pushing it out of the way), the drilling vessel and support vessels will enter into the polynya zone far enough so that ice breaking is not necessary. If it is necessary to move into the polynya zone, Shell will notify the local communities of the change in the transit route through the Com Centers. As soon as the fleet transits past the ice, it will exit the polynya zone and continue a path in the open sea toward the Camden Bay drill sites.

Aircraft travelling from the shorebase to the Kulluk or Discoverer, except for airplanes engaged in marine mammal monitoring, aircraft shall use a flight path that keeps the aircraft at least 5 mi (8 km) inland until the aircraft is south of its offshore destination, then at that point it shall fly directly north through the Mary Sachs Entrance to its destination. Shell reserves the option to use an alternate flight route in the event that transit through the Mary Sachs Entrance is unsafe due to weather, other environmental conditions, or in the event of an emergency. This flight path will be flown in the opposite direction for return flights.

Figure 13.e-1 Fleet Travel Route

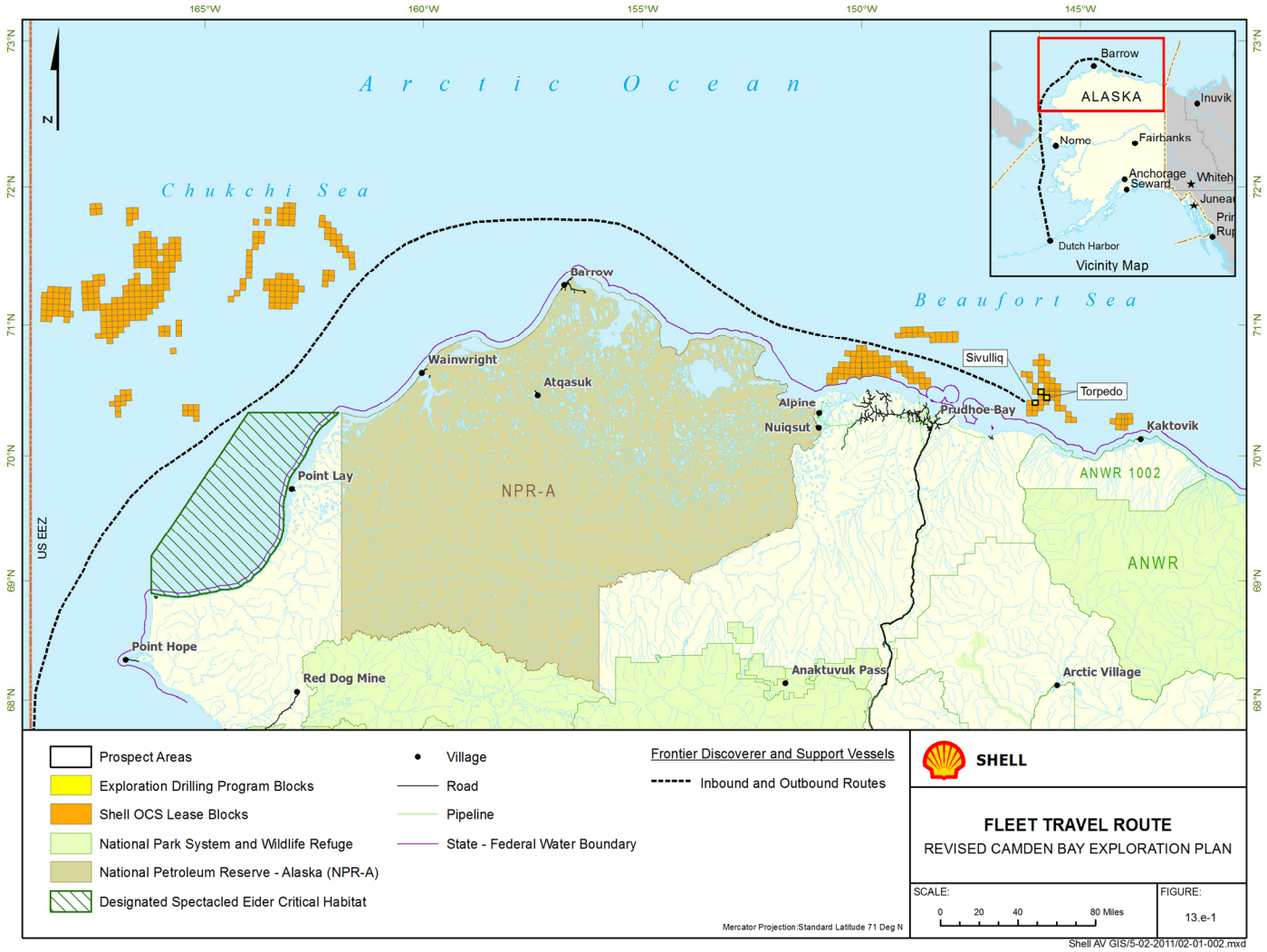
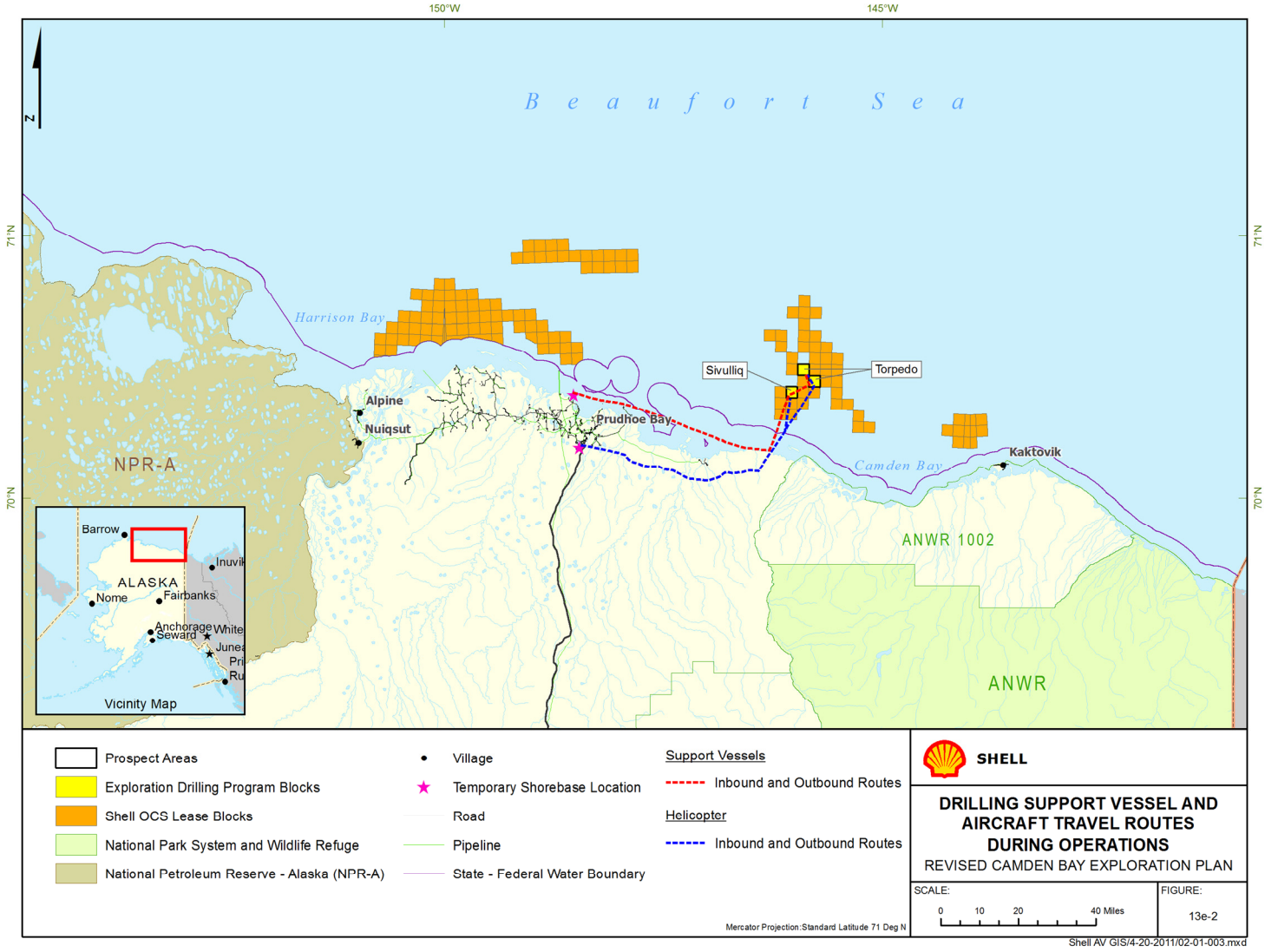


Figure 13.e-2 Drilling Support Vessel and Aircraft Travel Routes



SECTION 14.0 SHOREBASE FACILITIES INFORMATION

a) General

Shell's shorebase for air transportation for the planned exploration drilling program will be located at the Deadhorse Airport. A Search and Rescue helicopter, a Sikorsky S-92, or equivalent, will be stationed in Barrow in support of the drilling operations. A crew change helicopter, an AW-139, or Sikorsky S-92 will be based at the Deadhorse airport. A de Havilland Twin Otter will also be based at the Deadhorse airport. The Deadhorse airport (airport code SCC) has a paved runway that is 6,500 ft (1,981 m) in length and supports daily commercial and cargo flights from Anchorage and other locations in Alaska.

Marine support for the planned exploration drilling program will be primarily from the BP Exploration (Alaska) Inc. operated West Dock.

Facilities will be consolidated in Deadhorse to support drilling, logistics, and oil spill response. Approximately 30 Shell personnel will be based in Deadhorse. Facilities include accommodations at the Prudhoe Bay Hotel and Service Area 10; office space at the existing Carlile building, rental of existing Carlile yard space for short term Oil Response and Drilling equipment staging, and the leasing of Era Helicopter's terminal building to support crew change operations across the different function of Shell offshore drilling. No construction or expansion is planned at the Deadhorse facilities.

Shell will also manage portions of the exploration drilling program from their Anchorage and Houston offices. Also stationed in Anchorage is the SIWAC.

b) Air Emissions

There will be minimal additional emissions generated at the shorebase facilities, with respect to those emissions listed in Shells air permit (see Section 7.0), generated by land based aircraft at the shorebase. With respect to emissions generated by facilities used by Shell, Shell is using pre-existing infrastructure that would be functioning whether or not Shell is using the infrastructure. Any excess emissions based on Shell's usage are deemed to be minimal to the existing emissions.

c) Unusual Solid and Liquid Wastes

There will not be any unusual solid or liquid wastes generated at the shorebase facilities.

d) Waste Disposal

Table 14.d-1 identifies the types of waste and volumes likely to be generated during offshore drilling activities and the possible facility where the wastes will be shipped.

Table 14.d-1 Wastes and Volumes Generated During the Drilling Program

Name/Location of Facility	Type of Waste	Amount
Waste Management Inc., Arlington OR	Water based mud	Sivulliq G and N – 2,213 bbl each Torpedo H – 3,022 bbl Torpedo J – 3,003 bbl
	Drill cuttings with adhered mud	Sivulliq G and N - 713 bbl each Torpedo H – 1,522 bbl Torpedo J – 1,503 bbl
	Non-hazardous trash and debris	300 bbl/month

Table 14.d-1 Wastes and Volumes Generated During the Drilling Program

Name/Location of Facility	Type of Waste	Amount
Waste Management Inc., Arlington OR	Treated Sanitary waste	Sivulliq G and N – 20 bbl/well (*Kulluk*); 1,020 bbl (*Discoverer*) Torpedo H and J – 20 bbl/well (*Kulluk*); 1,320 bbl (*Discoverer*)
	Treated Domestic waste	Sivulliq G and N – 8,742 bbl/well (*Kulluk*); 11,333 bbl (*Discoverer*) Torpedo H and J – 11,314 bbl/well (*Kulluk*); 14,667 bbl (*Discoverer*)
	Uncontaminated Ballast Water	Sivulliq G and N – 10,200 bbl/well (*Kulluk*); 170 bbl (*Discoverer*) Torpedo H and J – 13,200 bbl/well (*Kulluk*); 220 bbl (*Discoverer*)
	Treated Bilge Water	Sivulliq G and N – 170 bbl/well (*Kulluk*); 442 bbl (*Discoverer*) Torpedo H and J – 220 bbl/well(*Kulluk*); 572 bbl (*Discoverer*)
Waste Management Inc., Arlington OR and/or Emerald Services Inc.	Hazardous Waste (Paint, solvents, unused chemicals, batteries, lamps, etc.)	10 bbl/well
	Used oil & glycol	50 bbl/well

Addresses for the waste facilities are:

Waste Management Inc's
Columbia Ridge Recycling and Landfill
18177 Cedar Springs Lane
Arlington, OR 97812
Telephone: 541-454-2030 Fax: 541-454-3312
http://www.wmnorthwest.com/landfill/landfillcities/columbia.html

Emerald Services Inc.
425 Outer Springer Loop Road
Palmer, AK 99645
Telephone: 907-258-1558
http://www.emeraldnw.com

SECTION 15.0 COASTAL ZONE MANAGEMENT ACT INFORMATION

a) Consistency Certification

Coastal Project Questionnaire and Certification Statement

The Coastal Project Questionnaire (CPQ) is a diagnostic tool that will identify the state and federal permit requirements for your project that are subject to a consistency review. You must answer all questions. If you answer "Yes" to any of the questions, please call that specific department for further instructions to avoid delay in processing your application. You can find an agency contact list online at http://alaskacoast.state.ak.us/Contacts/PRCregcont.html.

A complete project packet includes accurate maps and plan drawings at scales large enough to show details, copies of your state and federal permit applications, your answers to this questionnaire, and a complete consistency evaluation. DCOM will notify you within 21 days of receipt if the packet is incomplete and what information is still required.

For additional information or assistance, you may call or email the Juneau Project Review at (907) 465-2142, or the Anchorage Project Review at (907) 269-7478. This CPQ document contains numerous hyperlinks (underlined text that has a connection to an internet web page) and is best viewed on-line. Additional instructions are available at http://www.alaskacoast.state.ak.us/Projects/pcpq.html.

■ APPLICANT INFORMATION

1. Shell Offshore Inc	2.
Name of Applicant	Agent (or responsible party if other than applicant)
3601 C Street, Suite 1000	
Address	Address
Anchorage, Alaska 99503	
City/State/Zip	City/State/Zip
907-770-3700 (main); 907-646-7112 (direct)	
Daytime Phone	Daytime Phone
907-646-7145 susan.childs@shell.com	
Fax Number E-mail Address	Fax Number E-mail Address

■ PROJECT INFORMATION ..... Yes No

1. This activity is a: ☐ new project ☒ modification or addition to an existing project
2. If this is a modification or an addition, do you currently have any State, federal or local approvals for this activity? ☒ ☐

NOTE: Approval means any form of authorization. If "yes," please list below:

Approval Type	Approval #	Issuance Date	Expiration Date
ACMP Consistency Determination	AK 0908-02OG	22 January 2010	none
Exploration Plan Approval BOEMRE	none	16 October 2009	none
ODPCP Approval BOEMRE	none	March 11, 2010	none
ODPCP Consistency ADEC	none	22 January 2010	none
PSD Air Quality Permit EPA	R10OCS/PSD-AK-010-01	9 April 2010	none
NPDES EPA	AKG-28-0005	20 April 2010	26 June 2011
Section 10/404 USACE	POA-2009-662	8 July 2009	8 July 2011

Shell Offshore Inc. (Shell) submitted its initial Camden Bay Exploration Plan (Camden Bay EP) to BOEMRE in May 2009. After a thorough round of reviews, BOEMRE approved the Camden Bay EP on 16 October 2009. The Camden Bay EP was deemed consistent with the ACMP on 22 January 2010. Shell planned to conduct the exploration drilling program detailed in its Camden Bay EP during the 2010 open water season; however, its exploration activities were postponed when BOEMRE suspended all oil and gas exploration drilling activities in the Arctic following the *Deepwater Horizon* incident in the Gulf of Mexico.

Shell now plans to initiate its Camden Bay exploration drilling program during the 2012 open water season. Shell's plans for its renewed exploration drilling program are detailed in its revised Camden Bay Exploration Plan (revised Camden Bay EP), which was submitted to BOEMRE on 4 May 2011. Shell's revised Camden Bay EP includes a Coastal Project Questionnaire (CPQ) and consistency evaluation. Because the CPQ is for a project modification of an exploration drilling program previously found consistent with state standards and applicable district enforceable policies, pursuant to Chapter 11, Alaska Administrative Code (AAC), Section 110.820 (*Project modification after issuance of a final consistency determination),* the following sections of the CPQ and the Consistency Evaluation and Certification Statement discuss only the modifications of the project as detailed in the revised Camden Bay EP.

Shell's Camden Bay EP described a two well exploration drilling program, which was to be conducted using a single drilling vessel during a single season of operations. The revised Camden Bay EP contemplates completion of those wells evaluated as a part of the initial Camden Bay EP and describes two additional wells that will be drilled at the same two prospects previously identified and evaluated for exploration activities under the ACMP. The revised Camden Bay EP describes a scope of work of four wells that notionally may be accomplished over two drilling seasons. However, as with any Arctic exploration drilling program, weather and ice conditions, among other factors, will dictate actual length of each drilling season during which wells may be accomplished, hence more than two drilling seasons may be required to accomplish all four wells. Table 1 summarizes the comparison of the modification of the project from the initial Camden Bay EP to the revised Camden Bay EP.

3. If this is a modification, was this original project reviewed for consistency with the Alaska Coastal Management Program? ..... ☒ ☐

Previous ACMP I.D. Number: AK 0908-02OG
Previous Project Name: 2010 Camden Bay Exploration Plan Previous Project Applicant: Shell Offshore Inc.

■ PROJECT DESCRIPTION

Attach a complete and detailed narrative description of your new project or of your modification/addition including ALL associated facilities and changes to the current land or water use (if not already attached as part of an agency application). Clearly delineate the project boundaries and all property owners, including owners of adjacent land, on the site plan. The scale of the maps and plan drawings must be large enough to show pertinent

details. Identify your proposed footprint or disturbed area. If this project is a modification to an approved project, identify existing facilities and proposed changes on the site plan.

Proposed starting date for project: The revised Camden Bay EP is planned to begin during the summer of 2012. The initial Camden Bay EP described a single season of operations. The annual timing and schedule for the revised Camden Bay EP is the same as the initial EP such that the drilling vessel and support fleet will leave Dutch Harbor and pass through the Bering Strait on or after 1 July each season. Depending on weather and ice conditions, as well as other factors, the drilling activities are expected to commence at a drill site each season on or about 10 July. Exploration drilling activities at the drill sites will be suspended beginning 25 August for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts and resume after the subsistence bowhead whale hunts conclude.

Proposed ending date for the project: All exploration drilling activities will cease on 31 October during each drilling season, the same date as proposed in the initial Camden Bay EP.

Project description: For the revised Camden Bay EP, beginning in the summer of 2012 Shell plans to drill four wells on the same two prospects that were analyzed in the initial Camden Bay EP that included only two wells (Figure 1a-1). The drill sites for the four wells occur among three OCS lease blocks in Camden Bay (Figure 1a-2). Two of the three OCS blocks were evaluated in the initial Camden Bay EP and the ACMP. The revised Camden Bay EP also contemplates a situation where a well that is started must be temporarily suspended due to ice, weather, or other conditions, and finished at a later date. As described in the revised Camden Bay EP, any well on which drilling is suspended will be secured in compliance with BOEMRE regulations and with the approval of the Regional Supervisor/Field Operations (RS/FO), whether it is permanently abandoned (30 CFR 250.1710 through 1717) or temporarily abandoned (30 CFR 250.1721-1723).

Figure 1.a-1 Planned Exploration Drilling Program – Revised Camden Bay EP

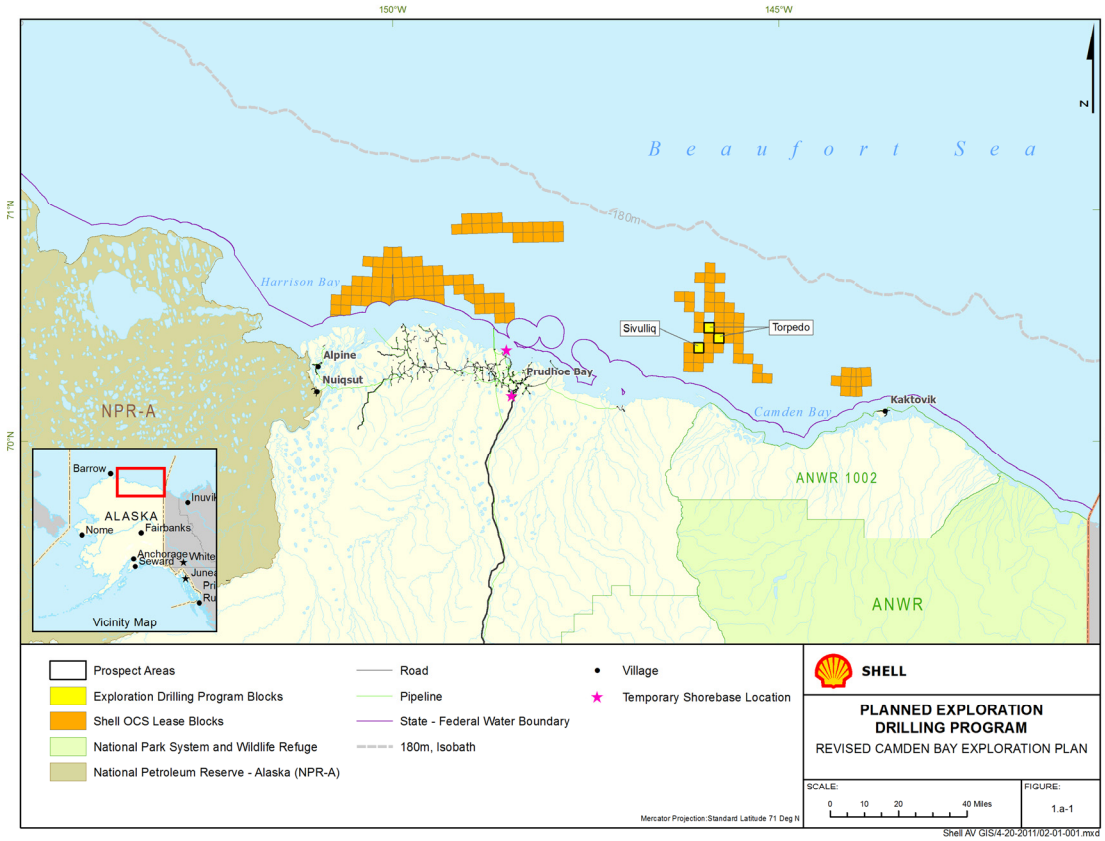
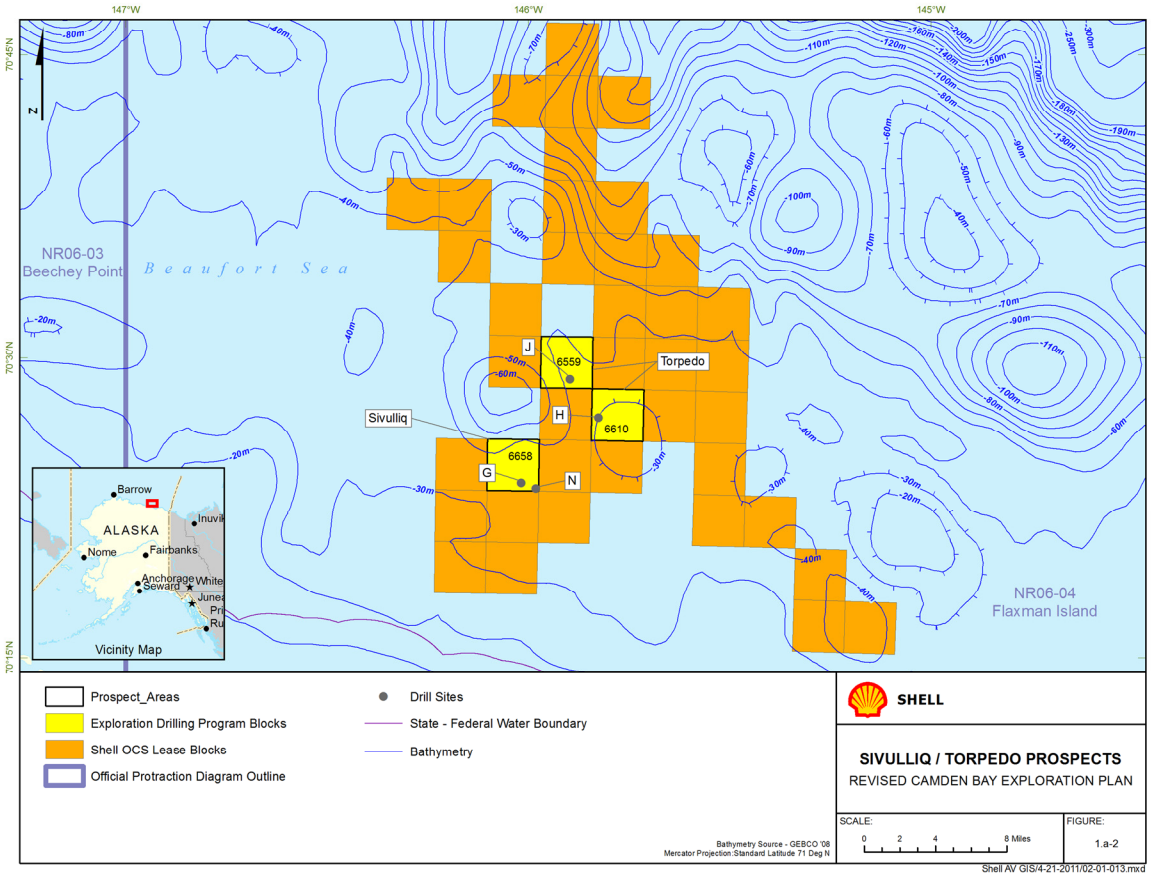


Figure 1.a-2 Location of the Sivulliq and Torpedo Prospects and Respective Drill Sites



Shell may conduct a geophysical survey referred to as zero-offset vertical seismic profile (ZVSP) at each drill site where a well is drilled. During exploration operations, the drilling vessel, which may be either the conical drilling unit *Kulluk* or drillship *Noble Discoverer* (*Discoverer*), will be attended by a minimum of 11 vessels that will be used for ice management, anchor handling/ice management, OSR, refueling, resupply, waste removal, and servicing of the drilling operations.

Primary elements of the modified exploration drilling program, as detailed in the revised Camden Bay EP, are compared to the analogous elements in the initial Camden Bay EP, which was found to be consistent with the ACMP, state standards and applicable district enforceable policies, in Table 1.

Table 1 Comparison and Similarities of Shell's Initial Camden Bay EP and the Revised Camden Bay EP

Parameter	Initial Camden Bay EP (2010)	Revised Camden Bay EP (2012 planned start)
Timing of operations	10 July – 31 October	10 July – 31 October
Prospects and OCS Lease Blocks	Sivulliq and Torpedo Flaxman Island 6610 and 6658	Sivulliq and Torpedo Flaxman Island 6559, 6610, and 6658
Drill site (wells)	Two - Sivulliq N and Torpedo H	Four - Sivulliq N, Torpedo H, Sivulliq G, Torpedo J
Drilling unit	Drillship *Discoverer*	Drillship *Discoverer* or the *Kulluk*
ZVSP	None	Zero offset vertical seismic profile at each drill site
Drilling fluids and cuttings with adhered fluids, Treated domestic waste, Treated sanitary waste; ballast water; Bilge water	Discharged to the ocean as permitted under NPDES Arctic General Permit AKG-28-0000	Collected, stored and then transported to an approved treatment/disposal site (TDS) for disposal
Primary Support Fleet	Anchor handler, Ice management vessel, Offshore supply vessel (OSV), West Dock shuttle	Anchor handler, Ice management vessel, OSV, West Dock shuttle OSV to collect waste streams from the *Kulluk* Deck barge and tug to store the waste streams (deck barge) Barge and tug to store liquid waste streams (waste barge)
Oil Spill Response (OSR)	OSR barge and tug, OSR vessel, Oil storage tanker (OST)	OSR barge and tug, Oil storage tanker (OST) Containment barge, tug, and anchor handler[1] for carrying containment equipment
Air permit	Discoverer – Prevention of Significant Deterioration (PSD) permit authorization R10OCS/PSD-AK-2010-01	*Discoverer* – PSD permit authorization R10OCS/PSD-AK-2010-01
		Kulluk – Minor Source Permit application for Beaufort Sea submitted February 28, 2011

Note: [1] Anchor handler included for planning purposes only, not assumed necessary since it is unlikely the containment barge will be anchored, but as an additional tending option if deemed necessary by Shell.

Based on the comparison provided in Table 1, the components that are in the revised Camden Bay EP that were not in the initial Camden Bay EP, and are assessed below in the Consistency Evaluation and Certification Statement are as follows:

- Two additional wells – Sivulliq G and Torpedo H
- The collection and transport of five waste streams
- Additional support vessels – an OSV, deck barge and tug, waste barge and tug, and a containment barge, tug, and anchor handler[1], and additional OSR vessel.
- ZVSPs – one at each of four drill sites
- Evaluation of the *Kulluk* as the primary drilling vessel as a possible replacement for the *Discoverer*

Note: See [1] above.
The project elements of the modification in the revised Camden Bay EP are further described below.

Additional Wells

The revised Camden Bay EP includes two additional wells that were not in the initial Camden Bay EP, one each in each of the prospects identified and evaluated in the initial Camden Bay EP and ACMP. The two new drill

sites identified in this revised Camden Bay EP are listed below in Table 2; the leases were acquired in Beaufort Sea Oil and Gas Lease Sale 195 (OCS-Y-1805) and 202 (OCS-Y-1936). Sivulliq G is located in the same lease block as the Sivulliq N drill site evaluated as a part of the initial Camden Bay EP and ACMP, and the Torpedo J drill site is in a lease block that is adjacent to the one in which Torpedo H is located, which was also evaluated in the initial Camden Bay EP and ACMP. Only lease block 6559 for the Torpedo J location is new for the revised Camden Bay EP. Drilling of these proposed wells would be done in the same manner as those approved with the initial Camden Bay EP and would generate similar amounts of waste. Shallow hazards surveys have been conducted at each drill site and no hazards to drilling or archeological resources were identified in the vicinity of the drill sites.

Table 2 Drill Sites in the Revised Camden Bay EP that Were Not in the Initial Camden Bay EP

Drill Site	Lease File Number	NR06-04 Flaxman Island Lease Block No.	Surface Location (NAD 83)*		Distance to Mainland Shore mi (km)
			Latitude (N)	Longitude (W)	
Sivulliq G	OCS-Y 1805	6658	70° 23' 46.82"	146° 01' 03.46"	16.6 (26.7)
Torpedo J	OCS-Y 1936	6559	70° 28' 56.94"	145° 53' 47.15"	23.1 (37.2)

Collection and Transport of Five Waste Streams

In response to stakeholder concerns, Shell has modified its proposed waste management procedures. The revised Camden Bay EP describes how Shell plan to implement its agreement with the local communities to collect selected waste streams and haul them outside the Arctic to a land based TSD facility for disposal.

By agreement with the local communities, during the completion of exploration activities contemplated by the revised Camden Bay EP, Shell will not discharge certain waste streams generated during routine drilling operations, even though the waste streams are allowable discharges under the current United States (U.S.) Environmental Protection Agency (EPA) administered Arctic National Pollutant Discharge Elimination System (NPDES) General Permit (GP) AKG-28-0000. Shell will not discharge 1) treated sanitary waste (black water), 2) domestic waste (gray water), 3) bilge water, 4) ballast water at any time, and 5) drilling mud and cuttings with adhered drilling mud when drilling below the depth of the 20-in conductor shoe. These wastes will be collected and stored on the deck barge and/or waste barge, then transported and disposed of at an approved and licensed onshore facility. Cuttings generated while constructing the mudline cellar (MLC) and drilling the 36-in. and 26-in. hole sections (all drilled with seawater and viscous sweeps only) plus cement discharged while cementing the 30-in and 20-in casing strings will be discharged to the surface of the seafloor under provisions of the previously mentioned NPDES GP.

During drilling operations, cuttings will be separated from the drilling fluids with shakers, de-sanders and de-silters. Drilling fluids will be recovered, reconditioned and reused as much as practicable. When drilling fluids have been exhausted, those spent drilling fluids will be held in storage aboard the drilling vessel. Drill cuttings that are recovered off the shakers will be transferred from the drilling vessel to an adjacent vessel, via a separate flexible hose connection, using compressed air. On the adjacent vessel (OSV), the cuttings will be held within lined, covered containers. In the event the storage tanks on the drilling vessel do not have the capacity to store the volume of spent drilling fluids generated during operations, the fluids in the storage tanks on the drilling vessel will be commingled with the drill cuttings waste stream during transfer. The treated sanitary water, domestic water, bilge and ballast water will be transferred from the drilling vessel via a separate flexible hose with secured fittings to an adjacent vessel and stored in above-deck storage tanks. The wastes would then be transferred in a similar manner from the OSV to the deck barge or waste barge. The deck barge and waste barge would transport the wastes to a treatment and disposal site onshore. Shell is finalizing a contract with the waste handler vessel owner for handling, transporting and disposal of the spent drilling fluids. Although Shell has not signed a contract with any disposal facility regarding the handling of waste streams that will not be discharged to the ocean, Shell has located appropriate licensed facilities to handle various waste streams. These facilities are located in Oregon and are licensed to handle the materials identified above in accordance with all applicable laws and regulations, including the Solid Waste Disposal Act and Resource Conservation and Recovery Act 42 USC 6901 et seq., and the EPA Solid Waste Disposal Facilities Regulations at 40 CFR 257-259.

Additional Support Vessels

Additional support vessels (Table 3) in the revised Camden Bay EP that were not in the initial Camden Bay EP include a second OSV, a deck barge and tug, a waste barge and tug, and a containment barge/tug/anchor handler. The primary need for these additional vessels is for the handling, storing, and transport of the five collected waste streams. The OSV will transfer the wastes from the drilling vessel to the deck barge or waste barge. The deck barge and waste barge will be stationed approximately 25 mi (40 km) from the drilling vessel and will be used to store the collected wastes, and at the end of the drilling season transport the wastes to a TDS in Oregon. One more OSR vessel is included in the revised Camden Bay EP that was not included in the initial Camden Bay EP (Table 4). The containment barge is part of the well control and OSR response equipment, and will house containment equipment. The tug is required to support the containment barge, whereas the anchor handler is included in this plan only as an additional tending option for the containment barge, if Shell deems it necessary in advance of the season to anchor the containment barge. Shell does not assume the containment barge will be anchored or that the anchor handler is necessary, but includes the option of anchoring the barge and it being also tended by an anchor handler in case that option is chosen.

Table 3 Specifications for Additional Support Vessels (Not Including OSR Vessels) for Revised Camden Bay EP

	Additional Vessels Included Only in Revised Camden Bay EP				
Specification	**Harvey Spirit[1,2]**	**Southeast Provider Barge & Ocean Ranger Tug[1,3] (Deck barge)**		**Waste Storage Barge[1,3] (Waste barge)**	
		Barge	**Tug**	**Barge**	**Tug**
Length	280 ft (85.4 m)	360 ft (110 m)	117 ft (35.7 m)	TBD	TBD
Width	60 ft (18.3 m)	100 ft (30.5 m)	32 ft (.8 m)	TBD	TBD
Draft	16.5 ft (5.0 m)	14 ft	-	TBD	TBD
Berths	26	-	10	TBD	TBD
Maximum Speed	13.5 knots (25 km/hr)	-	10 knots (18.5 km/hr)	TBD	TBD
Fuel Capacity	6,235 bbl (normal)	-	2,381 bbl	TBD	TBD

[1] Or similar vessel applies to all vessels.

[2] Dutch Harbor supply vessel/Waste removal

[3] Storage for drilling vessel resupply and waste streams removed from the drilling vessel

Table 4 Specifications for Additional OSR Vessel

	Vessel Included Only in Revised Camden Bay EP		
Specification	**Containment Barge[1,2,3]**		
	Barge	**Tug**	**Anchor Handler[3]**
Length	400 ft (122m)	136 ft (36.5 m)	275 ft (83.7 m)
Width	100 ft (30.5 m)	36 ft (11.1 m)	59 ft (18.0 m)
Accommodations	--	10	23
Maximum Speed	--	10 knots	16 knots
Fuel Capacity	--	3,690 bbl	7,484 bbl

[1] Or similar vessel applies to all vessels.
[2] Based on a standard deck barge, Crowley Invader class ocean going tug, and a *Tor Viking*-style anchor handler
[3] Vessel included for planning purposes only, not assumed necessary but as an additional tending option if deemed necessary by Shell.

Zero Offset Vertical Seismic Profiles

Shell plans to conduct a geophysical survey referred to as a vertical seismic profile or VSP at each drill site where a well is drilled. During VSP surveys, an airgun array, which is typically much smaller than those used for routine seismic surveys, is deployed at a location near or adjacent to the drilling vessel, while receivers are placed (temporarily anchored) in the wellbore. The sound source (airgun array) is fired repeatedly, and the reflected sonic waves are recorded by receivers (geophones) located in the wellbore. The geophones, typically in a string, are then raised up to the next interval in the wellbore and the process is repeated until the entire wellbore has been surveyed. The purpose of the VSP is to gather geophysical information at various depths, which can then be used to tie-in or ground-truth geophysical information from the previous seismic surveys with geological data collected within the wellbore.

Shell would likely be conducting a particular form of VSP referred to as a zero-offset vertical seismic profile (ZVSP), in which the sound source is maintained at a constant location near the wellbore. A typical sound source that would be used by Shell is the ITAGA eight-airgun array, which consists of four 150 in^3 (2,458 cm^3) airguns and four 40 in^3 (655 cm^3) airguns. These airguns can be activated in any combination and Shell would utilize the minimum gun volume required to obtain an acceptable signal. The airgun array is approximately 6 ft x 5 ft x 10 ft (1.8 x 1.5 x 3.0 m). Typical receivers would consist of a Schlumberger wireline four level vertical seismic imager (VSI) tool, which has four receivers 50-ft (15.2-m) apart.

A ZVSP survey is normally conducted at each well after total depth is reached but may be conducted at a shallower depth. For each survey, Shell would deploy the sound source (airgun array) over the side of the drilling vessel with a crane (sound source would be approximately be 50-200 ft [(15-60 m]) from the wellhead depending on the crane location), to a depth of approximately 10-23 ft (3-7 m) below the water surface. The VSI with its four receivers would be temporarily anchored in the wellbore at depth. The sound source is then routinely pressured up to 2,000 pounds per square inch (psi), and activated 5-7 times at approximately 20-second intervals. The VSI would then be moved to the next interval of the wellbore and re-anchored, after which the airgun array would again be activated 5-7 times. This process would be repeated until the entire well bore is surveyed in this manner. The interval between anchor points for the VSI is usually 200-300 ft (60-91 m). A normal ZVSP survey is conducted over a period of about 10-14 hours depending on the depth of the well and the number of anchoring points.

Use of the Drillship *Discoverer* or *Kulluk* to Drill the Wells

The revised Camden Bay EP also addresses the possibility that Shell might ultimately decide to substitute the drilling vessel *Kulluk* for the *Discoverer* to drill the wells contemplated by the revised Camden Bay EP. A comparison of attributes and specifications of the two drilling vessels is provided in Table 5. The *Discoverer* was to be the drilling vessel in the initial Camden Bay EP, which was found consistent, and therefore requires no further analysis. Both the *Kulluk* and *Discoverer* were to be used in Shell's 2007 Beaufort Sea EP, which was also found to be consistent with the ACMP.

There are no differences that would result in substantially different environmental impacts, if one or the other drilling vessel were to be used. The volumes of wastewater waste streams differ due to crew size and equipment, but these wastes will not be discharged to the ocean. The *Kulluk* has larger anchors, and more anchors (12 vs. 8) and would therefore impact a slightly larger area of the seafloor when mooring. Given the *Kulluk's* conical shape, the sound source level is louder for the *Kulluk* than the *Discoverer*, thus yielding a larger number of incidental takes of marine mammals due to sound for the *Kulluk.* Regardless of the drilling vessel, the exploration drilling program in Camden Bay is not expected to incidentally take more than small numbers of marine mammals, or have more than a negligible impact on their populations. All anticipated takes would be "takes by harassment", involving temporary changes in behavior.

Table 5 Drilling Vessel Comparison

Drilling Vessel Specifications - Relevant to Camden Bay Drill Sites				
ITEM	***KULLUK***		***DISCOVERER***	
Vessel Movement	No self-propulsion; must be towed		Self-propelled	
Crew size	108		140	
Cooling Water Discharge	13,178 bpd		45,000 bpd	
Domestic Waste Volumes[1]	100 gallons per person/per day = 10,800 gals or 257 bbl/day		100 gallons per person/per day = 14,000 gal/day or 333 bbl/day	
Sanitary Waste Volumes[1]	20 bbl at end of well – waste water purified and recycled		9 gal/person/day = 1,260 gal/day or 30 bpd	
Bilge Water[1]	5 bpd		13 bpd	
Ballast Water[1]	34-44 bpd		5 bpd	
Fuel Storage Capacities	10,085 bbl		6,498 bbl	
Anchor System	12-point anchor system		8-point anchored mooring system	
Anchors (number of anchors)	12		8	
Anchor type	Twelve, 15mt Stevpris anchors		Eight, 7.5 ton Stevpris anchors	
Anchor radii (maximum)	3,117 ft (950 m)		2,969-2,986 ft (905-910 m)	
Operational Restraint				
ITEM	**KULLUK**		**DISCOVERER**	
Vessel to Vessel Transfers[2]	24 resupply visits[2]		8 resupply visits[2]	
Seafloor Impacts				
Anchor scar (area [ft^2]and volume [yd^3]) per anchor	2,928 ft^2 (272 m^2)	531 yd^3 406 m^3	2,027 ft^2 (188 m^2)	390 yd^3 (298 m^3)
MLC Size	41 ft x 24 ft		41 ft x 20 ft	
MLC – Excavated Volume[3]	4,382 bbl (696 m^3)		3,049 bbl (485 m^3)	
MLC to 20" casing depth – cuttings discharge seafloor sediment coverage	802-953 bbl (128-152 m^3)			

Notes:
[a] Per well unless otherwise specified.
[1] Collected, held during season, disposed onshore at end of season.
[2] Per drilling season
[3] Included in this is a 30% washout of MLC excavation.

Key:
bbl – barrels
bpd – barrels/day
dB – decibel
ft - feet
ft^2 – square feet
m^2 – square meters
m^3 – cubic meter
mt – metric ton
µPa – micropascal
MLC – Mud line cellar
OSV – Offshore supply vessel
yd^3 - cubic yard

■ PROJECT LOCATION and LAND OWNERSHIP

	Yes	No

4. Describe/identify the project location on a map (Including nearest community, the name of the nearest land feature or body of water, and other legal description such as a survey or lot number.).
   Township _____ Range _____ Section _____ Meridian _____
   Latitude/Longitude 70° 23' 46.82" /146° 01' 03.46" Sivulliq G drill site; 70° 28' 56.94" 145° 53' 47.15" Torpedo J (NAD 83) (specify Decimal Degrees or Degrees, Minutes, Seconds)
   USGS Quad Map not applicable; federal outer continental shelf submerged lands; see Figure 1-1 for location map
5. The project is located on: ☐ State land or water* ☒ Federal land ☐ Private land ☐ Municipal land
   (Check all that apply) ☐ Mental Health Trust land ☐ University of Alaska land
   Contact the applicable landowner(s) to obtain necessary authorization. State land ownership can be verified using Alaska Mapper. **State land can be uplands, tidelands or submerged lands to 3 miles offshore*.
6. Is the project within or associated with the Trans Alaska Pipeline corridor? ---------- ☐ ☒

■ COASTAL DISTRICT

	Yes	No

7. Is the project located in a coastal district? ..... ☐ ☒
   If yes, identify the applicable coastal district(s) OCS Exploration Plan review triggers ACMP review and contact them to ensure your project conforms with district policies and zoning requirements. *Coastal districts are a municipality or borough, home rule or first class city, second class municipality with planning powers, or coastal resource service area. A coastal district is a participant in the State's consistency review process. Early interaction with the district can benefit you significantly; please contact the district representative listed on the contact list at* ***http://www.alaskacoast.state.ak.us/Contacts/PRCregcont.html***

■ DEPARTMENT OF NATURAL RESOURCES (DNR) APPROVALS

DNR DIVISION OF MINING, LAND & WATER- LAND SECTION

	Yes	No

1. Is the proposed project on State-owned land or water or will you need to cross State-owned land for access? *(NOTE: State land includes the land below the ordinary high water line of navigable streams, rivers and lakes, and in marine waters, below the mean high tide line seaward for three miles. State land does not include Alaska Mental Health Trust Land or University of Alaska Land.)* ..... ☐ ☒
2. If you answered yes to the question above, indicate the person you contacted at the appropriate Division of Mining, Land and Water regional office for information.
   a) Name/date of Contact: _____
   b) Is an application required for the proposed activity? ..... ☐ ☒
   c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: Shorebase facilities are on State owned land and will be used under third party contractors and permits

DNR DIVISION OF MINING, LAND & WATER- MATERIALS SECTION

	Yes	No

3. Do you plan to dredge or otherwise excavate or remove materials such as rock, sand, gravel, peat, or overburden from any land regardless of ownership? ☐ ☒
   .....
   a) Location of excavation site if different than the project site: _____
   Township _____ Range _____ Section _____ Meridian _____

4. At any one site (regardless of land ownership), do you plan any of the following? ☐ ☒
   .....
   ☐ Excavate five or more acres over a year's time
   ☐ Excavate 50,000 cubic yards or more of materials (rock, sand, gravel, soil, peat, overburden, etc.) over a year's time
   ☐ Have a cumulative, un-reclaimed, excavated area of five or more acres
5. Do you plan to place fill or excavated material on State-owned land? ..... ☐ ☒
   a) Location of fill or material disposal site if different than the project site: _____
   Township _____ Range _____ Section _____ Meridian _____

6. If you answered yes to any question above, indicate the person you contacted at the appropriate Division of Mining, Land and Water regional office for information.
   a) Name/date of Contact: _____
   b) Is an application required for the proposed activity? ..... ☐ ☐
   c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: _____

DNR DIVISION OF MINING, LAND & WATER- MINING SECTION	**Yes**	**No**
7. Do you plan to mine for locatable minerals such as silver, gold, or copper?	☐	☒
8. Do you plan to explore for or extract coal?	☐	☒

9. If you answered yes to any question above, indicate the person you contacted at the appropriate Division of Mining, Land and Water regional office for information.
   a) Name/date of Contact: _____
   b) Is an application required for the proposed activity? ..... ☐ ☐
   c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: _____

DNR DIVISION OF MINING, LAND & WATER- WATER SECTION	**Yes**	**No**
10. Will this project or development divert, impound, withdraw, or use any fresh water (regardless of land ownership)? *(NOTE: If you know of other water users who withdraw from the same source or any potential conflicts affecting this use of water, contact the Water Section. If you are obtaining water exclusively from either an existing Public Water Supply or from a rainwater catchment system, you are not required to contact the DNR Water Section regional office.)*	☐	☒

   a) Check all points-of-withdrawal or water sources that apply:
      ☐ Public Water system (name):_____
      ☐ Stream or Lake (name): _____
      ☐ Well
      ☐ Rain catchment system
      ☐ Other: _____
   b) Intended use(s) of water: _____
   c) Amount (maximum daily, not average, in gallons per day): _____
   d) Is the point of water withdrawal on property you own? ..... ☐ ☐

11. Do you plan to build or alter a dam (regardless of land ownership)?	☐	☒

12. If you answered yes to any question above, indicate the person you contacted at the appropriate Division of Mining, Land and Water regional office for information.
   a) Name/date of Contact: _____
   b) Is an application required for the proposed activity? ..... ☐ ☐
   c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: _____

DNR DIVISION OF FORESTRY	**Yes**	**No**
13. Does your operation meet **both** of the following criteria on any land, regardless of ownership?		
a) The project will commercially harvest timber on 10 or more acres, or commercially harvest timber that intersects, encompasses, or borders on surface waters, **and**		
b) The project involves one or more of the following: site preparation, thinning, slash treatment, construction and maintenance of roads associated with a commercial timber harvest, or any other activity leading to or connected to a commercial timber harvest operation.....	☐	☒

14. If you answered yes to any question above, indicate the person you contacted at the appropriate Division of Forestry regional office for information.
   a) Name/date of Contact: _____
   b) Is an application required for the proposed activity? ..... ☐ ☐
   c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: _____

	Yes	No
DNR DIVISION OF OIL & GAS		
15. a) Will you be exploring for or producing oil and/or gas? ……...	☐	☒
b) Will you conduct surface use activities on/within an oil and gas lease or unit? …….	☐	☒
If yes, please specify: _____		
16. Do you plan to drill a geothermal well (regardless of land ownership)?…….	☐	☒
17. If you answered yes to any question above, indicate the person you contacted at the appropriate Division of Oil & Gas office for information.		
a) Name/date of Contact: no contact made – federal OCS leases		
b) Is an application required for the proposed activity? ……...	☐	☒
c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: appropriate applications to be submitted to BOEMRE		
Visit the Division of Oil & Gas website for application forms and additional information.		

	Yes	No
DNR OFFICE OF HISTORY & ARCHAEOLOGY		
18. Will you investigate, remove, or impact historical, archaeological or paleontological resources (anything over 50 years old) on State-owned land? ……	☐	☒
19. If you answered yes to the question above, indicate the person you contacted at the State Historic Preservation Office for information.		
a) Name/date of Contact: _____		

	Yes	No
DNR DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS		
20. Is the proposed project located within a natural hazard area designated by a coastal district in the approved district plan? ……	☐	☒
a) If "yes", describe the measures you will take in the siting, design, construction, and operation of the proposed activity to protect public safety, services, and the environment from potential damage caused by the designated natural hazard(s)* **See the attached coastal consistency evaluation section on Natural Hazards for more detailed information.*		
21. If "YES" and you have contacted someone, please indicate the person you contacted at the Division of Geological and Geophysical Surveys or the coastal district for information.		
a) Name/date of Contact: _____		

	Yes	No
DNR DIVISION OF PARKS & OUTDOOR RECREATION		
22. Is the proposed project located in a unit of the Alaska State Park System including navigable waters, tidelands or submerged lands to three miles offshore? ……	☐	☒
23. If you answered yes to any question above, indicate the person you contacted at the appropriate DNR Division of Parks & Recreation office for information.		
a) Name/date of Contact: _____		
b) Is an application required for the proposed activity? ……	☐	☐
c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: _____		

DNR APPROVALS

List the Department of Natural Resources permits or authorizations required for your project below:

Types of project approvals or permits needed.	Date application subn

■ DEPARTMENT OF FISH AND GAME (DFG) APPROVALS

	Yes	No
1. Is your project located in a designated State Game Refuge, Critical Habitat Area or State Game Sanctuary? ……..……....	☐	☒
2. Does your project include construction/operation of a salmon hatchery? ……	☐	☒
3. Does your project affect, or is it related to, a previously permitted salmon hatchery? ……	☐	☒
4. Does your project include construction of an aquatic farm? ……	☐	☒
5. If you answered yes to any questions above, indicate the person you contacted at the Department of Fish and Game for information.		
a) Name/date of Contact: _____		
b) Is an application required for the proposed activity? ……	☐	☐
c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: _____		

DFG APPROVALS

List the Department of Fish and Game permits or authorizations required for your project below:

Types of project approvals or permits needed.	Date application submitted

■ DEPARTMENT OF ENVIRONMENTAL CONSERVATION (DEC) APPROVALS

DEC DIVISION OF WATER

	Yes	No
1 a) Will a discharge of non-domestic wastewater to lands, waters, or the subsurface of the state occur? *(NOTE: Non-domestic wastewater includes wastewater from commercial or industrial facilities, excavation projects, wastewater from man-made containers or containment areas, or any other non-domestic wastewater disposal activities see 18 AAC 72.990 for definitions.)* ……	☐	☒
b) Will a discharge of domestic wastewater or septage to lands, waters or the subsurface of the state occur? *(see 18 AAC 72.990 for definitions.)* ……..……	☐	☒
c) Will the wastewater disposal activity require a mixing zone or zone of deposit to meet Water Quality Standards (WQS)? (Many disposal activities require a mixing zone to meet WQS, contact DEC if unsure.)	☐	☒
d) Will the project include a stormwater collection/discharge system? ……	☒	☐
e) Will the project include placing fill in wetlands? ……	☐	☒
f) Is the surrounding area inundated with water at any time of the year? ……	☒	☐
g) Do you intend to construct, install, modify or use any part of a domestic or non-domestic wastewater treatment or disposal system? ……..……	☐	☒
2. Does your project qualify for a general permit for wastewater?	☒	☐
3. If you answered yes to any questions above, indicate the person you contacted at the DEC-Division of Water for information.		
a) Name/date of Contact: no contact made – federal OCS leases		
b) Is an application required for the proposed activity? ……...	☒	☐

c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: The project will discharge waste streams authorized pursuant to NPDES GP AKG-28-0000. Shell has authorization (AKG-28-0005) for the *Discoverer* to discharge under AKG-28-0000 on lease block 6658 (Sivulliq G). Shell submitted an NOI to the EPA for authorization for the *Discoverer* to discharge on lease block 6559 (Torpedo J) on 10 December 2010. Shell submitted supplemental NOI information for authorization for the *Kulluk* to discharge on lease blocks 6558 and 6559 and on 8 April 2011, Copies of these NOI submittals are available in Appendix B of the revised Camden Bay EP.

DEC DIVISION OF ENVIRONMENTAL HEALTH	**Yes**	**No**
4 a) Will your project result in construction, modification, or operation of a facility for solid waste disposal? *(NOTE: Solid waste means drilling wastes, household garbage, refuse, sludge, construction or demolition wastes, industrial solid waste, asbestos, and other discarded, abandoned, or unwanted solid or semi-solid material, whether or not subject to decomposition, originating from any source. Disposal means placement of solid waste on land.)*	☐	☒
b) Will your project result in treatment of solid waste at the site? *(Examples of treatment methods include, but are not limited to: incineration, open burning, baling, and composting.)*	☒	☐
c) Will your project result in storage or transfer of solid waste at the site?	☒	☐
d) Will the project result in storage of more than 50 tons of materials for reuse, recycling, or resource recovery?	☐	☒
e) Will any sewage solids or biosolids be disposed of or land-applied to the site? *(NOTE: Sewage solids include wastes that have been removed from a wastewater treatment plant system, such as a septic tank lagoon dredge, or wastewater treatment sludge that contain no free liquids. Biosolids are the solid, semi-solid or liquid residues produced during the treatment of domestic septage in a treatment works which are land applied for beneficial use.)*	☐	☒
5. Will your project require application of oil, pesticides, and/or any other broadcast chemicals?	☐	☒
6. Does your project qualify for a general permit for solid waste?	☐	☒
7. If you answered yes to any question above, indicate the person you contacted at the DEC- Division of Environmental Health for information.		
a) Name/date of Contact: no contact made – federal OCS leases		
b) Is an application required for the proposed activity?	☐	☒
c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: _____		

DEC DIVISION OF AIR QUALITY	**Yes**	**No**
8 a) Will you have an asphalt plant designed to process no less than *five tons per hour* of product?	☐	☒
b) Will you have a thermal remediation unit with a rated capacity of at least five tons per hours of untreated material? ..	☐	☒
c) Will you have a rock crusher with a rated capacity of at least five tons per hour?	☐	☒
d) Will you have one or more incinerators with a cumulative rated capacity of 1,000 pounds or more per hour? Incinerator capacity is 276 lb/hr.	☐	☒
e) Will you have a coal preparation plant?	☐	☒
f) Will you have a Port of Anchorage stationary source?	☐	☒
g) Will you have a facility with the potential to emit no less than 100 tons per year of any regulated air contaminant?.....	☒	☐
h) Will you have a facility with the potential to emit no less than 10 tons per year of any hazardous air contaminant or 25 tons per year of all hazardous air contaminants?.....	☐	☒
i) Will you be constructing a new stationary source with a potential to emit greater than:	☒	☐
☒ 15 tons per year (tpy) of PM-10		
☒ 40 tpy of nitrogen oxides		
☐ 40 tpy of sulfur dioxide		
☐ 0.6 tpy of lead; or		
☐ 100 tpy of CO within 10 km of a nonattainment area		

j) Will you be commencing construction, or *(if not already authorized under* 18 AAC 50*)* relocating a portable oil and gas operation? *(answer "yes" unless you will comply with an existing operating permit developed for the portable oil and gas operation at the permitted location; or you will operate as allowed under AS 46.14.275 without an operating permit)* …… ☐ ☒

k) Will you be commencing construction or (if not already authorized under 18 AAC 50) relocating an emission unit with a rated capacity of 10 million Btu or more per hour in a sulfur dioxide special protection area established under 18 AAC 50.025? …… ☐ ☒

l) Will you be commencing a physical change to or a change in the method of construction of an existing stationary source with a potential to emit an air pollutant greater than an amount listed in g) that will cause for that pollutant an emission increase (calculated at your discretion) as either an increase in potential to emit that is greater than: ☐ ☒

- ☐ 10 tpy of PM-10
- ☐ 10 tpy of sulfur dioxide
- ☐ 10 tpy of nitrogen oxides; or
- ☐ 100 tpy of CO within 10 km of a nonattainment area; or

  actual emissions and a net emissions increase greater than:
  - ☐ 10 tpy of PM-10
  - ☐ 10 tpy of sulfur dioxide
  - ☐ 10 tpy of nitrogen oxides; or
  - ☐ 100 tpy of CO within 10 km of a nonattainment area

m) Will you be commencing construction or making a major modification of a Prevention of Significant Deterioration stationary source under 18 AAC 50.306? …… ☐ ☒

n) Will you be commencing construction or making a major modification of a nonattainment area major stationary source under 18 AAC 50.311? …… ☐ ☒

o) Will you be commencing construction or reconstructing a major stationary source under 18 AAC 50.316, for hazardous air pollutants? Definition of Regulated Air Pollutants can be found at http://www.epa.gov/ttn/oarpg/t5/memoranda/rapdef.pdf ..... ☐ ☒

9. If you answered yes to any questions above, indicate the person you contacted at the DEC- Division of Air Quality for information.

a) Name/date of Contact: no contact made – federal OCS leases

b) Is an application required for the proposed activity? …… ☐ ☒

c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation:

EPA has jurisdiction of air emissions associated with OCS oil and gas exploration. Shell now has an air permit for the *Discoverer* to operate in the Beaufort Sea – authorization R10OCS/PSDAK-2010-01. Shell is applying for a synthetic minor source operating air emissions permit from EPA Region 10 for exploration drilling with the *Kulluk* (source) and its associated support vessels in the Beaufort Sea within the 25 mile Alaska seaward boundary. It is to be used for exploration drilling activity (NAICS category 211111) on the OCS of the Beaufort Sea near Camden Bay. As such, the application is made under the OCS permitting rules (40 CFR 55). Because the area of operation will be within 25 miles of the Alaska seaward boundary, the *Kulluk* is subject to the federal requirements of §55.13 and the Alaska rules as documented in §55.14. The permits and permit applications and supporting documents are available on line at the EPA's website at http://yosemite.epa.gov/R10/AIRPAGE.NSF/Permits/ocsap/

DEC DIVISION OF SPILL PREVENTION AND RESPONSE

	Yes	No
10 a) Will your project involve the operation of waterborne tank vessels or oil barges that carry crude or non crude oil as bulk cargo, or the transfer of oil or other petroleum products to or from such a vessel or a pipeline system? ……	☒	☐
b) Will your project require or include onshore or offshore oil facilities with an effective aggregate storage capacity of greater than 5,000 barrels of crude oil or greater than 10,000 barrels of non-crude oil? ……	☐	☒
c) Will you operate facilities on land or water for exploration or production of hydrocarbons? ……	☒	☐

11. If you answered yes to any questions above, indicate the person you contacted at the DEC-Division of Spill Prevention and Response office for information.

a) Name/date of Contact: Bob Tisserand, various dates
b) Is a plan required for the proposed activity? ☐ ☐
c) If "YES" then submit a signed copy of the completed Oil Discharge Prevention & Contingency Plan to the DCOM. If "No", explain why an application isn't required. Explanation: A revised Beaufort Sea Regional Exploration ODPCP was found consistent by ADEC during the last ACMP review (22 January 2010). A modification to the Beaufort Sea Regional Exploration ODPCP found consistent by ADEC and approved by BOEMRE 11 March 2010 was submitted to BOEMRE concurrent with the revised Camden Bay EP.

DEC APPROVALS

List the Department of Environmental Conservation permits or authorizations required for your project below:

Types of plan approvals or permits needed	Date application submitted
ODPCP (2010 Beaufort Sea Regional Exploration ODPCP)	Found consistent 22 January 2010
ODPCP (2011 revised Beaufort Sea Regional Exploration ODPCP)	Submitted May 2011

■ FEDERAL APPROVALS

U.S. ARMY CORPS OF ENGINEERS (USACE)

	Yes	No
1. Will you discharge dredged and/or fill material or perform dredging activities in waters of the U.S.? Section 404 of the Clean Water Act requires that a Department of the Army permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including wetlands (33 U.S.C. 1344). *(Your application to the USACE would also serve as application for DEC Water Quality Certification.)*	☐	☒
2. Will you place fill or structures or perform work in waters of the U.S.? Section 10 of the Rivers and Harbors Act of 1899 requires that a Department of the Army permit be obtained for structures or work in or affecting navigable waters of the U.S. (33 U.S.C. 403) *(Waters of the U.S. include marine waters subject to the ebb and flow of the tide, rivers, streams, lakes tributaries, and wetlands. If you are not certain whether your proposed project is located within a wetland, contact the USACE Regulatory Division to request a wetlands determination. For additional information about the Regulatory Program, visit www.poa.usace.army.mil/reg)*	☒	☐
3. If you answered yes to the question above, indicate the person you contacted at the US Army Corps of Engineers for information.		
a) Name/date of Contact: Julie McKim, March 23, 2009; Michiel Holley March 2011		
b) Is an application required for the proposed activity?	☒	☐
c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: A Pre-Construction Notification (PCN) has been submitted to the USACE for authorization of these activities at Sivulliq G and Torpedo J, and a copy is available in Appendix G of the revised Camden Bay EP		

BUREAU OF LAND MANAGEMENT (BLM)

	Yes	No
4. Is the proposed project located on BLM land, or will you need to cross BLM land for access?	☐	☒
5. If you answered yes to the question above, indicate the person you contacted at the Bureau of Land Management for information.		
a) Name/date of Contact: _____		
b) Is an application required for the proposed activity?	☐	☒
c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: _____		

U.S. COAST GUARD (USCG)

	Yes	No
6 a) Do you plan to construct a bridge or causeway over tidal (ocean) waters, or navigable rivers, streams or lakes?	☐	☒
b) Does your project involve building an access to an island?	☐	☒
c) Do you plan to site, construct, or operate a deepwater port?	☐	☒
7. If you answered yes to any question above, indicate the person you contacted at the appropriate U.S. Coast		

Guard office for information.
a) Name/date of Contact: _____
b) Is an application required for the proposed activity? ..... ☐ ☒
c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: _____

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)	**Yes**	**No**
8 a) Will the proposed project have a discharge to any waters?	☒	☐
b) Will you dispose of sewage sludge?	☐	☒
c) Will construction of your project expose 1 or more acres of soil? *(NOTE: This applies to the total amount of land disturbed, even if disturbance is distributed over more than one season, and also applies to areas that are part of a larger common plan of development or sale.)*.....	☐	☒
d) Is your project an industrial facility that will have stormwater discharge directly related to manufacturing, processing, or raw materials storage areas at an industrial plant? If you answered yes to c) or d), your project may require an NPDES Stormwater permit	☐	☒

9. If you answered yes to any question above, indicate the person you contacted at the U.S. Environmental Protection Agency for information.
a) Name/date of Contact: Sonia Porter; October 2008; Hahn Shaw, various dates 2010, 2011
b) Is an application required for the proposed activity? ..... ☒ ☐
c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: The project will discharge waste streams authorized pursuant to NPDES GP AKG-28-0000. Shell has authorization (AKG-28-0005) for the *Discoverer* to discharge under GP AKG-28-0000 on lease block 6658 (Sivulliq G) and lease block 6610. Shell submitted an NOI to the EPA for authorization for the *Discoverer* to discharge on lease block 6559 (Torpedo J) on 10 December 2010. Shell submitted supplemental NOI information for authorization for the *Kulluk* to discharge on lease blocks 6559, 6610 and 6658 on 8 April 2011, Copies of these NOI submittals are available in Appendix B of the revised Camden Bay EP.

FEDERAL AVIATION ADMINISTRATION (FAA)	**Yes**	**No**
10 a) Is your project located within five miles of any public airport?	☐	☒
b) Will you have a waste discharge that is likely to decay within 5,000 feet of any public airport?	☐	☒

11. If you answered yes to the question above, indicate the person you contacted at the Federal Aviation Administration for information.
a) Name/date of Contact: _____

FEDERAL ENERGY REGULATORY COMMISSION (FERC)	**Yes**	**No**
12 a) Does the project include any of the following:	☐	☒
1) a non-federal hydroelectric project on any navigable body of water		
2) locating a hydro project on federal land (including transmission lines)		
3) using surplus water from any federal government dam for a hydro project		
b) Does the project include construction and operation, or abandonment of interstate natural gas pipeline facilities under sections 7 (b) and (c) of the Natural Gas Act (NGA)?	☐	☒
c) Does the project include construction and operation of natural gas or liquefied natural gas importation or exportation facilities under section 3 of the NGA?	☐	☒
d) Does the project include construction for physical interconnection of electric transmission facilities under section 202 (b) of the FPA?	☐	☒

13. If you answered yes to any question above, indicate the person you contacted at the appropriate Federal Energy Regulatory Commission office for information.
a) Name/date of Contact: _____
b) Is an application required for the proposed activity? ..... ☐ ☐
c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: _____

	Yes	**No**

U.S. FOREST SERVICE (USFS)

14 a) Does the proposed project involve construction on USFS land? ☐ ☒

b) Does the proposed project involve the crossing of USFS land with a water line? ☐ ☒

c) The current list of Forest Service permits that require ACMP consistency review are online at http://alaskacoast.state.ak.us/Clawhome/handbook/pdf/11_AAC_110.pdf in Article 4, 11 AAC 110.400, pages 28-30. Does your proposed project include any of Forest Service authorizations found on pages 28-30 of the ACMP Handbook? ☐ ☒

15. If you answered yes to any question above, indicate the person you contacted at United States Forest Service for information.

a) Name/date of Contact: _____

b) Is an application required for the proposed activity? ☐ ☒

c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: _____

U.S. FISH AND WILDLIFE SERVICE (USFWS)

	Yes	No
16 a) Is your proposed project on land managed by the USFWS?	☐	☒
b) Does your project require a Right of Way from the USFWS under 50 C.F.R. 29 and 50 C.F.R. 36?	☐	☒

17. If you answered yes to any question above, indicate the person you contacted at the US Fish and Wildlife Service for information.

a) Name/date of Contact: _____

b) Is an application required for the proposed activity? ☐ ☒

c) If "YES" then submit a signed copy of the completed application to the DCOM. If "No", explain why an application isn't required. Explanation: _____

OTHER FEDERAL AGENCY APPROVALS

	Yes	No
18 a) Other Federal agencies with authorizations reviewable under the Alaska Coastal Management Program are posted online at http://alaskacoast.state.ak.us/Clawhome/handbook/pdf/11_AAC_110.pdf in Article 4, 11 AAC 110.400, pages 28-30. Does your proposed project include any of the Federal agency authorizations found on pages 28-30 of the ACMP Handbook?	☒	☐

b) If yes, which federal authorizations? See table below

19. Have you applied for any other federal permits or authorizations? ☒ ☐

Agency	Approval Type	Date Submitted
BOEMRE	Revised Exploration Plan	May 2011
BOEMRE	Revised Oil Spill Response Plan (State ODPCP)	May 2011
NMFS	MMPA IHA for Incidental Harassment Authorization for the Non-Lethal Taking of Whales and Seals	May 2011
USFWS	MMPA LOA for the Incidental Take of Polar Bears and Pacific walrus and the Intentional Take of Polar Bears	May 2011

Note: The Coastal Project Questionnaire (CPQ) identifies state and federal permits subject to a consistency review. You may need additional permits from other agencies or the affected city and borough government to proceed with your activity. Attach the documentation requested under the Project Description.

ACMP Consistency Evaluation & Certification Statement

Pursuant to 11 AAC 112.215 (a)(1)(c), the applicant shall submit an evaluation of how the proposed project is consistent with the statewide standards at 11 AAC 112.200 - 11 AAC 112.990 and with the applicable district enforceable policies, sufficient to support the consistency certification. Evaluate your project against each section of the state standards and applicable district enforceable policies using the template below or by submitting a narrative description in letter or report form. District enforceable policies are available on the ACMP website at http://www.alaskacoast.state.ak.us. Definitions of key terms can be found at: 11 AAC 110.990, 11 AAC 112.990 and 11 AAC 114.990.

If you need more space for an adequate explanation of any of the applicable standards, please attach additional pages to the end of this document. Be sure to include references to the specific sections and subsections that you are evaluating.

STATEWIDE STANDARDS

11 AAC 112.200. Coastal Development

Standard:

(a) In planning for and approving development in or adjacent to coastal waters, districts and state agencies shall manage coastal land and water uses in such a manner that those uses that are economically or physically dependent on a coastal location are given higher priority when compared to uses that do not economically or physically require a coastal location.

(b) Districts and state agencies shall give, in the following order, priority to

(1) water-dependent uses and activities;

(2) water-related uses and activities; and

(3) uses and activities that are neither water-dependent nor water-related for which there is no practicable inland alternative to meet the public need for the use or activity.

(c) The placement of structures and the discharge of dredged or fill material into coastal water must, at a minimum, comply with the standards contained in 33 CFR Parts 320 - 323, revised as of July 1, 2003.

Evaluation:

(a) How is your project economically or physically dependent on a coastal location? Why are you proposing to place the project at the selected location?

Shell proposes to complete the exploration drilling activities described in its revised Camden Bay EP on its OCS leases obtained from the BOEMRE during Lease Sales 195 and 202. Shell selected these leases based on their potential for holding oil and gas resources. Sivulliq G is located 16.6 mi (26.7 km) from shore and Torpedo J is located 23.1 mi (37.2 km) from shore and cannot be accessed / drilled from shore. Only Torpedo J is located on an OCS lease block (6559) not included in the initial Camden Bay EP. The project includes the use of existing coastal facilities at West Dock.

(b) Evaluation of development priority.

(1) How is the proposed project water-dependent? Explain.

The project involves exploration drilling on one more OCS lease block not included in initial Camden Bay EP 23.1 mi (37.2 km) from shore, which cannot be reached from shore via directional drilling. Existing boat ramps will be utilized to support the offshore operations.

(2) How is the proposed project water-related? Explain.

The project is water-dependant.

(3) If the proposed project is neither water-dependent nor water-related, please explain why there is not a practicable inland alternative that meets the public need for the use or activity. Explain.

The project is water-dependant.

c) *DCOM defers to the United States Corps of Engineers (USACE) to interpret compliance with the referenced standards.* If you plan to discharge or fill waters of the US, have you applied to the Corps of Engineers for the appropriate authorization?

Shell has received approval under NWP #8 to place the M/V *Noble Discoverer* in federal waters offshore Alaska (authorization # POA-2009-662) and a copy is provided in Appendix G of the revised Camden Bay EP. This authorization is valid until July 2011. Because the authorization will expire prior to Shell's drilling activities, Shell has applied to the USACE for coverage for either the *Discoverer* or the *Kulluk* to be placed on three OCS blocks, only one of which (6559) was not included in the initial Camden Bay EP. The application is also included as Appendix G of the revised Camden Bay EP.

11 AAC 112.210. Natural hazard areas.

Standard:

(a) In addition to those identified in 11 AAC 112.990, the department, or a district in a district plan, may designate other natural processes or adverse conditions that present a threat to life or property in the coastal area as natural hazards. Such designations must provide the scientific basis for designating the natural process or adverse condition as a natural hazard in the coastal area, along with supporting scientific evidence for the designation.
(b) Areas likely to be affected by the occurrence of a natural hazard may be designated as natural hazard areas by a state agency or, under 11 AAC 114.250(b), by a district.
(c) Development in a natural hazard area may not be found consistent unless the applicant has taken appropriate measures in the siting, design, construction, and operation of the proposed activity to protect public safety, services, and the environment from potential damage caused by known natural hazards.
(d) For purposes of (c) of this section, "appropriate measures in the siting, design, construction, and operation of the proposed activity" means those measures that, in the judgment of the coordinating agency, in consultation with the department's division of geological and geophysical surveys, the Department of Community and Economic Development as state coordinating agency for the National Flood Insurance Program under 44 C.F.R. 60.25, and other local and state agencies with expertise,
(1) satisfy relevant codes and safety standards; or
(2) in the absence of such codes and standards;
(A) the project plans are approved by an engineer who is registered in the state and has engineering experience concerning the specific natural hazard; or
(B) the level of risk presented by the design of the project is low and appropriately addressed by the project plans.

Evaluation:

(a) Describe the natural hazards designated in the district plan as they affect this site.

In the DCOM review of the initial Camden Bay EP, DCOM granted the North Slope Borough's (NSB's) request for designation of all state waters within the area bounded on the west by a longitudinal line at 148°31'40.36" (the longitude of West Dock) due north to federal waters to a longitudinal line in the east at 143°36'31" (longitude of Kaktovik due north to federal waters as a natural hazard area containing permafrost. DCOM also granted the NSB's request that these same state waters be designated as natural hazard areas for ice hazards. Ice hazards may include "ice ridging, shear zones, ice break-off, strudel scour, ice gouging, ice override, and ice pileup." Shell assumes the same designations will apply to the revised Camden Bay EP. Modification of the project does not change the conclusions regarding the evaluation of the revised project due to the natural hazards designation.

(b) Describe how the proposed project is designed to accommodate the designated hazards. How will you use site design and operate the proposed activity to protect public safety, services and the environment from potential damaged caused by known natural hazards?

Shell Responses:

Permafrost Designated Natural Hazard Area

Shallow hazards surveys have been conducted at each of the additional drill sites. Resulting reports have indicated the possible presence of permafrost in both the Sivulliq and Torpedo prospects. The main constraint associated with permafrost in exploration drilling is the loss of soil strength around the drillpipe. However, because of the highly consolidated nature of the subbottom soils at the drill sites, permafrost is not expected to present a hazard to drilling operations. At the Sivulliq G and Torpedo H drill sites, as was the case with other drill sites in the initial Camden Bay EP, Shell plans to use a mud cooler to mitigate any potential permafrost thawing while drilling the upper portions of the wells below the MLCs. Shell will also use permafrost cement in both the 30-in. and 20-in. casings. This cement has a very low heat of hydration, and will develop adequate compressive strength at low temperatures. These measures will ensure that once the 20-in. casing is set, permafrost thawing will be minimized or eliminated if any is present. The planned offshore exploration drilling program will not present a threat to public safety, services, and the environment as a result of permafrost potentially present in the drilling area. Permafrost hazards are not an issue with the EP modification (collection and transport of wastes, additional support vessels or OSR vessel, ZVSPs, and the use of the *Kulluk* as the drilling vessel).

Ice Hazards Designated Natural Hazard Area

The additional drill sites, Sivulliq G and Torpedo J, are located in an area characterized by active sea ice movement, ice scouring, and storm surges, as is the case for the drill sites included in the initial Camden Bay EP. Shell will therefore implement the same mitigation measures as reviewed by DCOM for the initial Camden Bay EP, including implementation of an Ice Management Plan (IMP), ice and weather forecasting provided by Shell's Ice and Weather Advisory Center. And Critical Operations and Curtailment Plan (COCP). The planned offshore exploration drilling program will not present a threat to public safety, security, and the environment as a result of operating in an area that may present ice hazards.

Sivulliq G Shallow Hazards Reports

A GeoLLC (2007) geohazards assessment is based on a synthesis of publicly-available geotechnical and high-resolution geophysical data, and reprocessed 2D seismic data. The GeoLLC (2008a) addendum report contains the same assessment plus high-resolution geophysical data acquired by Shell over the Sivulliq prospect during the 2006 open water season. The following parameters were analyzed in the 2007 geohazards assessment at the Sivulliq prospect:

a. Bathymetry
b. Ice gouging
c. Geologic conditions
d. Faulting
e. Seismicity
f. Gas hydrates
g. Shallow gas
h. Gas hydrates
i. General soil stratigraphy
j. Offshore permafrost
k. Buried channels
l. Historic shipwrecks
m. Prehistoric archaeological potential

These parameters were analyzed for both shallow hazards (defined as a feature or condition that presents difficulties that cannot be easily mitigated by design, implementation or procedures) and constraints (defined as a feature or condition that presents difficulties but can be easily mitigated by design, implementation or procedures).

Of all the parameters listed above, the following potential shallow hazards were identified near the Sivulliq G drill site:

- the possible occurrence of "acoustic permafrost" near the Sivulliq G drill site but not at the proposed drill sites (permafrost is not expected to be encountered during the drilling of either of these wells)
- shallow gas has been identified near the Sivulliq G drill site
    - shallow gas may be proximal to the Sivulliq G drill site and the chance of encountering shallow gas at the drill site is considered to be very low

Ice gouging is noted as an active process in the mid-shelf region of the Beaufort Sea. The majority of the gouges are oriented east to west with occasional deeper gouges crossing from the northeast to southwest. Maximum gouge depth as measured from the undisturbed seafloor is 8.2 ft (2.5 m) and the median width is 33 ft (10 m). The installation of a MLC at the Sivulliq G drill site will mitigate this constraint. The depth of the MLC is determined by the maximum ice keel scour depth, currently measured at 8.2 ft (2.5 m) below the seafloor in the Sivulliq area. The MLC depth will be adjusted to ensure that the top of the Upper H4 connector will be greater than 8.2 ft (2.5 m) below the seafloor in the event the well is temporarily abandoned leaving the ram-type BOP in place on the well during the winter, thereby protecting the BOP from damage from ice keel scouring.

Permafrost is identified in the acoustic signal over different portions of the Sivulliq prospect area and is expected to present little risk to the drilling operations. Shell will mitigate this by using chilled drilling fluids to prevent as much thawing of permafrost as possible.

Mitigation procedures and protocols for drilling safely through potential shallow gas zones are outlined in Shell's document *Protocols for Drilling Shallow Hole Segments Above the BOP Depth*. This document will be submitted as part of an APD application.

No shipwrecks or other historical artifacts were observed within the Sivulliq G drill site clearance area. No evidence of prehistorical archaeological potential was recognized within the Sivulliq G drill site clearance area.

Fugro 2009 Report

The following shallow hazards parameters were assessed for the Sivulliq G drill site in the supplemental Fugro report:

a. Man-made infrastructure
b. Seafloor conditions
c. Stratigraphy and structure
d. Permafrost
e. Shallow gas
f. Gas hydrates

The 2009 Fugro report confirmed the findings of the 2007 GeoLLC report. No shallow hazards, man-made obstructions (historic or prehistoric) were identified, specifically at the Sivulliq G drill site. The report concludes that the seafloor and shallow geologic conditions are favorable for exploration drilling operations.

Torpedo J Shallow Hazards Report

Fugro (2011) issued a site specific assessment of the Torpedo J location utilizing data collected in 2008.

The following shallow hazards parameters were assessed in the drill site clearance letter covering the Torpedo prospect, including the Torpedo J drill site:

a. Man-made facilities, obstructions, or debris
b. Seafloor features
c. Stratigraphy
d. Sub-seafloor geologic features
e. Gas hazards (shallow gas and gas hydrates)
f. Archaeological assessment

The Torpedo J drill assessment reported the following:

- No evidence of permafrost was observed at the drill site:
- No man-made facilities, obstructions or debris were identified;
- Ice gouging up to 3.5 ft (1.0 m) in depth were noted in the vicinity of the drill site. This will be mitigated by the depth of the MLC;
- Nothing unusual was identified in the stratigraphy down to the depth of investigation of 5,107 ft (1,557 m);
- No seafloor faults were identified. Four interpreted buried faults occur in the general area with the closest fault located 1,900 ft (579 m) to the northeast. None of these faults will be penetrated by the proposed well and they are not expected to adversely affect exploration drilling; and
- Anomalies indicative of possible shallow gas accumulations are interpreted to occur 2,624 ft (800 m) northeast of the drill site at a depth of 2,808 ft (856 m) below the seafloor. At the drill site, the potential for shallow gas is considered negligible.
- No shipwrecks or other historical artifacts were observed within the Torpedo J drill site clearance area. No evidence of prehistorical archaeological potential was recognized within the Torpedo J drill site clearance area. The archaeological assessment concluded that the potential for encountering prehistoric archaeological resources at the Torpedo J drill site is very low.

The report concludes that the seafloor and shallow geologic conditions are favorable for exploration drilling operations.

(d)(1) Describe the measures you will take to meet relevant codes and safety standards in the siting, design, construction and operation of the proposed activity.

Activities associated with the proposed modification to the exploration drilling program would take place largely on Shell leases located in Federal waters of the OCS. Shell will follow all applicable BOEMRE regulations, requirements, and safety standards as indicated in the initial Camden Bay EP and detailed in the revised Camden Bay EP. Compliance with applicable regulatory approvals will ensure that the relevant codes and safety standards are met. Shell's revised Camden Bay EP complies with all applicable regulatory and safety requirements of BOEMRE and the USCG and other federal and state regulatory agencies with jurisdiction over this plan. These activities and operations are described in detail in Section 2 of Shell's revised Camden Bay EP. BOEMRE has the regulatory jurisdiction to approve EPs that are consistent with Outer Continental Shelf Lands Act (OCSLA) and BOEMRE's implementing regulations, and approved the initial Camden Bay EP on December 7, 2009. The same measures will be implemented for the proposed modifications.

(d)(2)(A) If your project is located in an area without codes and safety standards, how is your project engineered for the specific natural hazard? Give the name of the appropriately qualified registered engineer who will approve the plans for protecting public safety, services, and the environment from damage caused by hazards OR

(d)(2)(B) If the level of risk presented by the design of the project is low, how do the project plans and project design address the potential natural hazard?

Activities associated with the proposed modification to the exploration drilling program would take place largely on Shell leases located in Federal waters of the OCS. Shell will follow all applicable BOEMRE regulations, requirements, and safety standards as indicated in the initial Camden Bay EP and detailed in the revised Camden Bay EP. See response for (d)(1) above.

11 AAC 112.220. Coastal access.

Standard:

Districts and state agencies shall ensure that projects maintain and, where appropriate, increase public access to, from, and along coastal water.

Evaluation:

Please explain how the proposed project will maintain and, where appropriate, increase public access to, from and along coastal water.

The modification in Shell's revised Camden Bay EP will not increase, decrease, or otherwise affect public access to, from, or along coastal waters. No construction of new, or modification existing coastal facilities are included in the initial or revised Camden Bay EP.

Shell has added two proposed drill sites, Sivulliq G and Torpedo J, which are located within a few miles of the drill sites in the initial Camden Bay EP. Sivulliq G is located 16.6 mi (26.7) km from shore, approximately 118 mi (190 km) east of Nuiqsut, and approximately 60 miles (97 km) west of Kaktovik. Torpedo J is located 23.1 mi (37.2 km) from shore, approximately 118 mi (190 km) east of Nuiqsut, and approximately 60 miles (97 km) west of Kaktovik. Therefore activities conducted at these sites will have no effect on coastal access. Additional vessel and helicopter trips will be required to support the drilling operations at these two additional drill sites, but the increase is not substantial, and would occur during a second drilling season thereby not increasing the seasonal impact of the project. Vessel and aircraft traffic will occur at the same frequency and duration, and with the same types of vessels and aircraft as for the drill sites in the initial Camden Bay EP. Within coastal waters, the vessel traffic will occur between the prospects and existing industrial facilities at West Dock and will therefore not affect the public's access to coastal waters.

Modification to the proposed exploration drilling program includes an OSV, a deck barge and tug, a waste barge and tug, and a containment barge/tug/anchor handler, but these vessels will remain offshore and outside the coastal zone, and will not affect coastal access.

The collection, storage, and transport of the selected waste streams will occur offshore and have no affect on coastal access. Vessel traffic between the drilling vessel and the deck barge and waste barge where the wastes will be stored will occur offshore near the prospects. The deck barge and waste barge will transport the wastes for disposal outside the Arctic, via an offshore route, to existing facilities in Washington and Oregon and will have no effect on coastal access.

The use of the *Kulluk* instead of the *Discoverer* as the drilling vessel will have no effect on coastal access. The drilling vessel will enter and exit the Beaufort Sea via offshore routes and will remain offshore for the duration of the drilling season.

11 AAC 112.230. Energy facilities.

Standard:

(a) The siting and approval of major energy facilities by districts and state agencies must be based, to the extent practicable, on the following standards:

(1) site facilities so as to minimize adverse environmental and social effects while satisfying industrial requirements;

(2) site facilities so as to be compatible with existing and subsequent adjacent uses and projected community needs;

(3) consolidate facilities;
(4) consider the concurrent use of facilities for public or economic reasons;
(5) cooperate with landowners, developers, and federal agencies in the development of facilities;
(6) select sites with sufficient acreage to allow for reasonable expansion of facilities;
(7) site facilities where existing infrastructure, including roads, docks, and airstrips, is capable of satisfying industrial requirements;
(8) select harbors and shipping routes with least exposure to reefs, shoals, drift ice, and other obstructions;
(9) encourage the use of vessel traffic control and collision avoidance systems;
(10) select sites where development will require minimal site clearing, dredging, and construction;
(11) site facilities so as to minimize the probability, along shipping routes, of spills or other forms of contamination that would affect fishing grounds, spawning grounds, and other biologically productive or vulnerable habitats, including marine mammal rookeries and hauling out grounds and waterfowl nesting areas;
(12) site facilities so that design and construction of those facilities and support infrastructures in coastal areas will allow for the free passage and movement of fish and wildlife with due consideration for historic migratory patterns;
(13) site facilities so that areas of particular scenic, recreational, environmental, or cultural value, identified in district plans, will be protected;
(14) site facilities in areas of least biological productivity, diversity, and vulnerability and where effluents and spills can be controlled or contained;
(15) site facilities where winds and air currents disperse airborne emissions that cannot be captured before escape into the atmosphere;
(16) site facilities so that associated vessel operations or activities will not result in overcrowded harbors or interfere with fishing operations and equipment.
(b) The uses authorized by the issuance of state and federal leases, easements, contracts, rights-of-way, or permits for mineral and petroleum resource extraction are uses of state concern.

Evaluation:
(a) If this standard applies to your project, please describe in detail how the proposed project is designed to meet each applicable section of this standard:

Modification to the exploration drilling program includes: one or more additional seasons to perform additional exploration drilling at two additional drill sites, additional vessels (OSV, deck barge and tug, waste barge and tug, and containment barge with tug and anchor handler), collections, storage, and transport of selected waste streams, ZVSPs, and use of the *Kulluk* instead of the *Discoverer* as the drilling vessel.

1) The drill site locations were selected based on interpretation and analysis of seismic surveys, and are in Federal waters of the OCS within oil and gas leases obtained from BOEMRE during oil and gas lease sales. Specific locations of the surface hole and anchor locations were selected based on the results of shallow hazards surveys and archeological assessments to minimize safety risks and avoid impacts to cultural resources. The additional support vessels, collection and storage of the selected waste streams, ZVSPs, and use of either drilling vessel will also be located offshore in the OCS either in or near the referenced lease blocks.

2) The drill sites and associated modification to the EP will be located in the OCS, and primarily on oil and gas lease blocks, and are therefore compatible by definition with the primary use of the area. There are few other uses in or near these lease blocks. There is no commercial fishing in the OCS waters of the Beaufort Sea and probably no recreational fishing. Commercial vessel traffic in the Beaufort Sea is limited largely to a small number of barge trips for supply of coastal villages or oil and gas facilities at Prudhoe Bay. This barge traffic is typically much closer to the coast than the drill sites. Subsistence activities occur in the area including the hunting of waterfowl, seals, and bowhead whales by Nuiqsut and possibly Kaktovik residents, with bowhead whales being the most important resource. Mitigation measures developed by Shell in consultation with these stakeholders will avoid most or all effects on subsistent, and thus be compatible, the primary mitigation measure being the shutdown (and relocation out of the subsistence area) of the drilling operation from 25 August through the end of the Nuiqsut (Cross Island) and Kaktovik fall whaling season.

(3-4) There are no other concurrent uses or facilities in the area with which Shell could consolidate. Shell is consolidating / sharing the use of some vessels in the proposed modification (containment barge with tug and anchor handler) with the planned exploration drilling program in the Chukchi Sea to reduce fleet size.

5) There are no developers in the area and BOEMRE holds jurisdiction over the submerged lands. Shell is cooperating with BOEMRE, and other Federal agencies with jurisdiction over resources in the area including NMFS, USFWS, and EPA. This cooperation is evident in the revised Camden Bay EP submitted to BOEMRE, the IHA/4MP (Appendix C & D), LOA (Appendix E), and the NPDES NOIs (Appendix B) and air permit respectively.

6) Shell's planned drill sites are located in OCS lease blocks with sufficient acreage (approximately 5,690 ac) to accommodate the planned activities and any future activities with regards to exploration for oil and gas.

7) The drill sites and associated activities would be located in offshore OCS leases where there is no infrastructure. However, the exploration drilling program will be conducted with either of two self-contained drilling vessels supported by vessels and aircraft as typically accomplished in offshore oil and gas exploration. No new infrastructure is planned. Existing facilities at West Dock and Deadhorse / Prudhoe Bay are sufficient and easily accommodate logistical needs for the program, including air, marine and land-based support.

8) No new harbors or shipping routes are required or planned as part of the modification in the revised Camden Bay EP.

9) All vessel traffic associated with the modification, including the deck barge and tug, waste barge and tug, containment barge / tug / anchor handler, and the *Discoverer/Kulluk* will be coordinated through the use of normal USCG and industry vessel communication protocols. Collision avoidance systems include the use of shipboard GPS tracking and radar systems.

10) No site clearing, dredging, or facility construction will be required, or is planned for these modifications. MLCs will be constructed at each drill site through a drilling process. MLCs and required by regulation everywhere in the Beaufort Sea OCS to protect wellhead equipment from ice, if and when the drilling vessel moves off the drill site.

11) No new shipping routes are required or planned as part of the modification to the revised Camden Bay EP.

12) No construction of facilities or support infrastructures in coastal areas is required or planned for the modification in the revised Camden Bay EP.

13) The drill sites and associated activities would be located in offshore OCS leases and are not in or near any areas of particular scenic, recreational, environmental, or cultural value.

(14) The drill sites and associated activities would be located offshore in OCS leases. The drill sites were selected based on interpretation and analysis of 3-D seismic survey data and shallow hazards and archaeological assessments. The drill sites are not within any areas identified as having especially high biological productivity, diversity, or vulnerability. The nearest such areas in the offshore is the Stefansson boulder patch located approximately 100 mi (161 km) west of the drill sites. Important or productive areas, such as the Arctic National Wildlife Refuge, and lagoons are located along the coastline 16.6-23.1 mi (26.7-37.2 km) from the drill sites. Air pollutant emissions, discharge effluents, and sound generated by activities at the drill sites would have no effect on these areas. No new aircraft or vessel transit routes are planned. As part of the modification of the Camden Bay EP, Shell has added a containment barge with additional oil spill response capabilities, as well as a capping stack, located on one of the ice management vessels, and associated intervention equipment to respond to any well control events or oil spills.

(15) The drill sites and associated activities would be located offshore in OCS leases where winds and air currents would disperse airborne emissions that cannot be captured before escape into the atmosphere. Modeling indicates that National Ambient Air Quality Standards (NAAQs) will be met within 1,640 ft (500 m) of either drilling vessel.

(16) The drill sites and associated activities (additional vessels, ZVSPs, waste collection and transport) would be located offshore in OCS leases and will not result in overcrowded harbors or interfere with fishing operations and equipment. There are no commercial fishing operations in the Beaufort Sea OCS. The addition of two drill sites to the plan will result in additional vessel trips to Dutch Harbor and West Dock, but at the same drilling seasonal frequency and duration as reviewed for the initial Camden Bay EP. Collection, storage and transport of the selected waste streams to Washington / Oregon for onshore disposal will result in the use of port facilities in that area. No construction of facilities is planned in any port or harbor as part of these revised Camden Bay EP modification. The planned modification will not result in any harbor overcrowding or interference with fishing

(b) List the authorizations for state and federal leases, easements, contracts, rights-of-way, water rights, or permits for mineral and petroleum resource extraction you have applied for or received.

The proposed exploration drilling program will be conducted in Federal waters of the OCS on leases held by Shell as indicated below in Table 6. Shell is submitting the revised Camden Bay EP for approval to conduct exploration drilling at the drill sites. Applications for Permits to drill at these locations will be filed with BOEMRE after the revised Camden Bay EP is approved and the permits must be obtained before drilling can be conducted.

Table 6 Federal Leases on Which Exploration Drilling Would Occur

Drill Site	Lease	Block	OCS Lease Sale
Sivulliq G	OCS-Y-1805	Flaxman Island 6658	195
Torpedo J	OCS-Y-1936	Flaxman Island 6559	202

11 AAC 112.240. Utility routes and facilities.

Standard:

(a) Utility routes and facilities must be sited inland from beaches and shorelines unless
(1) the route or facility is water-dependent or water related; or
(2) no practicable inland alternative exists to meet the public need for the route or facility.
(b) Utility routes and facilities along the coast must avoid, minimize, or mitigate
(1) alterations in surface and ground water drainage patterns;
(2) disruption in known or reasonably foreseeable wildlife transit;
(3) blockage of existing or traditional access.

Evaluation:

(a) If the proposed utility route or facility is sited adjacent to beaches or shorelines, explain how the route or facility is water dependent water related or why no practical inland alternative exits.

Modification to the exploration drilling program as detailed in the revised Camden Bay EP, as well as the initial Camden Bay EP, does not involve the construction of any utility routes or facilities. This standard is not applicable.

(b) If the proposed utility route or facility is sited along the coast, explain how you will avoid, minimize or mitigate:

(1) alterations in surface and ground water drainage patterns;
(2) disruption in known or reasonably foreseeable wildlife transit;
(3) blockage of existing or traditional access.

Modification to the exploration drilling program as detailed in the revised Camden Bay EP, as well as the initial Camden Bay EP, does not involve the construction of any utility routes or facilities. This standard is not applicable.

11 AAC 112.250. Timber harvest and processing.

Standard:

AS 41.17 (Forest Resources and Practices Act) and the regulations adopted under that chapter with respect to the harvest and processing of timber are incorporated into the program and constitute the components of the program with respect to those purposes.

Evaluation:
Does your activity involve harvesting or processing of timber? Yes _____ No X
If yes, please explain how your proposed project meets the standards of the State Forest Resources and Practices Act.

Timber harvest and processing is not within the scope of the planned exploration drilling program, therefore this standard is not applicable.

11 AAC 112.260. Sand and gravel extraction.

Standard:
Sand and gravel may be extracted from coastal waters, intertidal areas, barrier islands, and spits if there is no practicable alternative to coastal extraction that will meet the public need for the sand or gravel.

Evaluation:
If your proposed project includes extracting sand or gravel from coastal waters, intertidal areas, barrier islands or spits, please explain why there is no practicable alternative to coastal extraction that meets the public need for sand or gravel.

Sand and gravel will not be used for the planned exploration drilling program.

11 AAC 112.270. Subsistence.

Standard:
(a) A project within a subsistence use area designated by the department or under 11 AAC 114.250(g) must avoid or minimize impacts to subsistence uses of coastal resources.
(b) For a project within a subsistence use area designated under 11 AAC 114.250(g), the applicant shall submit an analysis or evaluation of reasonably foreseeable adverse impacts of the project on subsistence use as part of
(1) a consistency review packet submitted under 11 AAC 110.215; and
(2) a consistency evaluation under 15 C.F.R. 930.39, 15 C.F.R. 930.58, or 15 C.F.R. 930.76.
(c) Repealed 10/29//2004, Register 172.
(d) Except in nonsubsistence areas identified under AS 16.05.258, the department may, after consultation with the appropriate district, federally recognized Indian tribes, Native corporations, and other appropriate persons or groups, designate areas in which a subsistence use is an important use of coastal resources as demonstrated by local usage.
(e) For purposes of this section, "federally recognized Indian tribe," "local usage", and "Native corporation" have the meanings given in 11 AAC 114.990.

Evaluation:
(a) Is your proposed project located within a subsistence use area designated by a coastal district?
Yes X No
If yes, please describe how the proposed project is designed to "avoid or minimize impacts to subsistence uses of coastal resources:"

In review of the initial Camden Bay EP, DCOM granted the NSB's request for designation of all state waters within the area bounded on the west by a longitudinal line at 148°31'40.36" (the longitude of West Dock) due north to federal waters to a longitudinal line in the east at 143°36'31" (longitude of Kaktovik) due north to federal waters as subsistence use areas for the subsistence species and activities described in bullets below. Modification to the exploration drilling program includes: two additional drill sites, additional vessels (OSV, deck barge and tug, waste barge and tug, and containment barge with tug and anchor handler), collections, storage, and transport of selected waste streams, ZVSPs, and possible use of the *Kulluk* instead of the *Discoverer* as the drilling vessel. Shell assumes the same designations will apply to the modification in the revised Camden Bay EP. Modification of the project does not change the conclusions regarding the evaluation of the revised project versus these subsistence use designations.

- Marine Mammals: Polar bear, bearded seal, harbor or spotted seal, ribbon seal, ringed seal, walrus, beluga whale, and gray whale. Bowhead whale subsistence-use areas are described below.
- Land Mammals: Black bear, grizzly bear, caribou, moose, and Dall sheep.

- Fish: Blackfish, capelin, herring, Arctic Char, Arctic cod, ling cod, tom cod, Arctic flounder, grayling, northern pike, chum salmon, humpback salmon, Coho salmon, king salmon, sculpin, smelt, sucker, lake trout, Arctic cisco, least cisco, Bering cisco, rainbow trout, broad whitefish, humpback whitefish, round whitefish, and sheefish.
- Waterfowl: Eggs, lesser brant, sandhill crane, common eider, king eider, spectacled eider, Steller's eider, Canada goose, lesser snow goose, white-fronted goose, Arctic loon, common, loon, red throated loon, common murre, thickbilled murre, oldsquaw, snowy owl, pintail, rock ptarmigan, and willow ptarmigan.
- Furbearers: Arctic fox, red fox, snowshoe hare, lynx, hoary marmot, mink, porcupine, Arctic ground squirrel, weasel, wolf, and wolverine.
- Gathering: Clams, king crab, tanner crab, shrimp, blueberry, cloudberry, cranberry, crowberry, Hudson's Bay tea, salmon berry, sourdock, swamp grass, wild celery, wild chives, wild potato, wild rhubarb, wild spinach, willow leaves, alder bark, birch trees, willow brush, driftwood, sod, spruce trees, and timber logs.

Additionally, DCOM designated the following areas for subsistence uses related to bowhead whales for the initial Camden Bay EP. Shell assumes the same designations will apply to the revised Camden Bay EP. Modification of the project does not change the conclusions regarding the evaluation of the revised project versus these subsistence use designations.

Barrow Fall Subsistence Area: Excluding federal waters, all state coastal waters within the following areas are designated for subsistence use of bowhead whales from September to October: The area circumscribed from the mouth of Tuapaktushak Creek due north to the coastal zone boundary, to Cape Halkett due east to the coastal zone boundary.

Nuiqsut: Excluding federal waters, all state coastal waters within the following areas are designated for subsistence use of bowhead whales from August to October: The area circumscribed from the Nechelik Channel of the Colville River due north to the coastal zone boundary, to the eastern point of Flaxman Island due north to the coastal zone boundary and due south to the shore.

Kaktovik: Excluding federal waters, all state coastal waters within the following areas are designated for subsistence use of bowhead whales from August to October: The area circumscribed from Anderson Point in Camden Bay due north to the coastal zone boundary, to Humphrey Point due north the coastal zone boundary.

Point Hope Fall Subsistence Area: Excluding federal waters, all state coastal waters within the following areas are designated for subsistence use of bowhead whales from September to October: The area circumscribed from Cape Lisburne due north to the coastal zone boundary, to Cape Thompson due south to the coastal zone boundary.

Activities associated with modification of the Camden Bay EP will occur in Federal waters of the OCS, primarily within the lease blocks Flaxman Island 6658 and Flaxman Island 6559, for Sivulliq G and Torpedo J, respectively and surrounding OCS areas. The distances from these lease blocks to the subsistence use areas assumed designated for the revised Camden Bay EP are provided below in Table 7.

Table 7 Distances from Flaxman Island Blocks 6658 and 6559 to Designated Subsistence Use Areas

Subsistence Use Area	Distance to Nearest Revised Camden Bay EP Lease Block	
	Miles	Kilometers
Barrow Fall Subsistence	138.7	223.2
Nuiqsut Subsistence	9.3	14.9
Kaktovik Subsistence	37.7	60.6

The permits and authorizations table included in Section 2.0 lists the authorizations and necessary permits to conduct the planned exploration drilling program. Shell will adopt the mitigation measures written into these authorizations, and will therefore be working within regulatory requirements. In addition to meeting all regulatory requirements, Shell is committed to other mitigation measures including those that will decrease any potential conflicts between

exploration drilling activities and subsistence harvests. For the Camden Bay exploration drilling program, these mitigation measures include:

Communications

- Shell has developed a Communication Plan and will implement this plan before initiating exploration drilling operations to coordinate activities with local subsistence users, as well as Village Whaling Captains' Associations, to minimize the risk of interfering with subsistence hunting activities, and keep current as to the timing and status of the bowhead whale hunt and other subsistence hunts. The Communication Plan includes procedures for coordination with Com Centers to be located in coastal villages along the Chukchi and Beaufort Seas during Shell's proposed exploration drilling activities.
- Shell will employ local SAs from the Beaufort and Chukchi Sea villages that are potentially impacted by Shell's exploration drilling activities. The SAs will provide consultation and guidance regarding the whale migration and subsistence activities. There will be one per village, working approximately 8-hr per day and 40-hr weeks during the drilling seasons. The subsistence advisor will use local knowledge (Traditional Knowledge) to gather data on subsistence lifestyle within the community and to advise in ways to minimize and mitigate potential negative impacts to subsistence resources during the drilling season. Responsibilities include reporting any subsistence concerns or conflicts; coordinating with subsistence users; reporting subsistence-related comments, concerns, and information; coordinating with the Com and Call Center personnel; and advising how to avoid subsistence conflicts. Subsistence advisors will have a handbook that will specify work tasks in more detail.

Aircraft Travel

- Aircraft shall not operate below 1,500 ft (457 m) unless the aircraft is engaged in marine mammal monitoring, approaching, landing or taking off, in poor weather (fog or low ceilings) in an emergency situation. Aircraft engaged in marine mammal monitoring shall not operate below 1,500 ft (457 m) in areas of active whaling; such areas to be identified through communications with the Com Centers. Except for airplanes engaged in marine mammal monitoring, aircraft shall use a flight path that keeps the aircraft at least 5 mi (8 km) inland until the aircraft is south of its offshore destination, then at that point it shall fly directly north through the Mary Sachs Entrance to its destination. Shell reserves the option to use an alternate flight route in the event that transit through the Mary Sachs Entrance is unsafe due to weather, other environmental conditions, or in the event of an emergency.
- Aircraft and vessels will not operate within 0.5 mi (0.8 km) of walrus or polar bears when observed on land or ice.
- Shell will also implement non-MMO flight restrictions prohibiting aircraft from flying within 1,000 ft (300 m) of marine mammals or below 1,500 ft (457 m) altitude (except during takeoffs and landings or in emergency situations) while over land or sea. This flight will also help avoid disturbance of and collisions with birds.

Vessel Travel

- The Kulluk or Discoverer and support vessels will enter the Chukchi Sea through the Bering Strait on or after July 1, minimizing effects on marine mammals and birds that frequent open leads and minimizing effects on spring and early summer bowhead whale hunting.
- Exploration drilling activities at the Sivulliq or Torpedo drill sites are planned to begin on or about July 10 following transit into the Beaufort Sea and run through October 31, with a suspension of all operations beginning August 25 for the Nuiqsut (Cross Island) and Kaktovik subsistence bowhead whale hunts. During the suspension for the whale hunts the drilling fleet will leave the Camden Bay project area and move to an area north of latitude 71° 25'N and west of longitude 146° 4'W. Shell does not plan to anchor during this suspension. Shell will return to resume activities after the subsistence bowhead whale hunts conclude. Exploration drilling activities will be completed by October 31, depending on ice and weather.
- The drilling support fleet transit route will avoid known fragile ecosystems, including the Ledyard Bay Critical Habitat Unit, and will include coordination through Com Centers.

- To minimize impacts on marine mammals and subsistence hunting activities, the drilling vessel and support fleet will transit through the Chukchi Sea along a route that lies offshore of the polynya zone. In the event the transit outside of the polynya zone results in Shell having to break ice (as opposed to managing ice by pushing it out of the way), the drilling vessel and support vessels will enter into the polynya zone far enough so that ice breaking is not necessary. If it is necessary to move into the polynya zone, Shell will notify the local communities of the change in the transit route through the Com Centers. As soon as the fleet transits past the ice, it will exit the polynya zone and continue a path in the open sea toward the Camden Bay drill sites.
- MMOs will be aboard the Kulluk or Discoverer and all support vessels (see the 4MP in Appendix D of the revised Camden Bay EP).
- When within 900 ft (274 m) of marine mammals, vessels will reduce speed, avoid separating members from a group and avoid multiple changes of direction.
- Vessel speed is to be reduced during inclement weather conditions in order to avoid collisions with marine mammals.
- All vessels must maintain cruising speed not to exceed nine knots while transiting the Beaufort Sea. This measure would reduce the risk of ship-whale collisions.
- Shell will communicate and coordinate with the Com Centers regarding all vessel transit.

Drilling Operations

- Shell will collect all drilling mud and cuttings with adhered mud from all well sections below the 26-in. (20-in. casing) hole section, as well as treated sanitary waste water, domestic wastes, bilge water and ballast water, and transport them outside the Arctic for proper disposal in an EPA-licensed TDS. These waste streams will not be discharged to the ocean.
- Drilling mud will be cooled to mitigate any potential permafrost thawing or thermal dissociation of any methane hydrates encountered during drilling, if such materials are present at the drill site.
- Drilling muds will be recycled to the extent practicable based on operational considerations (e.g., whether mud properties have deteriorated to the point where they cannot be used further) so that the volume of the spent mud is reduced.
- Critical operations will not be started if potential hazards (ice floe, inclement weather, etc.) are in the vicinity and there is not sufficient time to complete the critical operation before the arrival of the hazard at the drill site (see COCP in Appendix J of the revised Camden Bay EP).
- All casing and cementing programs will be certified by a registered professional engineer.
- Airguns arrays will be ramped up slowly during ZVSPs to warn cetaceans and pinnipeds in the vicinity of the airguns and provide time for them to leave the area and avoid potential injury or impairment of their hearing abilities. Ramp ups from a cold start when no airguns have been firing will begin by firing a single airgun in the array. A ramp up to the required airgun array volume will not begin until there has been a minimum of 30 min of observation of the safety zone by MMOs to assure that no marine mammals are present. The safety zone is the extent of the 180 dB radius for cetaceans and 190 dB for pinnipeds. The entire safety zone must be visible during the 30-min lead-in to an array ramp up. If a marine mammal(s) is sighted within the safety zone during the 30-min watch prior to ramp up, ramp up will be delayed until the marine mammal(s) is sighted outside of the safety zone or the animal(s) is not sighted for at least 15-30 min: 15 min for small odontocetes and pinnipeds, or 30 min for baleen whales and large odontocetes.
- The blowout prevention program will be enhanced through the use of two sets of blind/shear rams, increased frequency of BOP performance tests from 14 days to 7 days, a remotely operated vehicle (ROV) control panel on the seafloor with sufficient pressured water-based fluid to operate the BOP, a containment system that includes treatment and flaring capabilities, capping stack equipment, and a fully-designed relief well drilling plan and provisions for a second relief well drilling vessel (*Discoverer* or *Kulluk*) to be available to drill the relief well if the primary drilling vessel is disabled and not capable of drilling its own relief well.

- Lighting on the drilling vessel will be shaded and has been replaced with ClearSky lighting. ClearSky lighting is designed to minimize the disorientation and attraction of birds to the lighted drilling vessel to reduce the possibility of a bird collision (see the Bird Strike Avoidance and Lighting Plan in Appendix I of the revised Camden Bay EP).

Ice Management

- Ice management will involve preferentially redirecting, rather than breaking, ice floes while the floes are well away from the drill site (see the Ice Management Plan in Appendix K of the revised Camden Bay EP).
- Real time ice and weather forecasting will be from the Shell Ice and Weather Advisory Center (SIWAC).

Oil Spill Response

- The primary OSR vessel will be on standby at all times when drilling into zones containing oil to ensure that oil spill response capability is available within one hour, if needed.
- Shell will deploy an OSR fleet that is capable of collecting oil on the water up to the calculated Worst Case Discharge flowrate of a blowout in the unlikely event that one should occur. The primary OSR vessel will be on standby when drilling into zones containing oil to ensure that oil spill response capability is available within one hour, if needed. The remainder of the OSR fleet will be fully engaged within 72 hours.
- In addition to the OSR fleet, oil spill containment equipment will be available for use in the unlikely event of a blowout. The barge will be centrally located in the Beaufort Sea and supported by an Invader Class Tug and possibly an anchor handler. The containment equipment will be designed for conditions found in the Arctic including ice and cold temperatures. This equipment will also be designed for maximum reliability, ease of operation, flexibility and robustness so it could be used for a variety of blowout situations.
- Capping Stack equipment will be stored aboard one of the ice management vessels and will be available for immediate deployment in the unlikely event of a blowout. Capping Stack equipment consist of subsea devices assembled to provide direct surface intervention capability with the following priorities:
- Attaching a device or series of devices to the well to affect a seal capable of withstanding the maximum anticipated wellhead pressure (MAWP) and closing the assembly to completely seal the well against further flows (commonly called “capping and killing”)
- Attaching a device or series of devices to the well and diverting flow to surface vessel(s) equipped for separation and disposal of hydrocarbons (commonly called “capping and diverting”)
- A polar bear culvert trap has been constructed in anticipation of OSR needs and will be deployed near Point Thomson or Kaktovik prior to drilling.
- Pre-booming is required for all fuel transfers between vessels

Air Emissions

Kulluk

- The Kulluk will have selective catalytic reduction (SCR) as a nitrogen oxide (NOx) tailpipe emission control on its primary engines. The primary generators will also have oxidation catalysts installed for control of particulate matter less than 2.5 microns ($PM_{2.5}$), volatile organic compounds (VOC), and carbon monoxide (CO).
- The other engines normally used in the exploration drilling activities (the air compressors, the MLC, hydraulic power units (HPU), and cranes) will also have oxidation catalysts as tailpipe control for oxidizing all oxidize-able substances, including $PM_{2.5}$, VOC, and CO. Control of engine emissions is assumed to be 50 percent for $PM_{2.5}$, 80 percent for CO, and 70 percent for VOC.
- Ice management vessels and anchor handlers will have SCR as a nitrogen oxide (NOx) tailpipe emission control on its primary engines..

- ULSD (0.0015 percent) fuel will be purchased for the Kulluk and support vessels to reduce sulfur dioxide (SO_2) emissions.

Discoverer

- Primary generators on the Discoverer are retrofitted with selective catalytic reduction devices to reduce NOx emissions to under 0.5 g/kW-hr, and catalytic oxidation devices to reduce CO, VOCs and PM_{10}.
- All other engines on the Discoverer will either be Tier 3 (low emissions) or will be retrofitted with Catalytic Diesel Particulate Filters devices to reduce CO, VOCs, and HAPs and fine particulate matter.
- Installation of selective catalyst reduction and oxidation catalyst emission controls on all propulsion and generation engines on the primary ice management vessel.
- ULSD (0.0015 percent) fuel will be purchased for the Discoverer and support vessels to reduce SO_2 emissions.

(b) If your project is located in a subsistence use area designated by the coastal district, provide an analysis or evaluation of its reasonably foreseeable adverse impacts to the subsistence uses.

Subsistence resources used by the communities of Kaktovik and Nuiqsut are discussed in Section 3.11.7 under Socioeconomic Resources of the EIA. Activities associated with the proposed modifications to the revised Camden Bay EP that could potentially affect subsistence activities in these designated areas are discussed in detail in Section 4.1.2 of the EIA (Appendix F of the EP), and include air pollutant emissions, discharge effluents, sound energy generated by drilling, ice management and vessel traffic, ZVSPs, and disturbance due to vessel and aircraft traffic.

Modeling analysis indicates that criteria air pollutant concentrations will be at or below primary and secondary National Ambient Air Quality Standards (NAAQS) within 500 m of the drilling vessel. The emission of air pollutants from the activities at the two drill sites should therefore result in only minor temporary impacts to local air quality, no effects on subsistence resources, and given the distance from the drill sites to the subsistence use areas (Table 7), have no effect on subsistence activities in the designated areas.

Discharges associated with the modification activities include the discharge of deck drainage, desalination unit wastes, BOP fluid, non-contact cooling water, excess cement, and cuttings from MLC construction and drilling of the upper hole sections (no drilling mud used). Modification of the Camden Bay EP includes the collection, storage, and transportation of the drilling fluids and drill cuttings generated by drilling the lower well sections, treated sanitary and domestic water, bilge and ballast water. This modification will reduce the already minor, localized, and temporary impacts to water quality and the seafloor associated with drilling waste discharges as evaluated in review of the initial Camden Bay EP. The remaining discharges are relatively benign and any effects on water quality would be generally restricted to the area within about 330 ft (100 m) of the discharge point. Modeling of the cooling water discharge (the discharge of greatest volume), which consists of uncontaminated, heated seawater, indicates that the effluent will approach ambient seawater temperatures within about 75 m of the discharge location. The discharge of cuttings from MLC construction and drilling the upper well sections will result in short-term impacts to water quality – primarily increased total suspended sediments but will be limited to the area within about 1,591 ft (485 m) of the discharge location and last only minutes or hours after the discharge is stopped. The discharged cuttings will settle on the seafloor over an area of about 0.0095 mi^2 (0.024 km^2) below and down-current of the drilling vessel, and would result in the smothering of some benthic organisms and slightly elevated concentrations of some metals. However, these effects would be ameliorated within a few years by biodegradation and re-colonization. The impact is negligible due to the limited area affected. These discharges would have little or no effect on subsistence resources, and given the distance from the drill sites to the subsistence use areas (Table 4), would have no effect on subsistence activities in the designated areas.

Noise generated by ice management and vessels traffic, drilling at the two additional drill sites, and by ZVSPs at all four drill sites, has the potential to affect lower trophic organisms, fish, marine birds, and marine mammals. These effects are discussed in detail in Sections 4.1.5, 4.1.6, 4.1.7, and 4.1.8 in the EIA (Appendix F of the EP). Effects

would be largely limited to behavioral disturbance within the area ensonified by these activities (Table 8).

Table 8. Extent of Ensonification from Activities Associated with Modification to the Camden Bay EP

Activity	Modeled Distance to Received Sound Level Radii	
	Radii	Sound Level
Drilling - *Discoverer*	3.32 km	120 dB rms
Drilling - *Kulluk*	13.27 km	120 dB rms
ZVSP	3.67 km	160 dB rms

Exposure of marine mammals to sound energy levels of 160 db rms from impulse sounds such as ZVSPs and 120 dB for continuous sounds such as drilling sounds have been shown to sometimes result in disturbance of marine mammals, and may be considered takes by NMFS. The modeling results indicate that these levels of ensonification may reach some designated subsistence use areas. Any effects on subsistence would be due to disturbance of the subsistence resources – primarily marine mammals. Behavioral reactions may make the animals more difficult to hunt or deflect their movements away from an area.

Reasonably foreseeable adverse impacts potentially include the temporary deflection of bowhead whales from their migratory route that may result in increased effort, risk, and expenses associated with additional travel to conduct the subsistence hunt. The planned exploration drilling program may have some level of disturbance on subsistence species such as bowhead whales, beluga whales, and seals. Sound associated with drilling activities varies considerably with ongoing operations, location, and environmental factors. In addition, marine mammal responses to drilling sound are variable. Nonetheless, the great concern expressed by residents on the North Slope of Alaska of the effects of drilling sound on the success of subsistence hunts is noted (MMS 2003).

The bowhead whale is of primary importance because it provides for a cultural basis for sharing and community cooperation and is the foundation of the Inupiat sociocultural system (MMS 2003). Impacts on Inupiat bowhead whalers may occur if whales are deflected seaward (further from shore) in the traditional hunting areas north of Point Thomson in Camden Bay. Some bowhead whales in the vicinity of the planned exploration drilling program might be expected to respond to sound by changing their speed and direction, thus avoiding close encounters of these sound sources. Bowhead whales exposed to drilling operations could experience temporary, nonlethal effects, and some avoidance behavior could persist up to 12 hours (MMS 2003). Whaling crews may have to travel greater distances to intercept westward migrating whales, thereby increasing risk for whaling crews and/or limiting chances of successfully striking and landing bowheads.

Seals, beluga whales, polar bears, and walrus may also respond to drilling activity that could potentially interrupt subsistence activities. However, these species are often closely associated with ice-covered waters (Burns 1967; Kelly 1988; Richard et al. 1998; Durner et al. 2004; Angliss and Outlaw 2005) or use coastal haulouts in the case of the spotted seal (Angliss and Lodge 2002). During the drilling season, the planned exploration drilling program will be well away from coastal haulouts and likely well away from ice-covered waters.

Activities associated with the modification to Shell's Camden Bay exploration drilling program will avoid any potential impacts to the Nuiqsut (Cross Island) and Kaktovik fall bowhead whale subsistence hunts through mitigation measures. These are the same mitigation measures as considered in the review of the initial Camden Bay EP. The primary mitigation measure focused on the bowhead subsistence hunt is that exploration drilling activities at the additional drill sites (as was the case for the drill sites in the initial Camden Bay EP) are planned to begin on or about 10 July and run through 31 October with a suspension of all operations during the time period when the Cross Island and Kaktovik fall bowhead hunts occur. During the suspension for the whale hunts the drilling fleet will leave the Camden Bay project area and move to an area north of latitude 71° 25'N and west of longitude 146° 4'W. The suspension will continue until the Cross Island and Kaktovik fall bowhead hunts are over, at which time the vessels may transit back to the drill site and continue operations through 31 October.

(c) No response required.

(d) If your project is not located in a designated subsistence use area, please describe any subsistence uses of coastal resources within the project area. Please be advised that subsistence use areas may be designated by the department during a review.

Not applicable, the department has designated subsistence use areas as discussed above.

(e) No response required.

11 AAC 112.280. Transportation routes and facilities.

Standard:

Transportation routes and facilities must avoid, minimize, or mitigate
(1) alterations in surface and ground water drainage patterns;
(2) disruption in known or reasonably foreseeable wildlife transit; and
(3) blockage of existing or traditional access.

Evaluation:

If your proposed project includes transportation routes or facilities, describe how it avoids, minimizes, or mitigates

(1) alterations in surface and ground water drainage patterns;

The exploration drilling program has been modified by the addition of two drill sites (Sivulliq G and Torpedo J), collection and transport of five waste streams, additional vessels (OSV, deck barge and tug, waste barge and tug, and containment barge/tug/anchor handler), ZVSP, and possible use of the *Kulluk*. All of these activities associated with the modification would take place offshore in Federal waters outside the coastal zone and would have no effect on surface and groundwater drainage patterns in the coastal zone or elsewhere. No construction of new transportation facilities is proposed.

(2) disruption in known or reasonably foreseeable wildlife transit; and

The program will not disrupt terrestrial wildlife transit. Sound generated by drilling at the Sivulliq G and Torpedo J drill sites could result in the deflection of movements by marine mammals such as bowhead whales, belugas, bearded seals, ringed seals, spotted seals or walrus during a subsequent drilling season, but the rate or level is assumed consistent for each drilling season. Detailed analyses of the levels and effects of sound generated by the drilling vessels, support vessels, and ZVSPs on birds, marine mammals, and threatened and endangered species are provided in Sections 4.1.7, 4.1.8, and 4.1.9 respectively in the EIA (Appendix F of the EP).

Appropriate mitigation measures have been adopted to avoid and/or minimize disruptions or deflections of marine mammals. Section 4.0 of the EIA (Appendix F of the EP) details the environmental impacts of the following drilling activities: discharges or emissions: vessel traffic; vessel mooring and MLC construction; aircraft traffic; sound energy from drilling and ice management; drill cuttings and drilling mud discharges; other permitted discharges; hydrocarbon spill; and project air emissions. The environmental impacts of these exploration drilling activities, discharges or emissions on wildlife transit are found in the following subsections: 4.1.8 (Marine Mammals); 4.1.7 (Coastal and Marine Birds); 4.1.6 (Fish); 4.1.8 (Terrestrial Mammals); 4.1.9 (Threatened and Endangered Species and Critical Habitat).

(3) blockage of existing or traditional access.

The exploration drilling program has been modified by the addition of two drill sites (Sivulliq G and Torpedo J), collection and transport of five waste streams, additional vessels (OSV, deck barge and tug, waste barge and tug, and containment barge/tug/anchor handler), ZVSP, and possible use of the *Kulluk*. All of these activities associated with the modification would take place offshore in Federal waters and would have no effect on traditional access to and of the coastal zone.

11 AAC 112.300. Habitats.

Standard:

(a) Habitats in the coastal area that are subject to the program are
(1) offshore areas;
(2) estuaries;
(3) wetlands;

(4) tideflats;
(5) rocky islands and sea cliffs;
(6) barrier islands and lagoons;
(7) exposed high-energy coasts;
(8) rivers, streams, and lakes and the active floodplains and riparian management areas of those rivers, streams, and lakes; and
(9) important habitat.
(b) The following standards apply to the management of the habitats identified in (a) of this section:
(1) offshore areas must be managed to avoid, minimize, or mitigate significant adverse impacts to competing uses such as commercial, recreational, or subsistence fishing, to the extent that those uses are determined to be in competition with the proposed use;
(2) estuaries must be managed to avoid, minimize, or mitigate significant adverse impacts to
(A) adequate water flow and natural water circulation patterns; and
(B) competing uses such as commercial, recreational, or subsistence fishing, to the extent that those uses are determined to be in competition with the proposed use;
(3) wetlands must be managed to avoid, minimize, or mitigate significant adverse impacts to water flow and natural drainage patterns;
(4) tideflats must be managed to avoid, minimize, or mitigate significant adverse impacts to
(A) water flow and natural drainage patterns; and
(B) competing uses such as commercial, recreational, or subsistence uses, to the extent that those uses are determined to be in competition with the proposed use;
(5) rocky islands and sea cliffs must be managed to
(A) avoid, minimize, or mitigate significant adverse impacts to habitat used by coastal species; and
(B) avoid the introduction of competing or destructive species and predators;
(6) barrier islands and lagoons must be managed to avoid, minimize, or mitigate significant adverse impacts (A) to flows of sediments and water;
(B) from the alteration or redirection of wave energy or marine currents that would lead to the filling in of lagoons or the erosion of barrier islands; and
(C) from activities that would decrease the use of barrier islands by coastal species, including polar bears and nesting birds;
(7) exposed high-energy coasts must be managed to avoid, minimize, or mitigate significant adverse impacts
(A) to the mix and transport of sediments; and
(B) from redirection of transport processes and wave energy;
(8) rivers, streams, and lakes must be managed to avoid, minimize, or mitigate significant adverse impacts to
(A) natural water flow;
(B) active floodplains; and
(C) natural vegetation within riparian management areas; and
(9) important habitat
(A) designated under 11 AAC 114.250(h) must be managed for the special productivity of the habitat in accordance with district enforceable policies adopted under 11 AAC 114.270(g); or
(B) identified under (c)(1)(B) or
(C) of this section must be managed to avoid, minimize, or mitigate significant adverse impacts to the special productivity of the habitat.
(c) For purposes of this section,
(1) "important habitat" means habitats listed in (a)(1) – (8) of this section and other habitats in the coastal area that are
(A) designated under 11 AAC 114.250(h);
(B) identified by the department as a habitat
(i) the use of which has a direct and significant impact on coastal water; and
(ii) that is shown by written scientific evidence to be biologically and significantly productive; or
(C) identified as state game refuges, state game sanctuaries, state range areas, or fish and game critical habitat areas under AS 16.20;
(2) "riparian management area" means the area along or around a waterbody within the following distances, measured from the outermost extent of the ordinary high water mark of the waterbody:
(A) for the braided portions of a river or stream, 500 ft on either side of the waterbody;
(B) for split channel portions of a river or stream, 200 ft on either side of the waterbody;

(C) for single channel portions of a river or stream, 100 ft on either side of the waterbody;
(D) for a lake, 100 ft of the waterbody.

Evaluation:
(a) List the habitats from (a) above that are within your proposed project area or that could be affected by your proposed project.

The exploration drilling program has been modified by the addition of two drill sites (Sivulliq G and Torpedo J), collection and transport of five waste streams, additional vessels (OSV, deck barge and tug, waste barge and tug, and containment barge/tug/anchor handler), ZVSP, and possible use of the *Kulluk*. All of these activities associated with the modification would take place offshore in Federal waters outside the coastal zone, and would not take place in or near any estuaries; wetlands; tideflats; rocky islands and sea cliffs; barrier islands and lagoons; exposed high energy coasts; rivers, streams, and lakes or their floodplains; or important habitats.

(b) Describe how the proposed project avoids, minimizes, or mitigates impacts to each of the identified habitat(s) in section (a) above.

The only activities associated with the exploration drilling program that would occur within the identified habitats in the coastal zone are vessel and aircraft trips between the offshore prospects and the shorebase facilities at West Dock near Prudhoe Bay. These activities were evaluated in DCOM's review of the initial Camden Bay EP and found to be consistent with the ACMP. The two additional drill sites may result in one or more drilling seasons but the frequency and duration of vessel and aircraft traffic within the coastal zone would remain the same in that subsequent season, and the same mitigation measures apply to the exploration drilling at the additional sites and to any associated vessel traffic in the coastal zone and elsewhere.

(c) No response required.

11 AAC 112.310. Air, land and water quality

Standard:
Not withstanding any other provision of this chapter, the statutes and regulations of the Department of Environmental Conservation with respect to the protection of air, land, and water quality identified in AS 46.40.040(b) are incorporated into the program and, as administered by that department, constitute the exclusive components of the program with respect to those purposes.

Evaluation: No response required.

11 AAC 112.320. Historic, prehistoric, and archaeological resources.

Standard:
(a) The department will designate areas of the coastal zone that are important to the study, understanding, or illustration of national, state, or local history or prehistory, including natural processes.
(b) A project within an area designated under (a) of this section shall comply with the applicable requirements of AS 41.35.010 – 41.35.240 and 11 AAC 16.010 – 11 AAC 16.900.

Evaluation:
(a) Have you contacted the State Historic Preservation Office (SHPO) to see if your project is in a designated area of the coastal zone that is important to the study, understanding, or illustration of national, state, or local history or prehistory, including natural processes?

To Shell's knowledge, areas of the coastal zone that are important to the study, understanding, or illustration of national, state, or local history or prehistory, including natural processes, have not been designated by the department. BOEMRE must consult with the SHPO prior to approval of the revised Camden Bay EP.

(b) If your project is within an area designated under (a) of this section, how will you comply with the applicable requirements in the statutes and regulations listed in (b)?

Potential cultural resources in the OCS include historic resources such as shipwrecks and prehistoric cultural resources such as camp sites in areas that were sub-aerially exposed during the period of human habitation of the

North Slope. The only potential effects the exploration drilling program could have on historic, prehistoric, and archeological resources, are due to seafloor disturbance by such activities as mooring and MLC construction. Drilling wells at the two additional drill sites would increase the area of seafloor disturbed by the exploration drilling program.

BOEMRE regulatory requirements for EPs with regards to the protection of archaeological resources are the requirements for shallow hazards surveys for all drill sites, and the preparation of archaeological assessments, with subsequent avoidance of disturbance of any potential resources identified in the assessment. Shallow hazards surveys and archeological assessments have been conducted at each of the drill sites (Sivulliq G and Torpedo J) added to the exploration drilling program, and the study areas encompassed all areas where anchors would be placed for the drilling vessel and MLCs would be constructed. The site clearance data did not detect any historic, prehistoric or archaeological resources at any of the planned locations. Anchor and drill site locations have been selected so that no unidentified magnetic anomalies or side-scan sonar contacts would be disturbed. The containment barge may be anchored in the event of a spill, but would also be anchored within the shallow hazards survey and archaeological assessment study area. Neither of the drill sites is located in OCS blocks identified by BOEMRE as having potential for prehistoric archaeological resources. Activities associated with modification to the EP are not anticipated to impact historic, prehistoric, or archaeological resources.

Affected Coastal District Enforceable Policies

Evaluate each applicable district enforceable policy using a format similar to the one you completed above for the State Standards. District enforceable policies are available at http://alaskacoast.state.ak.us/. If you need more space for an adequate explanation of any of the applicable district enforceable policies, please attach additional pages to the end of this document.

Applicable District Plan(s) NSBCMP is not in effect at this time.
Enforceable Policy: _____
Evaluation: _____

Certification Statement

The information contained herein is true and complete to the best of my knowledge. I certify that the proposed activity complies with, and will be conducted in a manner consistent with, the Alaska Coastal Management Program.

_____ May 4, 2011
Signature of Applicant or Agent Date

Note: Federal agencies conducting an activity that will affect the coastal zone are required to submit a federal consistency determination, per 15 CFR 930, Subpart C, rather than this certification statement.
ACMP has developed a guide to assist federal agencies with this requirement. Contact ACMP to obtain a copy.

This certification statement will not be complete until all required State and federal authorization requests have been submitted to the appropriate agencies.

b) Other Information

The "information" and "analysis" required are present within the body of the revised Camden Bay EP and appended Environmental Impact Analysis (Appendix H).

SECTION 16.0 ENVIRONMENTAL IMPACT ANALYSIS

Refer to Appendix F for Environmental Impact Analysis.

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SECTION 17.0 ADMINISTRATIVE INFORMATION

a) Description of Exempted Information (Public Information Copies Only)

Proprietary geological and geophysical information detailed in Section 3 of this document has been excluded from the public information copies of this plan. Appendix A includes OCS Plan Information Forms (Form MMS-137) which include specific information for each proposed well. The proprietary version of these forms includes information about bottom-hole locations. Public versions of these forms do not include the bottom-hole information.

b) Bibliography

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