Alaska Outer Continental Shelf

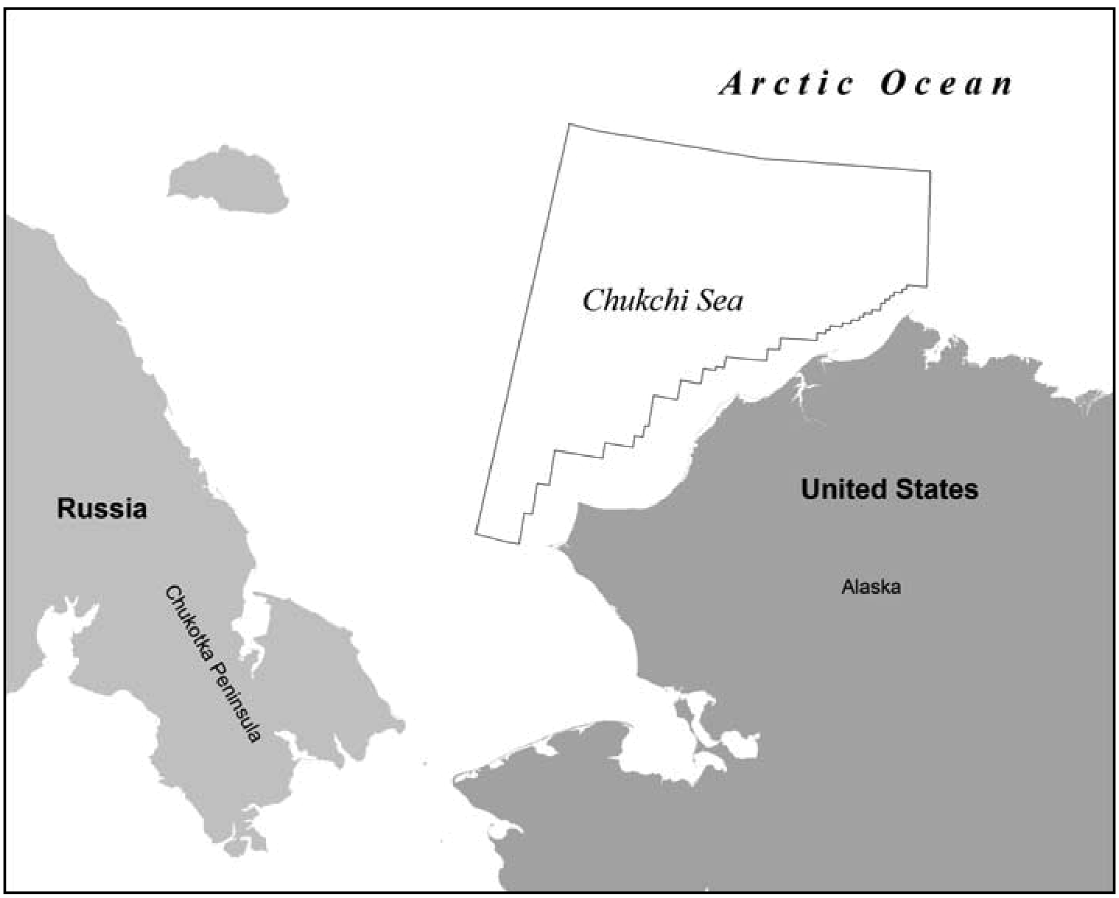
OCS EIS/EA
BOEM 2014-653

Chukchi Sea Planning Area

Oil and Gas Lease Sale 193
In the Chukchi Sea, Alaska

Draft Second Supplemental Environmental Impact Statement

Volume 2. Literature Cited, Appendices A, B, C, D



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Volume 2. Chapter 7 (Literature Cited) and Appendices A, B, C, D

Prepared by
Bureau of Ocean Energy Management
Alaska OCS Region

Cooperating Agencies
U.S. Department of Interior
Bureau of Safety and Environmental Compliance
Bureau of Land Management

State of Alaska
Department of Natural Resources
Office of Project Management and Permitting

North Slope Borough

North West Arctic Borough

U.S. Department of the Interior
Bureau of Ocean Energy Management
Alaska OCS Region

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APPENDIX A

Accidental Oil Spills and Gas Releases

Information, Models, and Estimates

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Appendix A. Accidental Oil Spills and Gas Releases

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Accidental Oil Spills and Gas Releases: Information, Models, and Estimates

BOEM analyzes hypothetical oil spills and gas releases from oil and gas activities and their relative impact to environmental, economic, and sociocultural resources and resource areas and the coastline. Each of these hypothetical spills or releases has varying potential to result from offshore oil and gas exploration, development and production in the Leased Area. BOEM makes a set of assumptions that collectively form an oil spill and gas release scenario. This consistent set of scenario information is used to formulate the potential oil spill and gas release effects from oil and gas activities in a consistent and logical manner throughout Chapter 4 and 5 of this Draft Second SEIS.

It is not anticipated that oil spills occur as a routine activity. Therefore, oil spills are not considered a routine impact-producing factor (IPF). Oil spills are considered accidental events, and the Clean Water Act and the Oil Pollution Act include both regulatory and liability provisions that are designed to reduce damage to natural resources from oil spills. Therefore oil spills are treated as an accidental IPF. An accident is an unplanned event or sequence of events that results in an undesirable consequence. In this analysis the undesirable consequence is an oil spill or gas release in the environment.

This appendix references to the Sale 193 FEIS, Appendix A and the Sale193 Final SEIS, Appendix B as well as new circumstances or information relevant to concerns that have become available since the publication of the Sale 193 Final SEIS. Much of the new information herein builds from the Scenario discussed in Sections 2.3, and 4.1.1 and Appendix B.

This Appendix discusses the technical information used to estimate a set of assumptions for purposes of oil spill or gas release analysis over the entire life of the Scenario. The information about these accidental oil spills or gas releases includes:

- Estimates of the sources of accidental spills or gas releases that may occur
- How many spills or releases occur and their chance of occurring
- Spill sizes
- Locations to which large spills might travel due to the effects of winds, currents and ice
- How long it may take large spills to travel
- Length of coastline affected by large offshore spills
- How oil spills might weather and the fate of spills
- The likelihood of one or more offshore large spills occurring and contacting locations of environmental, social or economic resources or resources areas

Oil spills are divided into two general spill-size categories and two general phases of operations. These divisions reflect a difference in how the information about the spills is derived and used. The two general activity categories considered in oil-spill analysis are:

- Exploration and delineation
- Development, production and decommissioning

The two general spill-size categories considered in oil-spill analysis are:

- Small spills, those less than less than (<) 1,000 barrels (bbl)
- Large spills, those greater than or equal to (≥) 1,000 bbl, meaning that 1,000 bbl is the minimum threshold size for a large spill.

- o A subset of large oil spills is called very large oil spills (VLOS), which are spills (≥) 150,000 bbl.

A small spill (<1,000 bbl) would not be expected to persist on the water long enough for the model to follow its path in a trajectory analysis. Therefore, for small spills, BOEM estimates the type of oil and the number and size of a spill(s).

Large spills are those spills that are ≥ 1,000 bbl and would persist on the water long enough for the model to follow its path in a trajectory analysis. To judge the effect of a large oil spill, BOEM estimates information regarding the general source(s) of a large oil spill (such as a pipeline, platform or well), the location and size of the spill, the type and chemistry of the oil, how the oil will weather (naturally degrade in the environment), how long it will remain prior to naturally degrading, and where it may go. BOEM also estimates the mean number of large spills and the chance of one or more large spills occurring over the exploration, development and production life of the Scenario. BOEM simulates the paths (trajectories) that large oil spills could take to estimate the chance of a large spill contacting a specific portion of shoreline or offshore resource area and the BOEM combines the chance of a spill contacting a portion of shoreline or resource area with the chance of one or more large spills occurring at all to estimate the chance of one or more large spills both occurring and contacting a shoreline or offshore resource area over the life of the scenario.

Estimating large oil-spill occurrence or large oil-spill contact is an exercise in mathematical probability. Uncertainty exists regarding whether exploration or development will occur at all and, if it does, the location, number, and size of potential large oil spill(s) and the wind, ice, and current conditions at the time of a spill(s). Although some of the uncertainty reflects incomplete or imperfect data, a considerable amount of uncertainty exists simply because it is difficult to predict events 15-77 years into the future.

VLOS are analyzed separately from large oil spills due to their lower level of probability. The technical analysis of a VLOS event is meant to assist BOEM in evaluating low-probability, high-impact events. The scenario and impacts discussed for a VLOS analysis should not be confused with the scenario and impacts anticipated to result from routine activities or from accidental events related to the proposed action or its alternatives. This is due to the very low mathematical frequency associated with VLOS events.

BOEM describes the rationale for the assumptions used in oil-spill analyses in the following subsections. The rationale for the assumptions is a mixture of project-specific information, modeling results, statistical analysis, three decades of experience modeling hypothetical oil spills, and professional judgment.

In this Appendix, the information, models, and assumptions about large spills are discussed in Sections 1 through 4. Small spills are discussed in Section 5. Gas releases are discussed in Section 6. Section 7 discusses Very Large Oil Spills, Section 8 discusses Alaska North Slope spill rates and cumulative large oil spills.

A-1. Accidental Large Oil Spills

To set a reference framework under which the analysis of large oil spills occurs, the following discussion provides the context for the sources of oil in the sea.

With the exception of rare events like the Deepwater Horizon (DWH), the inputs of oil in the sea (i.e. spills) have declined over the years, even though petroleum consumption is increasing (USDHS, USCG, 2011a, b; USEIA, 2014). Possible causes for the decline in oil inputs include passage of the Oil Pollution Act of 1990 (OPA 90), technology improvements, and implementation of safety-management systems that put into practice risk-reduction interventions.

Between 1971 and 2013, Outer Continental Shelf (OCS) operators produced almost 18 billion barrels (Bbbl) of oil. During this period (excluding the DWH spill which is a rare event) there were 2,844 spills ≥ 1 barrel that totaled approximately 174,000 bbl spilled. This equals 0.001% of the total bbl of oil produced during that period, or about 1 barrel spilled for every 103,200 bbl produced. This record has improved over time. During the more recent period between 1999 and 2013, almost 8.0 Bbbl of oil were produced and there were 645 spills that totaled approximately 39,000 bbl spilled. This is equal to 0.0005% of the total of bbl of oil produced, or approximately 1 barrel spilled for every 204,700 bbl produced. For typical OCS oil spills, the record of OCS oil spills into the environment is improving.

The inclusion of rare events like the DWH spill in the record requires sophisticated analysis due to the small number of events. For the 37 year period ending in 2009 the U.S. Coast Guard (USCG) noted that the DWH volume is 86% of all discharges by volume recorded for U.S. waters in the preceding 37 years (USCG, 2012). These rare events are small in number and are not well handled with the use of standard statistics such as average probabilities. Several recent papers and analyses have identified various methods for estimating the frequency of these rare events (Abimbola, Khan and Khakzad, 2014; Ji, Johnson, and Wikel, 2014; Khakzad, Khan, and Paltrinieri, 2014; USDOI, BOEM, 2012a; Figure 4.3.3-1). The mathematical analysis of very large spills like the DWH spill is detailed in Section 7.

A-1.1. Large Spill Size, Source, and Oil-Type Assumptions

Table A.1 1 shows the general size categories, source of a spill(s), type of oil, size of spill(s) in bbl, and the receiving environment BOEM assumes in the analysis of oil-spill effects in Section 4.3 of this Second SEIS for the Leased Area, Alternatives 1, 3, or 4.

A-1.2. Large Oil-Spill Sizes

Large spills have a minimum size, or threshold value of 1,000 bbl, but the spill size could be larger. Table A.1-1 shows the assumed large spill sizes and the sections within this Second SEIS where BOEM analyzes the effects of large spill(s) for the Leased Area.

The large spill-size assumptions BOEM uses are based on the reported spills in the Gulf of Mexico and Pacific OCS because no large spills (≥ 1,000 bbl) have occurred on the Alaska OCS from oil and gas activities. BOEM uses the median OCS spill size as the likely large spill size (Anderson, Mayes, and LaBelle, 2012) because it is the most probable size for that spill size category.The Gulf of Mexico and Pacific OCS data show that a large spill most likely would be from a pipeline or a platform. The median size of a crude oil spill ≥1,000 bbl from a pipeline on the OCS over the last 15 years is 1,720 bbl, and the average is 2,771 bbl (Anderson, Mayes, and LaBelle, 2012). The median spill size for a platform on the OCS over the entire record from 1964-2010, is 5,066 bbl, and the average is 395,500 bbl (Anderson, Mayes, and LaBelle, 2012). As previously discussed, outliers such as the DWH spill volume skew the average and the average is not a useful statistical measure. For purposes of this analysis, BOEM uses the median spill size, rounded to the nearest hundred shown below, as the likely large spill sizes.

	Pipeline	Platform
Assumed Large Spill Size (bbl)	1,700	5,100

A-1.2.1. Source and Type of Large Oil Spills

The source is considered the place from which a large oil spill could originate. The sources of large spills are divided generically into production platforms, wells, or pipelines (Anderson, Mayes, and LaBelle, 2012). The places where a large spill could occur are based on the Scenario (Appendix B). Platform sources include spills from wells or from diesel fuel tanks located on platforms. Large offshore pipeline spills include spills from the riser and from the offshore pipeline to the shore.

The types of oil spilled from platform spills are assumed to be crude oil, natural gas liquid condensate, or diesel oil. Large oil pipeline spills are assumed to be natural gas liquid condensate or crude oil.

The type of crude oil used in this analysis is Alpine composite. It is known that crude oils vary in properties and that crude oil spills behave in different ways based on their properties. The crude oil analysis considered a light crude oil. Crude oil samples recovered from wells onshore the Alaska North Slope (ANS) and offshore Beaufort and Chukchi seas are characterized by a range of American Petroleum Institute (API) gravity, which is a measure of how heavy or light the oil is compared to water. The crude oils in the Chukchi Sea are estimated to be lighter than crude oil in the Beaufort Sea. Given the existing information from crude oil samples recovered from Alaska wells, the Chukchi Sea oil seems to be characterized as relatively low sulfur (less than 18%), high-gravity (≥ 35º) API crude oils (Sherwood et al., 1998:129). BOEM looked for data on ANS crude oils with similar API gravity values that also had laboratory data on their rate of weathering (natural decomposition). Alpine composite crude oil has an API gravity of 35º and was chosen to be representative for the oil-weathering simulations used in this analysis. BOEM chose a standard diesel oil and a condensate with an API gravity of 50º for the weathering simulations.

A-1.2.2. Historical Loss of Well-Control Incidents on the OCS, Alaska North Slope and North Sea

The 2007 FEIS, Appendix A, Section A.1.c and the 2011 SEIS, Appendix B, Section 1.1 discussed OCS Well Control Incidents including their frequencies. USDOI, BOEM (2011; Appendix A, 2012a; Figure 4.3.3-1.), USDOI, BLM (2012; Appendix G), IAOGP (2010), Bercha Group Inc. (2014a) and Ji, Johnson, and Wikel (2014) detail the loss of well control (LOWC) incidents on the OCS, ANS and North Sea, and discuss the analysis of their frequencies. The loss of well control occurrence frequencies, per well, are on the order of 10^{-3} to 10^{-6}. The occurrence frequencies depend upon the operation or activity, whether the LOWC was a blowout or well release and whether there was oil spilled.

In general, historical data show that LOWC events escalating into blowouts and resulting in oil spills are infrequent and that those resulting in large accidental oil spills are even rarer events (Anderson, Mayes, and LaBelle, 2012; Bercha, 2014a, Izon et al. 2007, Ji, Johnson, and Wikel, 2014; Robertson et al., 2013; USDOI, BOEM, 2011; USDOI, BOEM, 2012a). From 1964 to 2010 there were 283 well control incidents, 61 of which resulted in crude or condensate spills (USDOI, BOEM, 2012a; Table 4.3.3 1). From 1971 to 2010, fewer than 50 well control incidents occurred. Excluding the volume from the DWH spill, the total spilled volume was less than 2,000 bbl of crude or condensate. The largest of the 1971-2010 spills was 350 bbl. During that same time period, more than 41,800 wells were drilled on the OCS and almost 16 Bbblof oil was produced.

When considering exploration wells, few of them involve loss-of-well-control incidents and even fewer result in a spill. From 1971-2010 Industry drilled 223 exploration wells in the Pacific OCS, 46 in the Atlantic OCS, 15,138 in the Gulf of Mexico OCS, and 84 in the Alaska OCS, for a total of 15,491 exploration wells. During this period, there were 77 well control incidents associated with exploration drilling. Of those 77 well control incidents, 14 (18%) resulted in oil spills ranging from 0.5 bbl to 200 bbls, for a total 354 bbls, excluding the estimated volume from the DWH spill. These statistics show that, while approximately 15,000 exploration wells were drilled, there were a total of 15 loss-of-well-control events that resulted in a spill of any size: 14 were small spills and one was a large spill (≥1,000 bbl) that resulted in a blowout.That one large/very large spill was the DWH.

The Norwegian SINTEF Offshore Blowout Database, where risk-comparable drilling operations are analyzed and where worldwide offshore oil and gas blowouts are tracked, supports the conclusion that blowouts are rare events (IAOGP 2010; DNV 2010a, b; DNV 2011). Blowout frequency analyses of the SINTEF database suggest that the highest risk operations are associated with exploration drilling in high–pressure, high-temperature conditions (DNV 2010a, b; DNV 2011). Prior to the DWH event, the three largest blowout spills on the OCS were 80,000 bbls, 65,000 bbls, and 53,000 bbls from production wells, and all of which occurred before 1971 (Anderson, Mayes, and LaBelle, 2012). New drilling regulations and recent advances in containment technology that were implemented after the DWH spill may further reduce the frequency and size of oil spills from OCS operations (DNV 2010a, b; DNV 2011). However, as the 2010 DWH spill illustrated, there is a very small chance for very large oil spill to occur and to result in unacceptable impacts (U.S. CSB, 2014).

A-1.2.3. Historical Exploration Spills on the Beaufort and Chukchi OCS

The Sale 193 FEIS, Appendix A, Section A.1.d discussed historical Arctic OCS exploration spills through 2006 which have all been small (less than 20 bbl). On the Beaufort and Chukchi OCS through 2003, the oil industry drilled 35 exploration wells to depth, spilled approximately 27 bbls and 24 bbls were recovered (Table A.1-2). Since 2003, there have been no wells drilled to total depth in the Alaska OCS. In 2012, only two top holes were drilled and the operator was not allowed to drill into a hydrocarbon zone. During the 2012 exploration drilling activities, no spills of 1 barrel or more (BSEE reportable quantities) occurred on the Arctic OCS. Only tiny spills (drips and drops) of hydraulic lube oil and gasoline for activities associated with the exploration program on the Arctic OCS were reported to the agencies and the National Response Center (NRC).

A-1.2.4. Historical Exploration Well-Control Incidents on the Alaska North Slope and Surrounding Area

No exploratory drilling LOWC incidents have occurred on the Alaskan OCS while drilling 84 wells to depth. One exploration drilling blowout of gas occurred on the Canadian Beaufort Sea. Up to 1990, 85 exploratory wells were drilled in the Canadian Beaufort Sea, and one shallow-gas blowout occurred. A second incident was not included at the Amaluligak wellsite with the Molikpaq drill platform because it did not qualify as a blowout by the definition used in other databases. In that incident, there was a gas flow through the diverter, with some leakage around the flange. (Devon Canada Corporation, 2004).

Since the Sale 193 SEIS, one gas blowout occurred on the ANS. On February 15, 2012 Repsol had a blowout from an exploration well on the Qugruk #2 pad (Q2 pad), on the Colville River Delta, approximately 18 miles northeast of Nuiqsut and approximately 150 miles southeast of Barrow (70° 27’ 19” N, 150° 44’ 52” W). The blowout from a shallow gas pocket released an unknown quantity of gas and approximately 42,000 gallons (gal) (1,000 bbl) of drilling mud (ADEC, 2012). The well ceased flowing on February 16, 2012. Of the 11 blowouts on the ANS, 10 were gas and 1 was oil. The one oil blowout was from drilling in the 1950s which would not be relevant by today’s regulatory standards.

A-2. Behavior and Fate of Crude Oils

There are scientific laboratory data and field information from accidental and research oil spills about the behavior and fate of crude oils. The Sale 193 FEIS, Appendix A, Section 2.1 discussed the behavior and fate of oil and is herein incorporated by reference and summarized below. BOEM discusses the background information on the fate and behavior of oil in Arctic environments and its behavior and persistence properties along various types of shorelines. BOEM also make several assumptions about oil weathering to perform modeling simulations of oil weathering that is specific to the large spills BOEM estimates for analysis purposes.

A-2.1. Generalized Processes Affecting the Fate and Behavior of Oil

Several processes alter the chemical and physical characteristics and toxicity of spilled oil. Collectively, these processes are referred to as weathering or aging of the oil. The major oil-weathering processes are spreading, evaporation, dispersion, dissolution, emulsification, microbial degradation, photochemical oxidation, and sedimentation to the seafloor or stranding on the shoreline (Payne et al., 1987; Boehm, 1987; Lehr, 2001; USDOI, MMS, 2007, Figure A.1-2).

Along with the physical oceanography and meteorology, weathering processes determine the oil's fate in the environment. Potter et al. (2012), Dickens (2011), and Lee et al. (2011) reviewed the state of fate and behavior of oil in ice and documented the relevant studies; some of which were detailed in the Sale 193 FEIS, Appendix A, 2.1. Collectively, 40 years of research underpin the available science on fate and behavior of oil in ice.

Further research on the fate of oil spills and oil dispersants is ongoing. Gong et al. (2014) document the relationships between sediment particle size and concentration, oil properties, and salinity characteristics and their contribution to the formation and characteristics of oil sediment-particulate-material aggregates. Beegle-Krause et al. (2013) reviewed the literature on the fate of either mechanically or chemically dispersed oil under ice and determined that under-ice turbulence was a key variable. Turbulence would tend to keep oil droplets in suspension but is significantly reduced under ice fields and oil droplets do not remain in suspension. Further research is also ongoing within Industry (Mullin, 2014) and government.

The potential volume of oil entrained in the interstitial space of the sea ice crystal fabric was studied using salinity and temperature data from Barrow, Alaska. Petrich, Karlsson, and Eicken (2013) found oil entrainment increases from January to May. Entrainment may reach approximately 20% of the potential oil volume pooled beneath sea ice.

Fingas and Hollebone (2014) conclude that the behavior of oil in ice can be modeled based on the previous research. However, they stress that new available technologies for measurement have the potential to move the science forward. Initial studies suggest oil spreads differently when spilled in young ice (frazil, nilas, or pancake). Wilkinson et al. (2014) documented oil penetrating frazil ice and frazil ice inhibiting brine channel migration. Waves were a controlling factor in the spread of oil associated with young ice.

Within Arctic waters and sea ice brine channels, there are natural indigenous microbial organisms. McFarlin et al. (2011a; b; 2014) studied crude oil biodegradation under cold and light-limiting conditions using indigenous microbes collected from the Beaufort and Chukchi seas. Biodegradation occurred down to -1^{o} C. The results by Bagi et al. (2013) also suggest that biodegradation capacity in cold seawater is not necessarily inherently lower than the biodegradation capacity of microbes in temperate seawater.

A-2.2. Oil-Spill Persistence

How long an oil spill persists on water or on the shoreline can vary widely, depending on the size of the oil spill, the environmental conditions at the time of the spill, and the substrate of the shoreline and, in the case of the U.S. Chukchi and Beaufort seas, whether the shoreline is eroding. Persistence on water and then on shorelines is discussed below.

A-2.2.1. On-Water Oil-Spill Persistence

In this analysis, BOEM conservatively assumes 1,700- and 5,100-bbl crude oil spills could last up to 30 days on the water as a coherent slick. After that, the weathering process mentioned in Section 2.1 above would degrade the oil on the surface of the water, making it hard to track. During higher wind speeds and wave heights, spills may dissipate more quickly. For spills that freeze into sea ice; spills are assumed to persist up to 30 days after melting out from the sea ice.

A-2.2.2. Shoreline Type, Oil Behavior, and Persistence

A new shorezone analysis was completed in 2014 and BOEM compiled the new Environmental Sensitivity Information (ESI) for each of the land segments along the northern coast of Alaska (Harper and Morris, 2014). For each land segment, the percentage of each ESI type by length is shown in Table A.1-3. In general, the higher the ESI number, the longer the oil is estimated to persist in that type of substrate.

A-2.2.3. Oil-Spill Toxicity

Oil-spill toxicity occurs through the mode of narcosis (state of stupor or unconsciousness) caused by monocyclic aromatic hydrocarbons crossing the cell membranes as well as oil being ingested by or coating an organism. Studies on the Exxon Valdez Oil Spill in Prince William Sound revealed that larger and more persistent PAHs in sediments are linked to long-term effects (Peterson et al., 2003). Shorelines with higher ESI values likely will have longer oil persistence in the sediments. Oil-spill toxicity is discussed in the effects of spills on each resource section.

Additional studies, from the Deepwater Horizon, examining dispersant use were recently published. Rico-Martinez, Snell, and Shearer (2013) found that toxicity testing with various species of marine rotifer revealed that, when the dispersant COREXIT 9500A (which was used during the DWH spill to disperse the oil in an attempt to reduce its toxicity) was well mixed with crude oil, the toxicity increased as much as 52-fold. Without mixing, the effect was decreased to 27.6 fold. The authors noted that the rotifer strain from the Gulf of Mexico was most tolerant to oil from the Macondo well. The authors described the effect as synergistic. However, other authors have noted that the increased toxicity of COREXIT 9500A plus crude oil is actually due to the oil itself (Wu et al., 2012) because the dispersant helps the oil dissolve into the water phase and then become more bioavailable. Furthermore, Chakraborty et al. (2012) found that COREXIT 9500 was not toxic to indigenous microbes and that various components of the COREXIT 9500 were degraded. This is part of the ongoing debate that exists with the use of dispersants as a response tool. Dispersants help make the oil more bioavailable so that the oil is subject to increased degradation, including biodegradation; however, oil that is more bioavailable may also be more toxic to some species.

Gardner et al. (2013) and deHoop et al. (2011) studied the relative sensitivity of cold-water species to oil components and to physically and chemically dispersed oil. In both of these studies, a small number of cold-water species fell within the range of sensitivities of commonly tested species, mostly of temperate climates. Bejarano, Clark, and Coelho (2014) suggest improvements to toxicity testing to make the results useful across species and geographic locations for better information to further management decisions on dispersant use.

A-2.3. Assumptions about Large Oil-Spill Weathering

To run the oil weathering model (OWM) using a consistent framework, several assumptions are made regarding the type of oil, the size of the spill, the environmental conditions, and the location of the spill. The following assumptions are used to estimate weathering of a large oil spill:

- The crude oil properties will be similar to Alpine composite crude oil for the Leased Area
- The condensate oil properties will be similar to a Sliepner condensate for the Leased Area
- The diesel oil properties will be similar to a typical diesel for the Leased Area
- The size of the diesel fuel spill is 5,100 bbls
- The size of the crude or condensate spill(s) is 1,700 or 5,100 bbls
- There is no reduction in the size of spill due to cleanup; instead cleanup is considered separately as either mitigation or disturbance
- The wind, wave, temperature and ice conditions are as described

- The spill is a surface spill or a shallow (less than 50m) subsea spill that reaches the water surface quickly
- Meltout spills occur into 50% ice cover
- The properties predicted by the OWM model are those of the thick part of the slick
- The spill occurs as an instantaneous spill over a short period of time
- The fate and behavior are as modeled (Tables A.1-4 through 8)
- The oil spill persists for up to 30 days in open water

Uncertainties exist, such as:

- The actual size of an oil spill or spills, should they occur
- Whether the spill is instantaneous or chronic
- The location of the spill
- Wind, current, wave, and ice conditions at the time of a possible oil spill
- The crude, diesel or condensate oil properties at the time of a possible spill

A-2.4. Modeling Simulations of Oil Weathering

To judge the effect of a large oil spill, BOEM estimates information regarding how much oil evaporates, how much oil is dispersed, and how much oil remains after a certain time period. BOEM derives the weathering estimates of Alpine composite crude oil, and Sliepner-condensate and diesel fuel from modeling results from the SINTEF Oil Weathering Model (OWM) Version 4.0 (Reed et al., 2005) for up to 30 days.

A-2.4.1. Oils for Analysis

The crude oil used in the analysis is a light crude oil. Alpine oil composite was chosen for simulations of oil weathering for the Leased Area, because it is a light crude oil that falls within the category of 35-40° API oils estimated to occur in the Leased Area. BOEM used a diesel fuel and Sliepner condensate.

A-2.4.2. Alpine Composite, Condensate, And Diesel Fuel Simulations Of Oil Weathering

This section discusses the simulation of oil weathering for OCS median spill sizes 1,700 and 5,100 bbl (Anderson, Mayes, and LaBelle, 2012). BOEM uses the SINTEF OWM to perform simulations of oil weathering. The SINTEF OWM has been tested with results from three full-scale field trials of experimental oil spills (Daling and Strom, 1999; Brandvik et al., 2010).

The simulated Alpine composite crude and the condensate oil-spill sizes are 1,700 bbl or 5,100 bbl. The diesel-oil-spill size is 5,100 bbl. BOEM simulates two general scenarios: one in which the oil spills into open water and one in which the oil freezes into the ice and melts out into 50% ice cover.

For the Leased Area, BOEM assumes open water is June through October, and a winter spill could melt out in July. BOEM assumes the spill starts at the surface or quickly rises to the surface in the shallow waters of the Leased Area. For open water, BOEM models the weathering of the spills as if they are instantaneous spills. For the meltout spill scenario, BOEM models the entire spill volume as an instantaneous spill. Although different amounts of oil could melt out at different times, BOEM took the conservative approach, which was to assume all the oil was released at the same time. BOEM reports the results at the end of 1, 3, 10, and 30 days.

For purposes of analysis, BOEM looks at the mass balance of the large oil spill; how much is evaporated, dispersed, and remaining. Tables A.1-4 through 8 summarizes the results BOEM assumes for the amount evaporated, dispersed, and remaining for a diesel fuel, condensate or crude oil. The results are considered in BOEM's analysis of the effects of oil on environmental, social and economic resources or resource areas. In general, diesel fuel and condensates will evaporate and disperse in a short period of time (3-10 days). The higher the wind speeds, the more rapidly the evaporation and dispersion occur. Crude oils tend to evaporate and disperse more slowly, especially if the oils become emulsified. Crude oil properties vary, and these are representative ranges of how different light crudes may weather.

The Alpine composite contains a relatively large amount of lower molecular-weight compounds. In weathering tests, approximately 29% and 33% of its original volume evaporated within 1 and 3 days, respectively, at both summer and winter temperatures. Alpine composite will form water-in-oil-emulsion with a maximum water content of 80% at both winter and summer temperatures, yielding approximately five times the original spill volume (Reed et al., 2005). At the average wind speeds over the Leased Area, dispersion is slow, ranging from 0-16% (Tables A.1-7 and 8). However, at higher wind speeds (e.g., 15 m/s wind speed) the oil spill will be almost removed from the sea surface within a day through evaporation and dispersion.

A-3. Estimates of Where a Large Offshore Oil Spill May Go

BOEM studies how and where large offshore spills move by using an oil-spill trajectory model with the capability of assessing the probability of oil-spill contact to environmental resource areas (ERA), known as the Oil-Spill Risk Analysis (OSRA) model (Smith et al., 1982; Ji, Johnson, and Li, 2011). The "Large" oil spill means spills with a threshold size of ≥ 1,000 bbl. This model analyzes the likely paths of over 1.215 million simulated oil spill trajectories in relation to biological, physical, and sociocultural resource areas that BOEM generically calls ERAs. The trajectory is driven by the wind, sea ice, and current data from a coupled ocean-ice model. The locations of environmental resource areas, including sociocultural resource areas, barrier islands, and the coast within the model study area, are used by OSRA to tabulate the percent chance of oil-spill contact to these areas.

A-3.1. Inputs to the Oil-Spill-Trajectory Model

There are several inputs necessary to run the oil-spill-trajectory model and to assess the probability of oil-spill contact to environmental resource areas, boundary segments, and land segments, including the following:

- Study area
- Arctic seasons
- Location of the coastline
- Location of environmental resource areas
- Location of land segments and grouped land segments
- Location of boundary segments
- Location of hypothetical launch areas
- Location of hypothetical pipelines and transportation assumptions
- Current and ice information from a general circulation model
- Wind information

A-3.1.1. Study Area and Boundary Segments

Map A-1 (Maps are found in section A.1, Tables and Maps) shows the study area used in the oil-spill-trajectory analysis. It extends from 174 º E to 130º W and 66 º N to 75º N. The OSRA model has a resolution of 0.6 km by 0.6 km and a total of 6 million grid cells in the study area. The study area is formed by 40 offshore boundary segments and the Beaufort (United States and Canada) and Chukchi seas (United States and Russia) coastline. The boundary segments are vulnerable to spills in both arctic summer and winter. The study area is chosen to be large enough to allow most trajectories of hypothetical oil spills to develop without contacting the boundary segments through as long as 360 days.

A-3.1.2. Trajectory Analysis Periods

The OSRA model launches a hypothetical oil-spill trajectory from a hypothetical location called a launch point (described in detail in Section 3.1.5) starting on day 1 on 1986, and it continuously launches the trajectory every other day for a total of 18 years (1986-2004). Therefore, a total of 3,240 trajectories are launched over this time period. The trajectories are driven by the three-hourly wind, current and ice data from a coupled ocean-ice model with 20 years (1985-2005) of simulation (described in detail in section 3.1.6; Curchitser et al., 2013), and are computed on an hourly basis. Note that data from 1985 are not used in the trajectory analysis because they do not start on January 1st.

BOEM defines three time periods for the trajectory analysis of large oil spills. These periods are the months when trajectories are started and the chance of contact is tabulated. BOEM calls these three periods annual, summer, and winter. Shown below are the three time periods that trajectories were started and the months that make them up.

Sale Area	Annual	Summer	Winter
Leased Area	January-December	June 1-October 31	November 1-May 31

The annual period is from January 1 to December 30. The summer period is from June 1 through October 31 and generally represents open water or arctic summer. The winter period is from November 1 through May 31 and represents ice cover or arctic winter. The choice of this seasonal division was based on meteorological, climatological, and biological cycles and consultation with Alaska OCS Region analysts.

A-3.1.3. Locations of Environmental Resource Areas

Environmental resource areas (ERAs) represent areas of social, economic, or biological resources or resource areas. BOEM, Alaska OCS Region analysts designate these ERAs. The analysts work with specialists in other federal and state agencies, academia and various stakeholders who provide information about these resources.The analysts also designate in which months these ERAs are vulnerable to spills, meaning the time period those resources occupy or use that spatial location. For example, birds migrate and may be there only from May to October.

There are 124 ERAs. Maps A-2a, A-2b, A-2c, A-2d, A-2e and A-2f show the location of the 124 ERAs. These resource areas represent concentrations of wildlife, habitat, subsistence-hunting areas, and subsurface habitats. The names or abbreviations of the ERAs and the general resource they represent are shown in Table A.1-9. Information regarding the general and specific ERAs for birds, whales, subsistence resources, marine mammals, fish, and lower trophic resources is found in Tables A.1-10, 11, 12, 13, 14, 15 and 16, respectively. Terrestrial mammals are not represented by ERAs but are represented by Grouped Land Segments (GLSs) shown in Table A.1-17 and discussed below. BOEM also includes Land as an additional environmental resource area (ERA). Land is the entire study area coastline and is made up of all the individual land segments (LSs) 1 through 132, which are described below.

A-3.1.4. Location of Land Segments and Grouped Land Segments

The coastline was further analyzed by dividing the Chukchi (United States and Russia) and Beaufort (United States and Canada) seas coastline into 132 LSs. Some LSs were added together to form larger geographic areas and were called GLSs.

The LS identification numbers (IDs) and the geographic place names within the LS are shown in Table A.1-18. Maps A-3a, A-3b, and A-3c show the location of these 132 LSs. Land segments are vulnerable to spills in both arctic summer and winter. The GLSs, their names, and the individual LSs that make them up are shown in Table A.1-19. Maps A-4a, A-4b, and A-4c show the location of these 46 GLSs. Grouped land segments are vulnerable to spills based on the time periods shown in Table A.1-19.

A-3.1.5. Location of Proposed and Alternative Hypothetical Launch Areas and Hypothetical Pipeline Segments

BOEM has information regarding where companies leased blocks in Sale 193. For this analysis, the launch areas (LAs) and pipeline segments (PLs) are hypothetical locations which have been reduced to the Leased Area. They are not meant to represent or suggest any particular development scenario. If and when any commercial hydrocarbons are discovered, detailed development scenarios would be engineered, designed, reviewed, and evaluated by both industry and BSEE, BOEM and other applicable regulatory agencies.

Map A-5 shows the location of the six hypothetical LAs (1, 4, 5, 6, 10, and 11) and six hypothetical PLs (2, 3, 5, 6, 8, and 9) where large oil spills could originate if they were to occur. Pipeline locations are entirely hypothetical. They are not meant to represent three proposed pipelines or any real or planned pipeline locations. They are spaced along the coast to evaluate differences in oil-spill trajectories from different locations along the coast.

Hypothetical launch points were spaced at one-seventh-degree intervals in the north-south direction (about 15.86 km) and one-third-degree intervals in the east-west direction (about 12.67 km). At this resolution, there were 375 total launch points in space, grouped into the six LAs (1, 4, 5, 6, 10, and 11) and six PLs (2, 3, 5, 6, 8, and 9) representing the Leased Area. Pipelines 2, 5 and 8 are offshore PL segments and PLs 3, 6 and 9 are nearshore PLs.

A total of 3,240 trajectories were simulated from each of 375 launch points over the 18 years of wind, current and ice data, for a total of 1.215 million trajectories. The results of these trajectory simulations were combined to represent platform/well spills from 6 LAs (Map A-5). Launch Area1 is >150 mi offshore. Launch Areas 4-6 are approximately 90-150 mi offshore. Launch Areas 10-11 are approximately 25-90 mi offshore. Pipeline spills were represented by trajectories from each launch point along each PL (2, 3, 5, 6, 8, and 9, Map A-5).

For the Leased Area Alternatives1, 3, or 4 BOEM assumes no large oil spills occur during exploration activities. Development/production activities for the Leased Area could occur in any of the LAs (1, 4, 5, 6, 10, and 11) or along any of the PL (2, 3, 5, 6, 8, and 9). Table A.1-20 shows the assumptions about how the hypothetical launch areas were assumed to be serviced by hypothetical pipelines.

A-3.1.6. Ocean Current and Ice Information from a General Circulation Model

BOEM uses the results from a coupled ice-ocean general circulation model to simulate oil-spill trajectories. The wind-driven and density-induced ocean-flow fields and the ice-motion fields are simulated using a three-dimensional, coupled, ice-ocean hydrodynamic model (Curchitser et al., 2013). The model is based on the Regional Ocean Modeling System (ROMS) (Shcheptkin and McWilliams, 2005). The ROMS has been coupled to a sea ice model (Budgell, 2005), which consists of elastic-viscous-plastic rheology (Hunke and Dukowics, 1997; Hunke, 2001) and the Mellor and Kantha (1989) thermodynamics. This model simulates flow properties and sea-ice evolution for the Arctic with enhanced resolution (5km) in the Chukchi and Beaufort seas during the years 1985-2005. The sea ice model was adapted to represent landfast ice, which occurs on the Chukchi Sea coast. The coupled ocean-ice model uses six-hourly CORE2 forcing files (Large and Yeager, 2009), including winds, air temperature, air pressure and humidity, plus daily solar radiation to compute the momentum, heat and salt fluxes. Comparison of model results with observation shows significant skill in the model capability to reproduce observed circulation and sea ice patterns in the Beaufort and Chukchi seas (Curchitser et al., 2013). BOEM uses 18 of the 20-years of data.

A-3.1.7. Wind Information

BOEM uses the reanalysis (1986-2004) wind fields provided by Curchitser et al. (2013). The wind data are from CORE2 (Large and Yeager, 2009) and was interpolated to the coupled ocean model grid at three-hourly intervals.

A-3.1.8. Large Oil-Spill-Release Scenario

For purposes of this trajectory simulation, all spills occur instantaneously. For each trajectory simulation, the start time for the first trajectory was the first hour of the first day of the first full calendar year of wind data (1986). Each subsequent trajectory was started every 2 days at the first hour of the day and trajectory was calculated on an hourly basis.

A-3.2. Oil-Spill-Trajectory Model Assumptions

The oil-spill-trajectory model assumptions are as follows:

- Large oil spills occur in the hypothetical launch areas or along hypothetical pipeline segments
- Operators transport the produced oil through pipelines
- A large oil spill reaches the water surface
- Large oil spills persist long enough for trajectory modeling for up to 360 days if they are encapsulated in ice and melt out
- A large oil spill encapsulated in the landfast ice does not move until the ice moves or it melts out
- Large oil spills occur and move without consideration of weathering. The oil spills are simulated each as a point with no mass or volume. The weathering of the oil is estimated separately in the stand-alone SINTEF OWM model
- Large oil spills occur and move without any cleanup. The model does not simulate cleanup scenarios. The oil-spill trajectories move as though no booms, skimmers, or any other response action is taken
- Large oil spills stop when they contact the mainland coastline, but not the offshore barrier islands in Stefansson Sound

Uncertainties exist, such as:

- the actual size of the large oil spill or spills, should they occur
- whether the large spill reaches the water
- whether the large spill is instantaneous or a long-term leak
- the wind, current, and ice conditions at the time of a possible large oil spill
- how effective response or cleanup is

- the characteristics of crude, condensate or diesel oil at the time of the large spill
- how Alpine composite crude, condensate or diesel oil will spread
- whether or not development and production occurs

A-3.3. Oil-Spill-Trajectory Simulation

The trajectory-simulation portion of the OSRA model consists of many hypothetical oil-spill trajectories that collectively represent the mean surface transport and the variability of the surface transport as a function of time and space. The trajectories represent the Lagrangian motion that a particle on the surface might take under given wind, ice, and ocean-current conditions. Thousands of trajectories are simulated to give a statistical representation, over time and space, of possible transport under the range of wind, ice, and ocean-current conditions that exist in the OSRA study area.

Trajectories are constructed to produce an oil-transport vector. For cases where the ice concentration is below 80%, each trajectory is constructed using vector addition of the ocean current field and 3.5% of the instantaneous wind field—a method based on work done by Huang and Monastero (1982), Smith et al. (1982), and Stolzenbach et al. (1977). For cases where the ice concentration is 80% or greater, the model ice velocity is used to transport the oil. Equations 1 and 2 show the components of motion that are simulated and used to describe the oil transport for each trajectory:

1. $U_{oil} = U_{current} + 0.035\ U_{wind}$ or
2. $U_{oil} = U_{ice}$

Where:

U_{oil} = oil drift vector

$U_{current}$ = current vector (when ice concentration is <80%)

U_{wind} = wind speed at 10 m above the sea surface

U_{ice} = ice vector (when ice concentration is ≥ 80%)

The wind-drift factor was estimated to be 0.035, with a variable drift angle ranging from 0º-25º clockwise. The drift angle was computed as a function of wind speed according to the formula in Samuels, Huang, and Amstutz (1982). The drift angle is inversely related to wind speed.

The trajectories age while they are in the water and/or on the ice. For each day that the hypothetical spill is in the water, the spill ages—up to a total of 360 days. While the spill is in the ice (≥ 80% concentration), the aging process is suspended. The maximum time allowed for the transport of oil in the ice is 360 days, after which the trajectory is terminated. After coming out of the ice, that is melting into open water, the trajectory ages to a maximum of 30 days.

A-3.4. Results of the Oil-Spill-Trajectory Model

A-3.4.1. Conditional Probabilities: Definition and Application

The chance that a large oil spill will contact a specific ERA, LS, GLS, or BS within a given time of travel from a certain location (LA or PL) is termed a conditional probability. The condition is that BOEM assumes a large spill occurs. Conditional probabilities assume a large spill has occurred and the transport of the spilled oil depends only on the winds, ice, and ocean currents in the study area. Conditional probabilities are reported for three seasons (annual, summer, and winter) and six time periods (3, 10, 30, 60, 180, and 360 days). Conditional probabilities are expressed as a percent chance. This means that the probability (a fractional number between 0 and 1) is multiplied by 100 and expressed as a percentage.

For the Leased Area, annual, summer, and winter periods are shown in Section 3.1.2. Contact, tabulated from a trajectory that began before the end of summer season, is considered a summer contact. BOEM also estimates the conditional probability of contact from spills that start in winter, freeze into the sea ice, and melt out in spring or summer. Winter contacts are from spills that begin in winter. Therefore, if any contact to an ERA, LS, GLS or BS is made by a trajectory that began by the end of winter, it is considered a winter contact. BOEM also estimates annual conditional probabilities of contact within 3, 10, 30, 60, 180, and 360 days. Annual contact is for a trajectory that began in any month throughout the entire year.

A-3.4.1.1. Conditional Probabilities: Results

The chance of a large spill contacting a specific ERA, LS, GLS, or BS or any of the areas being assessed (assuming a spill has occurred) is called a conditional probability. It is conditioned on the assumption that a large spill has occurred. The conditional probability results for the oil-spill-trajectory model are summarized generally below and are listed in Tables A.2-1 through A.2-72 for the Leased Area. The Maps referenced in this discussion are as follows:

- Boundary Segments (BSs) are shown in Map A-1,
- Environmental Resource Areas (ERAs) are shown in Maps A-2a through A-2f
- Land Segments (LSs) are shown in Maps A-3a through A-3c
- Grouped Land Segments (GLSs) are shown in Maps A-4a through 4c

For specific analysis of conditional probabilities in regard to specific resources, please see Chapter 4.3. The following section provides generalized comparisons for an overall generalized view. Probabilities in the following discussions, unless otherwise noted, are conditional probabilities estimated by the OSRA model (expressed as percent chance) of a spill ≥1,000 bbl in size contacting ERAs and LSs within the days and seasons as specified below.

Comparisons between Spill Location and Season

The primary differences of contact between hypothetical spill locations (LAs and PLs) are geographic in the perspective of west to east or nearshore versus offshore and temporal in terms of how long it takes to contact. Offshore spill locations take longer to contact the coast and nearshore ERAs, if contact occurs at all. Winter spill contact to nearshore and coastal resources is less often and, to a lesser extent, due to the landfast ice in place from December to April. Statistically, hypothetical spills have a westerly and southwesterly direction of drift through time.

General Contacts through Time

3 Days

In general, the contact to individual LSs and ERA Land is due to hypothetical large spills from the nearshore PLs where assumed hypothetical pipelines could come ashore. Annually, there is a <0.5-1% chance of a large spill contacting ERA Land or individual LSs from LAs that begin approximately 25-150 mi offshore from the coast. Annually, spills from hypothetical PLs adjacent to the coast have a <0.5-7% chance of contacting ERA Land. Launch areas or PLs adjacent to or on top of ERAs have the highest percent chance of contact within 3 days.

During the entire year (annual), the OSRA model estimates that a large spill from PLs 3, 6, or 9 has a <0.5-2% chance of contacting individual LSs. Those LSs with conditional probabilities of contact of 1% or greater include LS 65 (Cape Lisburne), 72-75 (Point Lay-Icy Cape), 79-80 (Wainwright-Kugra Bay), or 84-85 (Barrow Area) (Table A.2-7). All other LAs and PLs have a <0.5% chance of contacting individual LSs over the entire year. The OSRA model estimates the chance of contact to ERA Land ranges from 1-7% for LA 11 and PLs 3, 6, or 9 (Table A.2-1). All other LAs and PLs have a <0.5% chance of contact to ERA Land (Table A.2-1).

During summer, the OSRA model estimates that a large spill from PLs 3, 6, or 9 or LA11 has a <0.5-3% chance of contacting individual LSs. Those LSs of 1% or greater include 65 (Cape Lisburne), 72-75 (Point Lay-Icy Cape), 78-80 (Point Collie-Kugra Bay), or 84-85 (Barrow Area) (Table A.2-31). All other LAs and PLs have a <0.5% chance of contacting individual LSs. The OSRA model estimates the chance of contact to ERA Land ranges from 1-12% for LAs 10 or 11, or PLs 3, 6, or 9 (Table A.2-25). Hypothetical nearshore PLs have the highest chance of contact. All other LAs and PLs have a <0.5% chance of contact to ERA Land (Table A.2-25).

During winter, the OSRA model estimates that a large spill from PLs 3, 6 or 9 has a <0.5- 2% chance of contacting individual LSs. Those LSs of 1% or greater include 65 (Cape Lisburne), 72-74 (Point Lay-Kasegaluk Lagoon) or 79-80 (Wainwright-Kugra Bay) (Table A.2-55). All other LAs (both nearshore and offshore) and PLs have a <0.5% chance of contacting individual LSs within 3 days over winter (Table A.2-55). The OSRA model estimates the chance of contact to ERA Land ranges from 2-5% for PLs 3, 6, or 9 (Table A.2-49). All other LAs and PLs have a <0.5% chance of contact to ERA Land (Table A.2-49).

The OSRA model estimates that a large spill, from LAs or PLs adjacent to or on top of ERAs, has the highest percent chance of contact. During the entire year (annual), LAs have a <0.5-44% chance of contacting individual ERAs (Table A.2-1) and PLs have a less than 0.5-57% chance of contacting individual ERAs (Table A.2-1).

During summer, LAs have a <0.5-56% chance of contacting individual ERAs (Table A.2-25) and PLs have a <0.5-62% chance of contacting individual ERAs (Table A.2-25).

During winter, LAs have a <0.5-59% chance of contacting individual ERAs (Table A.2-49) and during winter, PLs have a <0.5-65% chance of contacting individual ERAs (Table A.2-49).

10 Days

During the entire year (annual), the OSRA model estimates that a large spill from PLs 3, 5, 6, or 9 has a <0.5-4 % chance of contacting individual LSs. Those LSs of 1% or greater include 64-66 (Point Hope-Ayugatak Lagoon), 72-85 (Point Lay - Barrow) (Table A.2-8). LAs 5, 6, 10 or 11 have a <0.5-2% chance of contacting LSs. Those LSs of 1% or greater 65 include (Cape Lisburne), 74-75 (Kasegaluk Lagoon-Icy Cape), 78-80 (Point Collie-Kugrua Bay), or 84-85 (Barrow Area) (Table A.2-8). All other LAs and PLs have a <0.5% chance of contacting individual LSs within 10 days over the entire year. The OSRA model estimates the chance of contact to ERA Land ranges from 9-10% for LAs 10 or 11 (Table A.2-2) and 1-4% for LAs 1, 4, 5, or 6. The OSRA model estimates the chance of contact to ERA Land ranges from 11-22% for PLs 3, 6, or 9 (Table A.2-2) and 3-4% for PLs 2, 5 or 8.

During summer, the OSRA model estimates a large spill, from PLs 2, 3, 5, 6, 8, or 9 has a <0.5-7% chance of contacting individual LSs 64-67 (Point Hope to Cape Sabine) and 71-85 (Sitkok Point-Barrow) (Table A.2.- 8). LAs 10 or 11 have a <0.5-4% chance of contacting LS 65 (Cape Lisburne), 71-75 (Kukpowruk River-Icy Cape), 78-80 (Point Collie-Kugrua Bay), or 83-85 (Nulavik-Barrow) (Table A.2-32). Offshore LAs 4, 5 or 6 has a <0.5-1% chance of contacting LSs 79-80 (Point Belcher-Kugrua Bay) or 84-85 (Barrow area). LA1 has a <0.5% chance of contacting individual LSs within 10 days over summer. The OSRA model estimates the chance of contact to ERA Land ranges from 14-15% for LAs 10 or 11 (Table A.2-26) and 2-5% for LAs 1, 4, 5, or 6. The OSRA model estimates the chance of contact to ERA Land ranges from 15-30% for PLs 3, 6, or 9 (Table A.2-26) and 3-8% for PLs 2, 5 or 8.

During winter, the OSRA model estimates that a large spill from PLs 3, 6, 8, or 9 have a <0.5-3% chance of contacting individual LSs 64-67 (Point Hope-Cabe Sabine) 72-76 (Point Lay-Tunalik River), or 78-85 (Point Collie-Barrow (Table A.2.56). Nearshore LAs 10, or 11, have a <0.5-1% chance of contacting LS 65 (Cape Lisburne) 79-80 (Point Collie-Wainwright) or 84-85 (Barrow Area) (Table A.2-56). All other LAs and PLs have a <0.5% chance of contacting individual LSs within 10 days over winter (Table A.2-56). The OSRA model estimates the chance of contact to ERA Land ranges from 5-6% for LAs 10 or 11 (Table A.2-50) and 1-3% for LAs 1, 4, 5, or 6. The OSRA model estimates the chance of contact to ERA Land ranges from 8-15% for PLs 3, 6, or 9 (Table A.2-50) and 2% for PLs 2, 5 or 8.

The OSRA model estimates a large spill from LAs or PLs adjacent to or on top of ERAs has the highest percent chance of contact. During the entire year (annual), LAs have a <0.5-35% chance of contacting individual ERAs (Table A.2-2) and PLs have a <0.5-61% chance of contacting individual ERAs (Table A.2-2).

During summer, LAs have a <0.5-71% chance of contacting individual ERAs (Table A.2-26) and PLs have a <0.5-83% chance of contacting individual ERAs (Table A.2-26).

During winter, LAs have a <0.5-67% chance of contacting individual ERAs (Table A.2 50) and PLs have a <0.5-62% chance of contacting individual ERAs (Table A.2-50).

30 Days

During the entire year (annual), the OSRA model estimates that a large spill from all LAs or PLs has a <0.5-3% of contacting Russian Chukchi coastline individual LSs 5-8 or 20-39 (E. Wrangel Island, Pil'gyn-Uelen, Russia) (Table A.2-9). The percent chance of contacting the GLS Russia Chukchi Coastline (GLS 175) ranges from 10-25% for LAs or PLs (Table A.2-14). Pipeline segments 3 or 6 and LAs 10 or 11 have a <0.5%-3% chance of contacting individual LSs 64-67 (Point Hope-Cape Sabine). During the entire year all LAs and PLs have a <0.5-6% chance of contacting individual LSs 71-85 (Kukpowruk River -Barrow) (Table A.2-9).

During summer, the OSRA model estimates that a large spill from all LAs and PLs has a <0.5-2% chance of contacting LSs 5-8 or 21-37 (E. Wrangel, Pil'khikay -Chegitun, Russia). All LAs and PLs have a <0.5%-10% chance of contacting at least one individual LSs 64-88 (Point-Cape Simpson) (Table A.2-31).

During winter the OSRA model estimates that a large spill from all LAs or PLs has a <0.5-3% of contacting Russian Chukchi coastline individual LSs 5-8 or 20-39 (E. Wrangel Island, Pil'gyn-Uelen, Russia) (Table A.2-57). Pipeline segments 3 or 6 and LAs 10 or 11 have a <0.5%-3% chance of contacting individual LSs 64-67 (Point Hope-Cape Sabine). All LAs and PLs have a <0.5%-4% chance of contacting at least one individual LSs 72-85 (Point Lay- Barrow) (Table A.2-58).

The OSRA model estimates a large spill from LAs or PLs adjacent to or on top of ERA have the highest percent chance of contact. During the entire year (annual), LAs have a <0.5-47% chance of contacting individual ERAs (Table A.2-3) and PLs have a <0.5-64% chance of contacting individual ERAs (Table A.2-3).

During summer, LAs have a <0.5-75% chance of contacting individual ERAs (Table A.2-26) and PLs have a <0.5-86% chance of contacting individual ERAs (Table A.2-26). During winter, LAs have a <0.5-70% chance of contacting individual ERAs (Table A.2-51) and PLs have a <0.5-78% chance of contacting individual ERAs (Table A.2-51).

A-4. Oil-Spill-Risk Analysis

A measure of oil-spill risk is determined by looking at the potential for one or more large spills occurring as a result of exploration, development, or production from the Scenario and then of a large spill contacting a shoreline segment, resource, or resource area of concern (called an environmental resource area (ERA)). If spilled crude or condensate oil contacts any portion of a shoreline segment or ERA, it is called simply a contact. The oil spill risk analysis helps determine the relative risk of occurrence and contact of one or more large spills in and adjacent to the Leased Area.

Combined probabilities are the chance of one or more large spills occurring and of those spills contacting over the life of the Scenario. They are estimated using the conditional probabilities, the large oil-spill rates, the resource estimates, and the assumed transportation scenarios. These are combined through matrix multiplication to estimate the mean number of one or more large spills from operations in and adjacent to the Leased Area occurring and of any of these spills making a contact.

A-4.1. Chance of One or More Large Spills Occurring

The chance of one or more large spills occurring is derived from two components: (1) the large spill rate and (2) the resource-volume estimate. The spill rate is multiplied by the resource volume to estimate the mean number of spills. Oil spills are treated statistically as a Poisson process, meaning that they occur independently of one another. If BOEM constructed a histogram of the chance of exactly 0 spills occurring during some period, the chance of exactly 1 spill, or exactly 2 spills, and so on, the histogram would have a shape known as a Poisson distribution. An important and interesting feature of this distribution is that it is entirely described by a single parameter, the mean number of large spills. Given the mean number of large spills, you can calculate the entire histogram and estimate the chance of one or more large spills occurring.

A-4.1.1. Large Spill Rates

BOEM derives the large oil-spill rates for the Arctic OCS from a fault-tree modeling study conducted by the Bercha Group Inc. (2014b). Using fault trees, oil-spill data from the Gulf of Mexico and Pacific OCS (Bercha Group Inc., 2013) were modified and incremented to represent expected Arctic performance and included both Arctic and non-Arctic variability.

Fault-tree analysis is a method for estimating the spill rate resulting from the interactions of other events. Fault trees are logical structures that describe the causal relationship between the basic system components and events resulting in system failure. Two general fault trees are constructed, one for large pipeline spills and one for large platform/well spills. In the Bercha Group Inc. (2006, 2008) studies, fault trees were used to transform historical spill statistics for non-Arctic regions to predictive spill-occurrence estimates for the Beaufort and Chukchi seas' sale areas. The Bercha Group, Inc. (2008) fault-tree analysis focused on Arctic effects as well as the variance in non-Arctic effects, such as spill size and spill frequency. Arctic effects were treated as a modification of existing spill causes as well as unique spill causes. Modification of existing spill causes included those that also occur in other OCS regions but at a different frequency, such as trawling accidents. Unique spill causes for pipeline spills included events that occur only in the Arctic, such as ice gouging, strudel scour, upheaval buckling, thaw settlement, and other causes. For platforms, unique spill causes included ice force, low temperature, and other causes. The measures of uncertainty calculated were expanded beyond Arctic effects in each fault-tree event to include the non-Arctic variability in spill size, spill frequency, and facility parameters, including wells drilled, number of platforms, number of subsea wells and subsea pipeline length. The inclusion of these types of variability—Arctic effects, non-Arctic data, and facility parameters—is intended to provide a realistic estimate of spill-occurrence indicators on the Arctic OCS and their resultant variability.

The Bercha Group Inc. (2014b) fault tree analysis includes updated spill information from the Gulf of Mexico and the Pacific OCS (Bercha Group Inc., 2013). It also included refined information about LOWC frequencies used in the fault tree by incorporating information from a recently completed LOWC study (Bercha Group Inc., 2014a). The LOWC study updated offshore LOWC frequency information through 2011 for both the Gulf of Mexico (GOM) and the Pacific (PAC) OCS and the North Sea using information from both the SINTEF worldwide database and the U.S. GOM and PAC OCS. Previous fault tree studies (2006, 2008) used all LOWC events and their resultant frequencies regardless of whether or not they spilled crude or condensate oil. To this extent, previous fault tree results were conservative. In addition, platform spills, which occurred from a LOWC event, were previously double counted as both a platform/well spill and a LOWC event.

Recent studies (Bercha Group Inc., 2014a; Ji, Johnson, and Wikel, 2014; USDOI, BOEM, 2012a) have continued to refine data and information about LOWC. Until recently, a consolidated dataset of multiple variables was not readily available to analyze the volumes of oil associated with LOWC with other applicable variables. Of the approximately 192 Gulf of Mexico LOWC events from 1980-2011, nine escalated into blowouts and spilled crude or condensate ≥ 50 bbl (Bercha Group Inc., 2014a) all of which were small spills except the DWH. The new information reveals that, compared to the total number of LOWC events, there are few crude and condensate spills as a result or a LOWC escalating into a blowout.

A-4.1.1.1. Results for OCS Large Spill Rates

For purposes of fault-tree analysis, BOEM uses the E&D Scenario in Appendix B. The annual rates were weighted either by the annual production divided by the total production or the year divided by the total years, and the prorated rates were summed to determine the large spill rates over the life of the exploration and production from the Leased Area. For the anchor A and satellite A2 prospects in the Leased Area, the life of exploration, development and crude oil and natural gas liquid condensate production is 51 years. This is inclusive of an oil production period of 44 years. Bercha Group Inc. (2014b) calculated the mean spill rate for Platforms/Wells, Pipelines, and Total as well as the 95% confidence intervals on the total large spill rate per Bbbl as shown below:

Type	Mean
Platforms/Wells	0.11 spills per Bbbl produced
Pipelines	0.21 spills per Bbbl produced
Total	0.32 spills per Bbbl produced
95% Confidence Interval	0.12 -0.56 spills per Bbbl produced

This analysis shows that the major contributors to the large spill rates are pipelines.

A-4.1.2. Resource-Volume Estimates

For this analysis it is assumed that 4.3 Bbbl is produced and transported. The resource volume estimates and resource E&D scenarios are discussed in the Second SEIS Sections 2.3, 4.1.1, and Appendix B.

A-4.1.3. Transportation Assumptions

Section 3.1.5 discusses the transportation assumptions for the hypothetical launch areas and their associated hypothetical pipelines.

A-4.1.4. Results for the Chance of One or More Large Spills Occurring

BOEM's estimate of the likelihood of one or more large spills occurring assumes that there is a 100% chance that development(s) will occur and 4.3 Bbbl of crude oil and natural gas liquid condensate will be produced. (That volume is based on estimates discussed in Chapter 2, Section 2.3 and Chapter 4, Section 4.1.1). BOEM evaluates what would happen if full development as described in the Scenario occurred, even though the chance of that happening is probably very small in a frontier area like the Chukchi Sea. If a development occurs, this oil-spill analysis more accurately represents the chance of one or more large spills occurring.

Additionally, the chance of one or more large spills occurring as a result of operations in and adjacent to the Leased Area is estimated over the life of the development(s). For the Leased Area, crude oil and natural gas liquid condensate production is assumed to occur over a production period of 44 years. In the estimates of one or more large spills occurring, the annual chances for large spills occurring from both pipeline and platforms/wells over the entire estimated life of the development(s) are added together to get the final result.

The large spill rates used in this section are all based on the mean number of large spills per Bbbl of hydrocarbon produced. Using the above mean spill rates for large spills, Table A.1-21 shows the estimated mean number of large oil spills for the Alternatives 1, 3, or 4. BOEM estimates 0.9 pipeline spills and 0.5 platform (and well) spills would occur, for a total (over the life of the Leased Area) of 1.4 spills.

For purposes of analysis, two large spills are assumed to occur and are analyzed in this Second SEIS. The two large spills are assumed to occur during the development and production phase. This assumption is based on the fact that a very small fraction of spills are estimated during the relatively short exploration drilling phase, as compared to the total spill frequency for exploration, development and production activities.

Now, looking at the entire 51-year exploration and oil and condensate production life of the Leased Area, BOEM uses the above mean spill number to determine the Poisson distribution. Table A.1-22 shows the chance of no large pipeline spills occurring is 41%, and the chance of one or more large pipeline spills occurring is 59%. The chance of no large platform (wells and platform) spills occurring is 61% and the chance of one or more large platform (wells and platform) spills is 39%. The mean spill number total is the sum of the mean number of platform, well, and pipeline spills over the entire 51-year exploration and production life. The chance of no large spills occurring is 25%, and the chance of one or more large spills occurring is 75% for the Scenario. Figure A-1 shows the Poisson distribution that demonstrates this analysis.

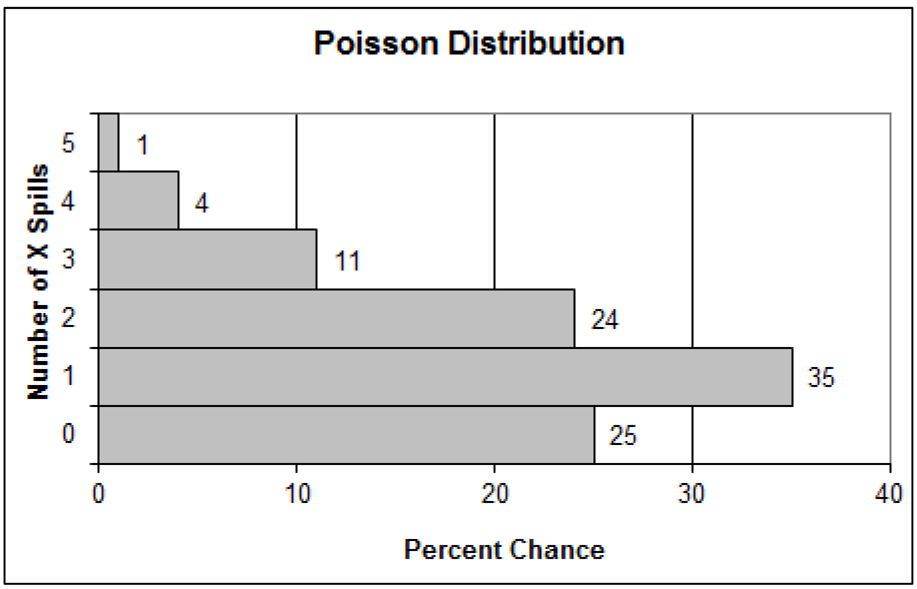

Figure A-1. Poisson Distribution: Leased Area, Alternatives 1, 3 or 4 (Pipeline and Platform/Well) over the Scenario Life.

A-4.2. Chance of a Large Spill Contacting: Conditional Probabilities

The chance of a large spill from operations on the Leased Area contacting shoreline sections or ERAs is taken from the oil-spill-trajectory model results, called conditional probabilities. These are summarized in Section 3.4.2.2 and are listed in Tables A.2-1 through A.2-72.

A-4.3. Results of the Oil-Spill-Risk Analysis: Combined Probabilities

Tables A.2-73 through A.2-75 show the annual combined probabilities for the Leased Area for Alternatives 1, 3, and 4. The combined probabilities reflect the chance of one or more large spills occurring and contacting resources over the Scenario life of the Leased Area. Because no leases or few (5) leases were contained within the alternatives the combined probabilities varied by ±1%

between alternatives. The variation was not substantive enough to warrant a separate analysis and is well within the variation on the input ice, ocean and wind fields.

For the most part, the chance of one or more large spills from operations in or adjacent to the Leased Area occurring and contacting land segments or environmental resource areas is 37% or less within 30 days, or 40% or less within 360 days. For environmental resource areas with a chance of occurrence and contact ≥ 1%, the chance of one or more large spills from operations in or adjacent to the Leased Area occurring and contacting a certain environmental resource areas ranges from 1-21%, 1-27 %, and 1-37 % within 3, 10, and 30 days, respectively. Land segments with at least a 1% chance of one or more large spills from operations on the Leased Area occurring and contacting land segments within 30 days include LSs 7,8 (Wrangel Island) 22-37 (Chukotka coastline), 64-80 (Point Hope – Eluksingiak Point) and 84-85 (Barrow Area). The LSs 30 (Nutepynmin), 31 (Alyatki), 80 (Eluksingiak Point), and 84 (Will Rogers and Wiley Post Mem.) have a 2% and 79 (Wainwright) and 85 (Barrow) have a 3% chance of one more large spills occurring and contacting.

A-5. Accidental Small Oil Spills

Small spills are spills that are <1,000 bbl. Table A.1-1 shows the Second SEIS sections where BOEM analyzes the effects of small spill(s). BOEM considers three oil types for small spills: crude, condensate and refined oil.

Small spills, although accidental, are relatively routine. These are dealt with using routine spill prevention and response measures. Small spills would occur from both exploration and development activities. The majority of small spills could be contained on a vessel or platform, and refined fuel spills that reach the water would evaporate and disperse within hours to a few days. Further, those spills reaching the water may be contained by booms or absorbent pads. BOEM estimates small spills are likely to occur over the life of the exploration and development activities.

A-5.1. Exploration

Exploration includes both geological and geophysical activities (marine seismic, geotechnical and geological surveys) and exploration and delineation drilling activities. Small spills during exploration are likely to be refined oil products such as lube oil, hydraulic oil, gasoline or diesel fuel.

A-5.1.1. Geological and Geophysical (G&G) Activities

Small fuel spills associated with the vessels used for G&G activities could occur, especially during offshore vessel-to-vessel fuel transfers. For purposes of the oil spill analyses for Alternative 1, 3, or 4, no large or very large crude or diesel oil spills are estimated from G&G activities, although small spills are expected to occur. This is based on a review of potential discharges and on the historical oil spill occurrence data for the Alaska OCS and adjacent State of Alaska waters. Several spills from refueling operations (primarily at West Dock) have been reported to the National Response Center in the Beaufort and Chukchi seas and all the spills were small.

For purposes of analysis, BOEM estimates an offshore vessel transfer spill ranges from <1-13 bbl (USDOI, BOEMRE, 2010a; USDOI, BOEMRE, 2010b; USDOI, BOEM, 2012b; USDOI, BOEM, 2013). The <1 bbl is the estimated volume of diesel fuel resulting from an offshore vessel fuel transfer accident assuming the dry quick disconnect and positive pressure hoses function properly. Dry quick disconnect couplings are designed to snap closed should the valve become disconnected with the poppet open, thereby limiting liquid release. Positive pressure fuel hoses are designed to stop pumping if the pressure is lost in the hose due to a break.

In a potential scenario, where a transfer hose ruptures and the positive pressure hoses fail, BOEM assumed that it would take a maximum of 30 seconds for someone to discover the rupture and 30 seconds to stop the pump. The estimated volume spilled during the maximum 60 second interval is likely to be approximately 13 bbl. In this scenario, BOEM assumes that all spilled fuel reached the water and none remains on the deck of the vessel.

In this analysis, BOEM assumes that 99% of the time, all dry quick disconnect and positive pressure hoses function properly. BOEM also assumes that every other G&G activity has an offshore transfer fuel spill (which is a very conservative estimate, based on the fact that no offshore fuel transfer spills have been reported from G&G surveys in the Alaska Region). Also, BOEM assumes that spills do not occur in the same space and time, and that up to one G&G activity has an equipment malfunction. Therefore, fuel spills from a maximum level of anticipated annual G&G activities could range from 0 to less than 3 at a minimum and up to 13 bbl at a maximum of fuel spilled in one instance annually. Table A.1-23 shows the estimated number and volume of small spills during G&G activities.

A-5.1.2. Exploration and Delineation Drilling Activities

For purposes of the oil spill analyses for Alternatives 1, 3, or 4, no large crude or diesel oil spills are estimated from exploration and delineation drilling activities. This is based on a review of potential discharges, historical oil spill and modeling data, and the likelihood of oil spill occurrence. This estimate is based on:

- The low rate of OCS exploratory drilling well-control incidents spilling crude oil per well drilled
- The fact that, since 1971, one OCS crude oil spill (large/very large) has occurred during temporary abandonment (converting an exploration well to a development well) while more than 15,000 exploratory wells were also drilled
- The low number (40) of exploration wells being drilled as a result of this proposed action
- The fact that no crude oil would be produced from the exploration wells, and the wells would be permanently plugged and abandoned
- The history of exploration spills on the Arctic OCS, all of which have been small
- The fact that no large spills occurred while drilling 35 exploration wells to depth in the Arctic OCS 1975-2003
- Pollution prevention and oil spill response regulations and methods, implemented by BOEM, BSEE, and the operators and since the Deepwater Horizon spill have reduced the risk of spills and diminished their potential severity (USDOI, BOEM, 2011; Shell, 2011, Shell, 2012)

Historical Beaufort Sea and Chukchi Sea OCS exploration spill data suggest that the most likely cause of an oil spill during exploration could be operational, such as a hose rupture, and the spill could be relatively small (Table A.1-2). For purposes of analysis, up to a 50-bbl diesel fuel-transfer spill was chosen as one spill volume in the small spill category and 5-bbl was selected as the typical volume. This was based on historical exploration spill sizes in the Beaufort and Chukchi OCS, OCS oil-spill data, which indicated that 99.7% of all OCS spills are <50 bbl (Anderson, Mayes, and LaBelle, 2012) and estimates of USCG Worst Case Discharge, average most probable discharge and maximum most probable discharge for exploration plans (Shell, 2011, Shell, 2012).

The WCD (for the purposes of the USCG) was calculated based on the definition contained in 33 CFR 154.1029(b) (2). Operators used the following values: (1) Maximum Time to Discover Release: 5 minutes; (2) Maximum Time to Shutdown Pumping: 0.5 minutes (30 seconds) (3) Maximum Transfer Rate: 320 gpm (based on representative fuel transfer pumps on the oil spill response vessel = 7.6 bbl/min; (4) Total Line Drainage Volume: 163 gal [assuming a 4-inch by 820-ft marine hose between the pump manifold on the fuel barge and the delivery flange on the inlet piping at the drillship] or 3.9 bbl. The total volume was 48 bbls and for this analysis was rounded to the nearest ten for a value of 50 bbl.

The maximum most probable discharge is 5.0 bbl of diesel fuel. It was calculated from the definition contained in 33 CFR 154.1020 (the lesser of 1,200 bbl or 10% of the volume of the WCD).

Small spills could occur during exploration and delineation drilling activities. In this analysis BOEM assumes that every drilling activity has an offshore transfer fuel spill. Annually one drilling activity has a WCD and one has a maximum most probable discharge for a total of 55 bbl annually. These spills do not occur in the same space and time. The volumes range from 5 up to 50 bbl of fuel spilled. The estimated number and volume of small spills during exploration activities presented is displayed in Table A.1-23.

The 50 bbl spill is estimated to last less than 3 days on the surface of the water, based on the SINTEF OWM calculations. In terms of timing, a small spill from the exploration activities could happen at any time from July to November. Conservatively, BOEM assumes that the vessel would not retain any of the diesel fuel, and depending on the time of year, a small spill could reach the vessel and then the environment. The environment could be open water or open water and ice. The analysis of a small spill examines the weathering of the estimated 50 bbl diesel fuel spill.

BOEM summarizes below the estimates for the fate and behavior of diesel fuel in the analysis of the effects of oil on environmental, economic and social resources in Section 4.3. BOEM outlines the scenario assumptions for an exploration drilling small spill to provide a consistent analysis of small oil spill impacts by resource:

- One small spill occurs
- The spill size is 50 or 5 bbl
- The oil type is diesel fuel
- All the oil reaches the environment; the vessel or facility absorbs no oil
- There is no reduction in volume due to cleanup or containment. (Pollution prevention, containment and cleanup are analyzed separately as mitigation and as disturbance.)
- The spill could occur at any time of the exploration operations (July-November)
- The weathering for a 50 bbl spill is as shown in Table A.1-24, and the spill lasts less than 3 days on the water
- The spill starts within the Leased Area or Kotzebue Sound

A-5.1.3. Modeling Simulations of Oil Weathering

To judge the effect of a small oil spill, BOEM makes estimates regarding how much oil evaporates, how much oil is dispersed, and how much oil remains after a certain time period. BOEM derives the weathering estimates of diesel fuel oil from the SINTEF Oil Weathering Model Version 4.0 (Reed et al., 2005) modeling results for up to 30 days. Table A.1-24 summarizes the results BOEM estimates for the fate and behavior of a 50-bbl diesel fuel spill. Based on OWM modeling simulations and historical response experience, a small, 50-bbl diesel fuel oil spill will be localized and short term.

A-5.2. Development and Production

The analysis of onshore ANS crude oil spills greater than 1 barrel is performed collectively for all facilities, pipelines, and flowlines (Nuka, 2013; Robertson et al., 2013). ANS crude oil spill frequencies are applied to estimate small spills for the Leased Area. Following is the estimated number and volume of small crude and refined oil spills during development and production:

For purposes of analysis, this Second SEIS assumes a median small crude or condensate spill size of 3 bbl (Robertson et al., 2013a, Anderson, Mayes and LaBelle, 2012). An estimated 220 small crude oil spills, >1 bbl, could occur during the 44-year oil-production period for Alternatives 1, 3, or 4; an average of about 5 spills per year. An estimated 260 refined-oil spills >1 bbl could occur during the 44-year oil-production period, an average of about 6 spills per year. The same number of refined spills occurs over the 44-year gas-sales production period. Overall, an estimated 11 crude and refined oil spills >1 and <1,000 bbl are assumed to occur each year of production for Alternatives 1, 3, or 4 for years 10-30, 17 for years 31-53 and 6 for years 54 to 78.

In addition the spills just discussed, an estimated two small crude oil spills ≥500 bbl could occur during the 44-year oil-production period for Alternatives 1, 3, or 4. One of those two small crude oil spills ≥500 bbl is assumed to occur from the 300 mile onshore pipeline.

A-5.3. Small Spill Assumptions Summary.

The analysis of small oil spill effects for Alternatives 1, 3, or 4 is based on the following assumptions:

- Small spills occur during exploration and delineation activities and initial development activities.
- Spills from offshore refueling during geological and geophysical activities ranges up to <3 bbl annually with one individual spill of approximately 13 bbl.
- Small spills during exploration and delineation drilling operations range from 0 up to 50 bbl.
- All the oil reaches the environment.
- The oil types could be diesel during exploration and delineation activities and crude, diesel, or condensate during production.
- The small spill could occur during open water during exploration and delineation activities and at any time of the year during development and production.
- The spill weathering is shown in Tables A.1-24 or 25.

A-6. Potential for Natural Gas Releases

Potential accidental gas release impact producing factors were detailed in 193 SEIS Section IV.B.5 for gas sales totaling 2.25 trillion cubic feet (Tcf) over 20 years. This analysis evaluates the potential for a large gas release during natural gas development and production of 2.2 Tcf over 44 years, as well as the potential impacts of such releases on the environment. This analysis identifies potential releases from:

- LOWC escalating into a blowout at production platforms/wells
- Ruptured or leaking pipelines
- Onshore facilities

The following subsections discuss possible ways in which natural gas may be released into the environment, assign frequencies to notable events, and present hypothetical release scenarios for further environmental resource-specific analysis.

Loss of Well Control

It is possible, though unlikely that a LOWC during natural gas production could cause a release of natural gas into the environment. A LOWC can result in a blowout, but blowouts do not always follow a LOWC incident. Also, the frequency of LOWCs can vary with the type of well drilled. The International Association of Oil and Gas Producers estimates the frequency of LOWC events at 3.6 x

10^{-4} gas blowouts per exploration well, and at 7.0 x 10^{-4} gas blowouts per development well drilled (IAOGP 2010). The production well-control blowout incident rate for production of gas is an order of magnitude lower, estimated at 5.7 x 10^{-5} blowouts per well year (IAOGP, 2010). While estimates for gas blowout frequencies have been updated the since the 193 SEIS, they still occur at a very low frequency.

Initially, natural gas produced from the Leased Area will be reinjected due to the lack of natural gas infrastructure. In about 2031, infrastructure will have been installed, and sale of natural gas from the Lease Area is expected to begin. When this occurs, it is assumed that one well control incident of a single well on the facility could occur, releasing 10 million cubic feet of natural gas for one day. This is based on the average well production for one day from one well and the estimated rates of blowout duration for gas production wells.

Ruptured Pipeline

Although unlikely, there exists some potential for a gas pipeline to rupture. The estimated rate of offshore gas pipeline ruptures in the Gulf of Mexico is 2.4 x 10^{-5} per mile-year (USDOI, MMS, 2009). For a 160 mile offshore gas transmission pipeline, over a 44 year production life, the estimated number of incidents is 0.17 offshore gas pipeline ruptures over the life of the gas sales. For onshore gas pipelines, the estimated spill rate for a generic DOT onshore gas transmission lines from 1994-2013 is 1.5 x 10^{-4} spill or release per pipeline mile per year (USDOT, 2013a, b). For a 300 mile onshore pipeline, over a 44 year production life, the estimated number of significant incidents using DOT's estimated rate is 2 pipeline ruptures over the life of the gas sales. Under DOT regulation, significant incidents are incidents that involve property damage of more than $50,000, injury, death, release of gas, or that are otherwise considered significant by the operator. The lack of population and scarcity of human activity on the ANS is expected to reduce the historical frequency of significant incidents as defined by DOT.

If a major release of dry natural gas would occur, this would cause a sudden decrease in gas pressure, which in turn would automatically initiate procedures to close the valves on both ends of the ruptured segment of pipeline. Closure of the valves would effectively isolate the rupture and limit the amount of natural gas released into the environment. Given the daily flow rate and the estimated total number of valves, it is estimated that approximately 20 million cubic feet could be released within one pipe section between two valves. Onshore any gas releases from an elevated pipeline would disperse into the atmosphere. There is some small potential for ignition, but in the remote Alaska North Slope, ignition sources would not be readily available.

Onshore Facility

Although unlikely, there remains some potential for a gas leak and explosion at the onshore facility, due to the enclosed space in the facility.

Gas Release Fate

Natural gas is primarily made of up methane CH_4 and ethane C_2H_6 which make up 85-90% of the volume of the mixture. Propane, butane, and heavier hydrocarbons can be extracted from the gas system and liquefied for transportation and storage. These natural gas products are commonly known as liquid petroleum gas or LPG. Pentane through decane are the intermediate-weight hydrocarbons and are volatile liquids at atmospheric temperature and pressure. The common names for these natural gas products are pentanes-plus, condensate, natural gasoline, and natural gas liquids (NGLs). Produced gas is expected to be dry gas (no water or condensates).

In the event of a pipeline rupture, the leak detection system would close the pipeline isolation valves. Any release would be almost entirely vapor, rather than liquid. Winter temperatures could cause the butane and pentane components to initially remain in a liquid state. However, if any liquids formed, much of the volume would quickly evaporate due to the volatile nature of NGLs. The consequences of an accidental spill of NGLs as a result of a pipeline rupture could include fire and/or explosion of NGL vapors.

The primary component of natural gas is methane, a colorless, odorless, and tasteless gas. It is not toxic in the atmosphere, but is classified as a simple asphyxiate, possessing an inhalation hazard. As with all gases, if inhaled in high enough concentration, oxygen deficiency could occur and result in suffocation. The specific gravity of methane is 0.55 (Air = 1.0). Being lighter than ambient air, it has the tendency to rise and dissipate into the atmosphere, rather than settle into low areas. For this reason, natural gas leaks are assumed to rise and disperse.

A-7. Very Large Oil Spills

A-7.1. Estimates of Source and Size

Very large spills could potentially come from four sources associated with OCS exploration or development operations: (1) pipelines (2) facilities (3) tankers or (4) support vessels. BOEM reviewed those four sources and determined well-control incidents (LOWCs) have the potential for the largest spill volumes, assuming all primary and secondary safeguards fail and the well does not bridge (collapse in on itself). At this time, pipelines are the preferred mode of petroleum transport (over tankers) in the Chukchi OCS and, therefore, BOEM did not consider the loss of a fully loaded tanker. The loss of the entire volume in an offshore pipeline would be less than a long duration well control incident with high flow rates. Sizes of spills from support vessels were considered based on foundering and the loss of entire fuel tanks, and determined to be lower in volume than a well control incident where all primary and secondary safeguards failed. For purposes of analysis, BOEM examined a well control incident which escalates into a catastrophic blowout. This Second SEIS details the oil spill analysis results that are relevant to the very large oil spill (VLOS) analysis.

A-7.2. Behavior and Fate of Crude Oils

The Sale 193 FEIS Appendix A.1, Section B, and this Appendix, Section A-2.1 summarizes the behavior and fate of crude oil. This section summarizes and updates relevant information to the VLOS analysis.

A-7.2.1. Release from a Well Control Incident

A very large oil and gas release could rise to the ocean surface from shallow to moderate depths on the seafloor (e.g. 1979 Ixtoc I spill) or fall from the top of the rig or platform to the surface of the ocean. The force of the gas would facilitate the formation of small oil droplets (0.5 – 2.0 mm) and to disperse them in the ocean or atmosphere (Dickins and Buist, 1981; Belore, McHale and Chapple, 1998; S.L. Ross Environmental Research Ltd, D.F. Dickins and Associates Ltd., and Vaudrey and Associates Inc., 1998). A small portion (1-3%) of droplets could form a plume as identified from Ixtoc at shallow to moderate depths without the injection of dispersants (Boehm and Fiest, 1982). The more soluble compounds within the oil may dissolve, particularly from small droplets that are prevalent in the vertical plume, which is where the vigorous turbulence occurs (Adcroft et al. 2010). Figure A-2 diagrams a subsea blowout in shallow to moderate water depths (Westergaard, 1980). A subsea release in shallow to moderate depths moves through three zones: (1) a jet zone causing turbulence and droplet formation, (2) a buoyancy zone where gas, oil, and water are carried to the surface and droplet size governs rise velocity, and (3) a surface interaction zone where the surface influence carries the oil with the prevailing currents or ice and the gas exits into the atmosphere, which causes a surface boil zone (Westergaard, 1980; PCCI, 1999; Reed et al., 2006). Volatile organic carbons would be measurable in the atmosphere downwind of the spill in a small area confined to a narrow plume (deGouw et al., 2011; Ryerson et al., 2011) during the summer open water and broken ice seasons.

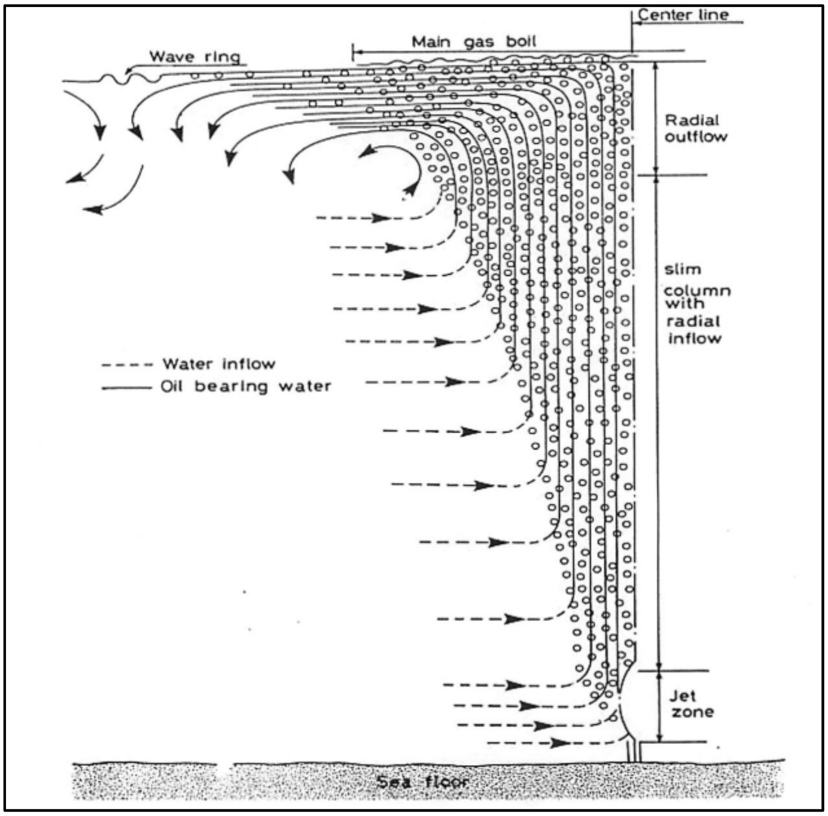

Figure A-2. Shallow (<50 meters) Underwater Blowout Plume.
Source: Westergaard, 1980.

For well control incidents at shallow to moderate depths, the gas is considered to be an ideal gas with a specific volume decreasing linearly with pressure. Dissolution of gas from rising bubbles may be minimal for incidents at shallow to moderate depth since the residence time of gas bubbles is expected to be short (Reed et al., 2006). Thus, very little of the gas would dissolve in the water column and nearly all of the gas would be released to the atmosphere.

A-7.2.2. Ice Present

The fate and behavior of oils in ice conditions is different from oil in temperate water; slower chemical and biological reactions occur when temperatures are lower. Broken ice occurs in the Chukchi Sea during fall freezeup and spring breakup. The ice would restrict the oil somewhat and reduce spreading (Gjosteen and Loset, 2004; Faksness et al., 2011). Weathering of oil in high-ice concentrations (70-90%) is significantly slower compared to weathering in open water (Brandvik et al. 2010). However, unless the oil is frozen into the ice, evaporation would continue to occur. Dispersion and emulsification rates are s lower in broken ice than in open water. During fall freezeup, the oil would freeze into the grease ice and slush before ice sheeting occurs (NORCOR, 1975). Winds and storms could break up and disperse the ice and oil until the next freezing cycle occurs. These freezing cycles could be hours or days.

Faksness and Brandvik (2008a) studied the dissolved water-soluble crude oil components encapsulated in first-year sea ice. Their data show a concentration gradient from the surface of the ice to the bottom, indicating there is transport of the dissolved components up through brine channels. Field studies also showed that high air temperature leads to more porous ice, and the dissolved water-soluble components leak out of the ice rapidly; however, under cold air temperatures and less porous ice, the water-soluble components leak out of the ice more slowly and have potentially toxic concentrations (Faksness and Brandvik, 2008b).

Any oil remaining in the environment during deep winter, the oil would freeze into the forming and existing ice sheets (Dickens, 2011; Mar, Inc., et al., 2011). Then, in late spring and summer, the unweathered oil would melt out of the ice at different rates, depending on whether it is encapsulated in multiyear or first-year ice, and depending on when the oil was frozen into the ice. In first-year ice, most (85%) of the oil spilled at any one time would percolate up to the ice surface over about a 10-day period (Dickens, Buist and Pistruzak, 1981; Dickins et al., 2008; NORCOR, 1975; Nelson and Allen, 1981). In approximately mid-July, the oil pools would drain into the water among the floes of the opening ice pack. Thus, in first-year ice, oil would be pooled on the ice surface for up to 30 days before being discharged from the ice surface to the water surface. The pools on the ice surface would concentrate the oil, but only to about 2 centimeters thick, allowing evaporation of 5% of the oil, the part of the oil composed of the lighter, more toxic components. By the time the oil is released from the melt pools on the ice surface, evaporation will have almost stopped, with only an additional 4% of the spilled oil evaporating during an additional 30 days on the water.

A-7.2.3. Open Water

Spilled oil on sea water would move with the currents, ice, and winds. In addition to sunlight breaking down the oil, sunlight also has the potential to cause photo-enhanced toxicity (Barron et al., 2008).

A-7.2.4. Persistence

Spilled oil in sediments weathers differently than spilled oil in the open ocean. Shoreline oiling and persistence depends on a number of factors (Etkin, McCay, and Michel, 2007). Certain factors allow for some spills to persist in the shoreline and adjacent intertidal areas for decades (Li and Boufadel, 2010; Owens, Taylor, and Humphrey, 2008; Peacock et al., 2005). Many coastlines of the Chukchi and Beaufort Seas have high environmental sensitivity index (ESI) shoreline types such as tundra, marshes, peat, and fine-grained sediments to which oil clings. In these environments, oil tends to weather very slowly. The losses of hydrocarbons from both abiotic and biotic weathering in subsea Arctic sediments could be slow (Atlas, Horowitz, and Dushoshi, 1978; Payne, Clayton, and Kirstein, 2003). Table A.1-3 shows the percent high-ESI shores of the adjacent coastlines. Besides oiling the shore, some components of spilled oil can deposit on the sea floor. Dispersion of oil droplets and suspension of sediments from turbulence at the discharge location could facilitate the formation of oiled sediments and oily particulate matter, which could be deposited on the seafloor in the vicinity of the discharge location (Lee and Page, 1997; Payne, Clayton and Kirstein, 2003; Sterling et al., 2004; Farwell et al., 2009).

Spilled oil can also enter tidal waters and sediments. Lee and Page (1997) reviewed several large spills and estimated 1–13% of the spilled oil entered subtidal zones with an order of magnitude less hydrocarbon concentration than found in intertidal sediments. Exceptions (for less hydrocarbon concentrations) were semi-enclosed areas with clay-silt surface sediments and high concentrations of suspended sediments (Page et al., 1989). Oil persistence in subtidal areas would be weeks to years, except for specific areas described above (Lee and Page, 1997). Biodegradation and weathering of intertidal areas in cold waters were on the order of months to decades (Atlas, Boehm, and Calder, 1981; Prince et al., 2003). A recent study of biodegradation in the Arctic showed that as temperature increased in the Arctic summer, biodegradation increased (Chang, Whyte, and Ghoshal, 2011).

A-7.3. Very Large Oil-Spill Weathering

The weathering for a very large oil spill is as follows:

- The crude oil properties will be similar to a light crude oil of 35 API
- The size of the crude oil spill ranges from 60,000–20,000 bbl per day
- The wind, wave, and temperature conditions are as described
- The spill is a subsurface spill at approximately 40 m (meters)
- Meltout spills occur into 50% ice cover
- The properties predicted by the model are those of the thick part of the slick
- The spill occurs as a long- duration spill estimated at a daily rate
- The fate and behavior are as modeled (See Tables A.1-26 and A.1-27)
- The oil spill persists for up to 30 days in open water and ice when the wind speed is under 4 m/s (meters/second)
- The wind speed remains 4 m/s or less

For purposes of analysis, we look at the mass balance of the VLOS; in other words, how much is evaporated, dispersed, and remaining. At the average wind speeds over the Sale 193 area, dispersion is estimated to be moderate, ranging from 2-33% (Tables A.1-26 and A.1-27). Approximately one third of the spill evaporates within 30 days, with most of the evaporation taking place within the first day during both summer and winter.

However, at higher wind speeds (e.g., 10-15 m/s wind speed) and during summer, the slick would be dispersed and evaporated from the sea surface within a few days. Natural dispersion would take place if there was sufficient energy on the sea surface, such as breaking waves. The waves would break the oil slick into small droplets, typically with a diameter of 1–1000 μm (micrometers), which are mixed into the water masses (Reed et al., 2005). The largest droplets will resurface causing a thin monomolecular layer or sheen behind the main body of the oil spill. "Remaining" (in Tables A.1-26 and A.1-27) refers to the oil remaining after subtracting the above estimates from the total estimated release. Possible fates of the remaining oil include: remaining in the water column, settling to the sea floor, mixing with sediment, ingestion by microbes, or beaching on the shoreline with subsequent removal during shore cleanup activities or burial within the beach profile.

A-7.4. Persistence

Table A.1-3 shows the new ESI information for the coastlines of the U.S. portions of the Beaufort and Chukchi seas. The new information leads to the same conclusions discussed in the 2011 SEIS. Many coastlines of the Chukchi and Beaufort seas have high ESI shoreline types which means oil could weather very slowly and persist for long periods of time in those areas

A-7.5. Very Large Oil Spill Conditional Probabilities

Assuming a hypothetical high-volume and long-duration oil release occurs resulting in a VLOS, this section describes how the conditional probabilities from this Second SEIS for a large oil spill should be considered and applied for a VLOS, and where an offshore VLOS may go over longer time periods within 60 and within 360 days.

In this Second SEIS, a large spill is modeled differently than a VLOS. A large spill would be represented by a single trajectory, while a VLOS of long duration would be represented by numerous trajectories, as described below.

In a large spill trajectory analysis, it is not estimated that any one trajectory brings oil to a particular location. Rather, the number of trajectories contacting an individual resource over the total number of trajectories launched is used to calculate the percent chance of a hypothetical large spill trajectory contacting that resource. For example, if 1,000 large oil spill trajectories are launched and 500 of the trajectories contact that location, there is a 50% chance of a large spill contacting that location.

A long duration VLOS would consist of a spill occurring continuously for up to 74 days[1] and therefore this type of spill is more like a batch spill launched every day or so. In this case, there would be multiple trajectories over time with each trajectory launched regularly as the well continued to flow. Each trajectory would model how some fraction of the oil spill could spread to a specific resource or location. The multiple trajectories representing a VLOS would change how the conditional probabilities are interpreted. The conditional probabilities would represent how many trajectories come to that location, as described as percent trajectories (number of trajectories contacting a location/total number of trajectories launched). For example, if 1,000 trajectories are launched and 500 of the trajectories contact a specific location, then 50% of the trajectories would allow oil to be carried to that location. The terminology used hereafter is "percentage of trajectories contacting."

Therefore the conditional probabilities are used to provide information about the both the large and very large spill; however the interpretation of the data changes. Appendix A, Tables A.2-28, 30, 34, 36, 40, 42, 54, 60 and 66, which show summer and winter seasons within 60 and 360 days, are applicable to the VLOS conditional analysis.

A-8. Historical Alaska North Slope Crude Oil Spills and Rates (≥ 500 bbl)

The ANS oil spill analysis (≥ 500 bbl) includes onshore oil and gas exploration and development spills from the Point Thompson Unit, Badami Unit, Kuparuk River Unit, Milne Point Unit, Prudhoe Bay West Operating Area, Prudhoe Bay East Operating Area, Colville River, Bear Tooth, Greater Mooses Tooth and offshore Duck Island Unit (Endicott), Oooguruk, Nakaitchuq and Northstar Unit. ANS spill data include large spills from onshore pipelines and offshore state waters and onshore production and gathering facilities. The following information does not include spills on the ANS from the TAPS, which were evaluated separately.

For the ANS, all available information on historic industry oil spills ≥ 100 bbl during the period 1968 through 2013 was obtained from industry and regulatory agencies and collated (Hart Crowser, Inc. 2000; Robertson et al. 2013).

A review of the reliability and completeness of the data for spills ≥ 500 bbl (Hart Crowser, Inc. 2000; Robertson et al., 2013) indicated that the available information was most reliable starting in1985 for crude oil spills on the ANS, based on written documentation or lack of documentation for spills before that period. The BOEM determined that spills ≥ 100 bbl were documented and included in the database since 1985. In 1985, the State of Alaska Department of Environmental Conservation (ADEC) began tracking spills in an electronic format. Although Hart Crowser, Inc. (2000) states that the database is complete for the years since production began, the BOEM prefers to use 1985 as the starting point of reliability for large spills.

Analysis of the spill databases indicates that there are fewer spill records per year in the early years of ANS production (Everest Consulting Associates, 2007; Robertson et al., 2013). The average number of spills reported from 1977 to 1984 was 100 per year. The average number of spills reported from 1985 to 2006 was 324 spills per year—greater by a factor of three. Any uncertainty in documenting spills before that time is a concern because it is typical for spills to occur more frequently during field and pipeline startup.

[1] See Second SEIS Section 4.5.1 for the discussion explaining why the 74 days spill duration was selected for the VLOS analysis.

A-8.1. Historical Alaska North Slope Crude Oil Spills (≥ 500 bbl)

Eight crude oil spills ≥ 500 bbl associated with onshore and nearshore ANS oil production occurred from 1985 to 2013 (Table A.1-28). One spill ≥ 1,000 bbl was documented during this time period. Of the eight spills, three are classified as a pipeline spill. Four are classified as production processing and one as a production well site. These five spills collectively are called facility spills.

Using the highest reported spill-quantity values, from 1985 to 2013, the median spill size for facilities and pipeline ≥ 500 bbl on the ANS was 663 bbl, and the mean (or average) was 1,229 bbl. For purposes of analysis the BOEM rounds the median spill size to 700 bbl. The largest facility spill on record is 925 bbl. The largest pipeline spill is 5,053 bbl. Rounded to the nearest 100 bbl (to reflect the uncertainty associated with spill estimates), the hypothetical spill sizes used for purposes of this analysis is the median spill size of 700 bbl for the both the facility and pipeline spills.

A-8.2. Historical Trans-Alaska Pipeline Crude Oil Spills (≥ 500 bbl)

Private industry provides oil-spill information to the ADEC according to the State of Alaska Regulations 18 AAC 75 and the U.S. Department of Transportation according to 49 CFR 195.50 (Reporting Accidents). The Trans-Alaska Pipeline spill data were compiled by Hart Crowser, Inc. (2000) Maxim and Niebo (2002) and NRC (2003b). The oil-spill data were collated and evaluated for completeness and comprehensiveness. The ADEC, USDOT and Alyeska online spill data reports were used to update the Trans-Alaska Pipeline crude large oil spill data to 2013.

The Trans-Alaska Pipeline spill data include the pipeline from the ANS to the Valdez marine terminal. It does not include oil spills at the marine terminal. The Trans-Alaska Pipeline oil-spill analysis includes the pipeline and the pump stations, but excludes the Valdez marine terminal. Nine crude oil spills ≥ 500 bbl associated with TAPS occurred from 1977 through 2013 (Table A.1-29). Most large crude oil spills were associated with the start-up of the pipeline. No large spills ≥ 1,000 bbl occurred from 1981 to October 2001; a period of 20 years. The mean (average) size crude oil spill ≥ 500 bbl from 1977 to 2013 is 5,142 bbl, and the median is 4,000 bbl. For spill analysis, the median spill quantity is used and rounded to the nearest 100. Therefore, the median hypothetical TAPS pipeline spill size is 4,000 bbl for the cumulative oil spill analysis.

A-8.3. Historical Alaska North Slope and Trans Alaska Pipeline Large Crude Oil Spill Rates

To use historical ANS industry spill records to successfully estimate the mean number of large oil spills occurring, there must be a properly developed and validated database. Ideally, the database should include a wide range of spill volumes over a long period of time from oil exploration and production resembling the prospective project. The record of ANS onshore and state waters large crude oil spills from 1985-2013 represents a long time period and the record of large spills have been validated through several past and ongoing studies (Hart Crowser 2000; Maxim and Niebo 2002; NRC, 2003b; Everest Consulting, 2006; Nuka, 2010; Nuka, 2013; Robertson et al., 2013).

In addition to a properly developed and validated database, the computation of an oil-spill rate requires an exposure variable. The purpose of an exposure variable is to balance equally different oil developments that should have similar oil-spill frequencies for a given size of spills. Such an exposure variable is required, because oil developments rarely exactly resemble one other. Two basic criteria for the selection of an exposure variable are: (1) it should be defined simply; and (2) it should be a quantity readily estimated. The verification of a potential exposure variable includes a demonstration that the exposure variable generates equal values, in a statistical sense, for oil developments with similar oil-spill histories.

For oil spills, numerous such variables are in use, including historic volumes of oil produced/transported, number of wells drilled, well-years, and pipeline mile-years. Each of these exposure variables has an assigned application; for example, "wells drilled" would be used to compute the chance of a loss of well control incident during drilling operations. Moreover, two different variables may be used for computing the spill rate from the same segment of an oil development; for example, both historic volumes of oil produced/transported, and pipeline mile-years are used to estimate the spill rate from the same pipeline. For this analysis the exposure variable of volume of oil produced and pipeline mile year were calculated. For purposes of analysis, the volume of oil produced was used to estimate the large spill rate as shown below.

Alaska North Slope Production

1977-2013 16.7 Bbbl

1985-2013 12.8 Bbbl

Trans-Alaska Pipeline Mileage

1977-2013 29,238 pipeline mile years

1985-2013 23,209 pipeline mile years

A-8.3.1. Alaska North Slope Large Crude Oil Spill Rate 1985-2013 Based on Volume

Since 1985, one ANS facility or pipeline spill ≥ 1,000 bbl from ANS production has occurred. No documentation for crude oil spills ≥ 100 bbl occurring prior to 1985 was found, but spill records dated prior to 1985 have not been validated as complete because of missing or incomplete documentation (Hart Crowser, 2000; Robertson et al., 2013).

As noted above, eight spills ≥500 bbls are documented from 1985 to 2013; one of which was ≥1,000 bbl. For that same time period the total ANS production was 12.80 Bbbl of crude oil and condensate (Alyeska Pipeline Service Company, 2013).

The ANS spill rates for crude oil spills ≥500 bbl from 1985-2013 are:

- 0.63 total spills per Bbbl of oil produced
- 0.39 facility spills per Bbbl of oil produced and
- 0.24 pipeline spills per Bbbl of oil produced.

The ANS spill rates for crude oil spills ≥1,000 bbl from 1985-2013 are:

- 0.08 total spills per Bbbl of oil produced

A-8.3.2. Trans-Alaska Pipeline Large Crude Oil Spill Rate 1977-2013 and 1985-2013 Based on Volume and Pipeline-Mile-Year

Flow in the Trans-Alaska Pipeline System (TAPS) began on June 20, 1977, with throughput of 112 million bbl by the end of 1977. Throughput increased to almost 400 million bbl in 1978, peaked at 744 million bbl in 1988, and was 182 million bbl in 2013. The estimated total volume transported through the TAPS during the period 1977 through 2013 is 16.7 Bbbl (Alyeska Pipeline Service Company, 2013). The TAPS is 800.302 miles long.

1977-2013

There have been nine crude oil spills ≥ 500 bbl attributed to TAPS operation, eight of which were ≥ 1,000 bbl. The last spill ≥ 1,000 bbl occurred in 2010 at Pump Station 9. The spill rate of 0.54 spills for spills ≥ 500 bbl of spills per Bbbl transported for TAPS pipeline was calculated based on the record of seven accidental and two sabotage spills over 16.7 Bbbl of production. The spill rate of 0.0003078 large spills per pipeline-mile-year for TAPS was calculated based on the record of seven accidental and two sabotage spills over 29,238 pipeline-mile-years during the period 1977 through 2013.

1985-2013

There have been three crude oil spills ≥ 500 bbl, of which two were ≥ 1,000 bbl. The spill rate of 0.23 spills for spills ≥ 500 bbl of spills per Bbbl transported for TAPS was calculated based on the record of three accidental spills over 12.8 Bbbl of production. The spill rate of 0.0001293 large spills per pipeline-mile-year for TAPS was calculated based on the record of two accidental and one sabotage spill over 23,208 pipeline-mile-years during the period 1985 through 2013.

A-8.4. Estimating Potential Large Spills from Past, Present and Future Production

An important element in estimating environmental impacts associated with oil and gas activities on the North Slope and adjacent Beaufort and Chukchi seas is accidental large oil spills. Oil production has occurred on the North Slope since the mid-1970s. Accidental spills of crude oil have occurred on the North Slope due to oil and gas exploration and production (NRC, 2003b). The average volume of crude oil spilled annually to 2000 from the ANS operations and the TAPS segment from Pump Station 1 to Atigun Pass is 523 bbl of crude oil and 278 bbl of product (Niebo, pers. comm., as cited by NRC, 2003b). Environmental effects of small spills are generally less significant than large spills because they typically occur on pads or roads and are contained and cleaned up at the site of the spill. Therefore, small spills are less likely to cause adverse environmental effects (NRC, 2003b). The largest 10 percent of ANS crude spills accounted for 87 percent of the volume spilled (NRC, 2003b; Robertson et al. 2013). For purposes of analysis of cumulative oil spills, the discussion below focuses on large crude oil spills.

The history of ANS large volume crude spills is discussed to set the framework of previous large oil spills from oil and gas production. Generally, the frequency of large oil spills is decreasing through time as both regulation and technology have been able to address the causal factors of past large oil spills (Schmidt-Etkin, 2011). Between 1985 and 2013 there were eight crude oil spills of 500 or more bbl onshore on the North Slope while producing 12.8 Bbbl. One of these spills was ≥ 1,000 bbl. That was the GC-2 spill of 2006 in which 5,054 bbl leaked from a pipeline. The total volume of these eight large spills was approximately 9,800 bbl. No large (≥ 1,000 bbl) offshore U.S. Arctic (State and Federal) spills from oil and gas exploration and production have occurred to date. One large offshore spill of diesel heating fuel (1,619 bbl), from a punctured fuel barge, occurred north of Flaxman Island in the Beaufort Sea on August 20, 1988 but was not related to the oil and gas industry (USDOC, NOAA, 1988). Nine large TAPS pipeline oil spills (≥ 500 bbl) have occurred from 1977-2013 while transporting 16.7 Bbbl. The total volume of the nine large TAPS spills was approximately 46,000 bbl, based on the high spill volume estimates, with three of those spills occurring on the ANS totaling approximately 11,400 bbl.

To estimate the assumed number of large oil spills for the cumulative effects analysis, BOEM used a production estimate. The production estimate includes past, present, and future production for the ANS and U.S. Beaufort and Chukchi seas. For cumulative case analysis, estimates are made for past, present and future production for the onshore ANS, State Beaufort Sea and adjacent OCS Beaufort and Chukchi OCS areas. Tables 5-4 and 5-5 in Chapter 5 showed the past, present, and reasonably foreseeable oil and gas fields, pools, satellites, and discoveries considered. The estimates for past activities include remaining proven reserves in already developed fields. The estimates for present activities include proven and probable resources reported for discovered fields expected to be developed in the near future. The estimates for future activities are based on undiscovered resources that may or may not become future commercial projects under favorable conditions. Estimates for future production are much more uncertain because the fields have not been discovered and the favorable economic factors cannot be guaranteed for decades into the future

To estimate an assumed number of large oil spills for purposes of cumulative analysis, the estimated production volumes were multiplied by the appropriate large spill occurrence rate per Bbbl produced as shown in Table A.1-28. The TAPS pipeline, onshore ANS, and the Alaska OCS have varying large spill rates and spill-size categories. For a summary of the spill rates and spill size categories that were assumed for analysis of oil spills in the cumulative case, see Table A.1-28. One noteworthy fact is that most oil originating from either onshore or offshore on the North Slope of Alaska flows through the TAPS pipeline and into TAPS tankers. The TAPS spills were considered within the geographic scope of the ANS

The incremental contribution of the Proposed Action (by the number of large spills) is about 20-25 percent of the cumulative case total estimate.

The estimated spills within National Petroleum Reserve Alaska (NPR-A) could occur within the area open for leasing. The estimated Colville Canning/State Beaufort Sea large spills could occur either in the offshore state waters of the Beaufort Sea or onshore from facilities and pipelines between the Colville and Canning River. Future discoveries of unconventional oil from shale gas or increased production of heavy oil are not included in the Colville Canning/State Beaufort Sea estimates.

The BOEM estimates two OCS platform/rig large spills could occur in offshore OCS water from the Alternative1, 3, or 4. The estimated Arctic OCS large pipeline spills could occur offshore. For purposes of analysis, the estimated large OCS pipeline spills were allocated to offshore. Onshore, it is assumed that one small pipeline spill of 700 bbls would occur along a 300-mile onshore pipeline traversing the NPR-A and other North Slope lands from the Chukchi Sea to TAPS Pump Station 1.

The estimated six large TAPS pipeline spills includes all large spills that could occur over the entire length of the TAPS pipeline, pump stations, and associated tank farms. For purposes of analysis, two of the spills were assigned to the North Slope based on the historical geographical location of large TAPS pipeline spills. The other four spills were assigned to the rest of the geographic extent of the TAPS pipeline.

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A.1. Supporting Tables and Maps

Table A.1-1. Large and Small Spill Sizes, Source of Spill, Type of Oil, Number and Size of Spill and Receiving Environment BOEM Assumes for Analysis in Chukchi Sea Sale 193 Leased Area.

Second SEIS Section	Source of Spill	Type of Oil	Number and Size of Spill(s) (in bbl)	Receiving Environment
Large Spills[1] (≥1,000 bbl)				
4.3 Scenario Through Time	Offshore	Crude Condensate Or Diesel	2 spill(s)	Containment Open Water Under Ice On Top of Sea Ice Broken Ice Coastal Shoreline
	Pipeline Platform/ StorageTank/Well		5,100 Or 1,700 bbl	
Small Spills[1] (< 1,000 bbl)				
4.3 Scenario Through Time	Offshore and/or Onshore	Total Below	~800 spills	Containment, Open Water, On Top of Sea Ice, Broken Sea Ice, Snow/Ice, Tundra, Coastal Shoreline
	Operational Spills from All Sources	Crude Condensate or Diesel	~220 spills Median 3 bbl; 2 up to 700 bbl	
		Refined	~35 spills Exploration and Delineation	
			~520 spills Development and Production	

Note: 1 These numbers are for Alternatives 1, 3, or 4.
Source: USDOI, BOEM, Alaska OCS Region (2014).

Table A.1- 2. Exploration Spills on the Beaufort Sea and Chukchi Sea OCS (1981-2012).

Lease No.	Sale Area	Operator	Date	Facility	Oil	Amt. (Gal)	Cause of Spill	Response Action	Rec. (gal)
0344	71	Sohio	7/22/1981	Mukluk Island	Diesel	0.50	Leaking line on portable fuel trailer	Sorbents used to remove spill. Contaminated gravel removed.	0.05
0344	71	Sohio	7/22/1981	Mukluk Island	Diesel	1.00	Overfilled fuel tank on equipment	Sorbents used to remove spill. Contaminated gravel removed.	1.00
0280	71	Exxon	8/7/1981	Beaufort Sea I	Hydraulic Fluid	1.00	Broken hydraulic line on ditch witch.	Fluid picked up with shovels.	1.00
0280	71	Exxon	8/8/1981	Beaufort Sea I	Trans. Fluid	0.25	Overfilling of transmission fluid.	Fluid picked up and placed in plastic bags.	0.25
0280	71	Exxon	1/11/1982	Beaufort Sea I	Hydraulic Fluid	0.50	Broken hydraulic line.	Fluid picked up and stored in plastic bags.	0.50
0280	71	Exxon	1/11/1982	Alaska Beaufort Sea I	Diesel	3.00	Overfilled catco 90-3 tank.	Fluid picked up.	3.00
0280	71	Exxon	1/17/1982	Beaufort Sea I	Diesel	1.00	Tank on catco 90-14 overfilled.	Fluid picked up and stored in plastic bags.	1.00
0280	71	Exxon	1/21/1982	Beaufort Sea I	Hydraulic Fluid	0.25	Broken hydraulic line on ditch witch.	Fluid picked up.	0.25
0371	71	Amoco	3/16/1982	Sandpiper Gravel Island	Unknown	1.00	Seeping from Gravel Island.	Sorbent pads.	Unk
0849	87	Union Oil	9/4/1982	Canmar Explorer II	Unknown	1.00	Transfer of test tank from drillship to barge.	None	None
0871	87	Shell Western	9/5/1982	Canmar Explorer II	Light Oil	0.50	Washing down cement unit, drains not plumbed to oil/water separator.	None	None
N/A	87	Shell	9/14/1982	Canmar II Drillship	Diesel	30.00	Tank vent overflowed during fuel transfer.	Deployed sorbent pads and pump.	30.00
0191	BF	Exxon	11/11/1982	Beechey Pt. Gravel Is.	Lube Oil	1.00	Loader tipped over lube oil drum	Oil cleaned up with sorbents. Contaminated gravel removed	1.00
0191	BF	Exxon	1/15/1983	Beechey Pt. Gravel Is.	Diesel	0.12	Fuel truck spilled diesel as it climbed a 40 degree ramp to island	Sorbents used and contaminated gravel removed	0.12
0191	BF	Exxon	1/23/1983	Beechey Pt. Gravel Is.	Hydraulic Fluid	2.50	Hydraulic line on backhoe broke	1 gallon in water. Boom deployed with sorbents, Contaminated gravel removed	2.50
0191	BF	Exxon	8/29/1983	Beechey Pt. Gravel Is.	Hydraulic Fluid	0.20	Hydraulic line on backhoe broke	Spill contained on island surface. Sorbents used and contaminated gravel removed.	0.25
0196	BF	Shell	8/30/1983	Ice Road to Tern Island	Hydraulic Fluid	10.0	Broken hydraulic line on rollogon	Unknown	Unk
0191	BF	Exxon	2/26/1985	Beechey Pt. Gravel Is.	Hydraulic Fluid	0.37	Hydraulic line broke	Contaminated Snow Removed	0.37
0196	BF	Shell	3/1/1985	Ice Road to Tern Island	Hydraulic Fluid	3.00	Hydraulic line broke	Unknown	3.00

Lease No.	Sale Area	Operator	Date	Facility	Oil	Amt. (Gal)	Cause of Spill	Response Action	Rec. (gal)
0191	BF	Exxon	3/2/1985	Beechey Pt. Gravel Is.	Gasoline	0.01	Operational Spill	Snow shoved into plastic bag.	0.01
0191	BF	Exxon	3/4/1985	Beechey Pt. Gravel Is.	Waste Oil	2.00	Drum of waste oil punctured	Snow recovered	2.00
0196	BF	Shell	3/4/1985	Tern Gravel Island	Crude Oil	1.00	Well Separator overflowed, crude oil escaped	Line boom deployed	Unk
0196	BF	Shell	3/6/1985	Tern Gravel Island	Crude Oil	15.00	Test burner was operating poorly	Containment Boom deployed	Unk
0196	BF	Shell	9/24/1985	Tern Gravel Island	Crude Oil	2.00	Oil released from steam heat coil when Halliburton tank moved	Sorbents and hand shovel used	2.00
0191	BF	Shell	10/4/1985	Enroute to Tern Gravel Island	Jet fuel B	800.00	Wire sling broke during helicopter transport of fuel blivits	Contaminated Snow Removed. Test holes drilled with no fuel below snow.	Unk
0196	BF	Shell	10/29/1985	Tern Gravel Island	Crude Oil	2.00	Test oil burner malfunction	Contaminated snow removed	2.00
0196	BF	Shell	6/27/1986	Tern Gravel Island	Crude Oil	3.00	Test oil burner malfunction	Spray picked up with sorbents. Bladed up dirty snow.	2.00
0943	87	Tenneco	1/24/1988	SSDC/MAT	Gear oil	220.0	Helicopter sling failure during transfer of drums to SSDC	Scooped up contaminated snow and ice	220.0
1482	109	SWEPI	7/7/1989	Explorer III Drillship	Hydraulic fluid	10.0	Hydraulic line connector	Sorbent pads	0.84
1092	97	AMOCO	10/1/1991	CANMAR Explorer	Hydraulic fluid	2.00	Hydraulic line rupture	None	None
0865	87	ARCO	7/24/1993	Beaudril Kulluk	Diesel	0.06	Residual fuel in bilge water	None	None
0866	87	ARCO	9/8/1993	CANMAR Kulluk	Hydraulic fluid	1.26	Seal on shale shaker failed	None	None
0866	87	ARCO	9/24/1993	CANMAR Kulluk	Fuel	4.00	Fuel transfer in rough weather	3 gal on deck of barge recovered, none in sea	3.00
1597	124	ARCO	10/31/1993	CANMAR Kulluk	Fuel	0.50	Released during emptying of disposal caisson	None	None
1585	124	BP Alaska	1/20/1997	Ice Road to Tern Island	Diesel, Hydraulic Fluid	10.5	Truck went through ice; fuel line ruptured	Scooped up contaminated snow and ice. Some product entered water	Unk
2280	193	Noble Drililing US	9/24/2012	D/V Noble Discoverer	Hydraulic Oil	0.004	Unknown Leak	None	None

Source: USDOI, BOEM, Alaska OCS Region (2014).
Note: Unk = Unknown

Table A.1-3. Land Segment (LS) ID and the Percent Type of Environmental Sensitivity Index Shoreline Closest to the Ocean for United States, Alaska Shoreline.

LS ID	Geographic Place Names	1A	1B	1C	3A	3B	3C	4	5	6A	6B	6C	7	8A	8B	8C	8E	9A	9B	10A	10B	10E	U
40	Lopp Lagoon, Mint River	-	-	-	21	-	3	1	23	-	-	-	6	-	-	-	21	7	1	2	-	15	-
41	Ikpek, Ikpek Lagoon	-	-	-	16	-	6	-	-	-	-	-	12	-	-	-	21	7	2	16	-	19	2
42	Arctic Lagoon, Nuluk River	-	-	-	1	-	3	1	7	-	-	-	1	-	-	-	30	6	14	2	-	34	1
43	Sarichef Island	-	-	-	-	-	13	4	1	-	-	-	12	-	-	-	27	7	1	4	-	32	-
44	Cape Lowenstern, Shishmaref	-	-	-	6	-	8	-	-	-	-	1	7	-	-	-	32	6	4	6	-	31	-
45	LS45	-	-	-	17	-	-	-	-	-	-	-	1	-	-	-	25	7	9	-	-	40	2
46	Kalik & Singeakpuk River	-	-	-	13	-	2	-	-	-	-	-	4	-	-	-	38	7	12	-	-	24	-
47	Kitluk River	-	-	-	13	-	1	-	-	-	-	-	32	-	-	-	20	2	24	-	-	-	7
48	Cape Espenberg	-	-	-	13	-	1	-	10	-	-	-	2	-	-	-	7	8	-	25	-	20	14
49	Pish River	-	-	-	19	-	-	-	15	-	-	-	-	-	-	-	14	5	3	20	-	24	-
50	Goodhope Bay & River	1	-	3	4	-	-	4	22	4	12	-	-	-	-	-	12	-	-	4	-	35	-
51	Deering	1	-	11	15	-	-	-	23	6	4	-	-	-	-	-	12	2	1	24	-	-	1
52	Willow Bay	2	5	4	9	-	-	-	35	1	1	-	-	-	1	-	1	-	-	32	-	7	-
53	Kiwalik	-	-	-	3	-	-	-	18	-	-	-	-	2	1	-	-	3	-	13	-	43	15
54	Baldwin Peninsula	-	-	-	15	-	8	-	68	-	-	-	-	1	-	-	2	-	-	-	-	6	-
55	Cape Blossom, Pipe Spit	-	-	-	1	-	6	-	78	1	1	-	-	-	-	-	4	-	-	7	-	1	-
56	Kotzebue, Noatak River	-	1	-	-	-	3	-	13	-	-	1	-	-	-	-	8	9	1	5	-	23	38
57	Aukulak Lagoon	-	-	-	4	-	2	-	18	-	-	-	-	-	-	-	19	7	3	5	-	28	14
58	Cape Krusenstern	-	-	-	-	-	1	-	32	-	1	-	-	-	-	-	17	-	1	22	-	26	-
59	Imik, Ipiavik & Kotlik Lagoon	-	-	-	1	-	-	-	48	4	-	-	-	-	-	-	6	4	-	35	-	2	-
60	Kivalina, Kivalina & Wulik River	-	-	-	-	-	2	1	46	3	-	1	-	-	-	1	19	5	7	9	-	6	-
61	Cape Seppings	-	-	-	-	-	-	-	54	-	-	-	-	-	-	-	9	-	11	6	-	19	-
62	Atosik Lagoon	-	-	-	-	-	-	-	76	-	-	-	-	-	-	-	1	-	17	5	-	1	-
63	Asikpak Lag., Cape Seppings	-	-	1	5	-	1	1	46	11	-	-	19	-	-	-	10	3	1	1	-	-	-
64	Kukpuk River, Point Hope	1	-	2	8	-	1	2	42	4	-	-	12	-	-	-	16	4	6	-	-	1	-
65	Buckland, Cape Lisburne	13	-	2	-	-	-	-	71	10	3	-	-	-	-	-	-	-	-	1	-	-	-
66	Ayugatak Lagoon	54	-	-	-	-	-	-	32	1	-	-	-	-	-	-	-	-	-	12	-	-	-
67	Cape Sabine, Pitmegea River	38	-	3	-	-	15	-	22	1	-	-	-	-	-	-	-	-	-	19	-	-	-
68	Agiak Lagoon, Punuk Lagoon	-	-	-	-	-	11	-	76	11	-	-	-	-	-	-	-	-	-	1	-	-	-
69	Cape Beaufort, Omalik Lagoon	-	-	-	-	-	-	-	44	47	-	-	-	-	-	-	-	-	-	2	-	6	-
70	Kuchaurak and Kuchiak Creek	-	-	-	-	-	-	-	20	-	-	-	20	-	-	-	14	1	21	2	-	19	2
71	Kukpowruk River, Sitkok Point	-	-	-	4	-	9	-	35	-	-	-	21	-	-	-	5	19	4	-	-	2	1
72	Point Lay, Siksrikpak Point	-	-	-	4	-	2	-	49	-	-	-	8	-	-	-	12	15	-	5	-	3	-
73	Tungaich Point, Tungak Creek	-	-	-	-	-	8	-	52	-	-	-	-	-	-	1	4	15	5	10	-	4	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	15	-	-	-	28	1	-	-	1	-	-	-	5	41	2	5	-	-	1
75	Akeonik, Icy Cape	-	-	-	13	-	4	1	34	-	-	-	2	-	-	-	14	14	11	5	1	1	-
76	Avak Inlet, Tunalik River	-	-	-	2	-	8	3	40	-	-	-	1	-	-	-	13	11	8	1	-	13	-
77	Nivat Point, Nokotlek Point	-	-	-	13	-	3	6	42	-	-	-	9	-	-	-	12	9	4	-	-	1	-
78	Point Collie, Sigeakruk Point	-	-	-	15	-	5	-	38	-	-	-	19	-	-	-	-	4	7	-	-	5	8
79	Point Belcher, Wainwright	-	-	-	22	-	1	-	33	2	1	-	32	-	-	-	2	-	-	1	-	5	-
80	Eluksingiak Point, Kugrua Bay	-	-	-	13	-	35	-	10	-	-	-	12	-	-	-	14	9	-	1	-	5	1
81	Peard Bay, Point Franklin	-	-	-	3	-	21	-	37	1	-	-	25	-	-	-	3	9	-	-	-	-	-
82	Skull Cliff	-	-	-	-	-	76	2	12	9	-	-	1	-	-	-	-	-	1	-	-	-	-
83	Nulavik, Loran Radio Station	-	-	-	-	-	73	-	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-
84	Will Rogers & Wiley Post Mem.	-	-	-	1	-	8	-	82	-	-	-	-	-	-	-	-	-	8	-	-	-	-
85	Barrow, Browerville, Elson Lag.	-	-	-	11	-	14	-	37	-	-	-	1	-	-	-	17	2	2	3	-	7	7
86	Dease Inlet, Plover Islands	-	-	-	30	3	5	-	3	-	-	-	2	-	-	-	19	15	3	11	-	9	-
87	Igalik & Kulgurak Island	-	-	-	17	-	4	-	3	-	-	-	-	-	-	-	25	7	-	9	-	34	1
88	Cape Simpson, Piasuk River	-	-	-	6	-	5	6	-	-	-	-	-	-	-	-	14	-	-	-	-	25	44
89	Ikpikpuk River Point Poleakoon	-	-	-	2	-	4	-	-	-	-	-	-	-	-	-	4	57	-	-	-	13	20
90	Drew & McLeod Point, Kolovik	-	-	-	5	-	19	7	-	-	-	-	-	-	-	-	14	16	-	11	-	27	-
91	Lonely, Pitt Pt., Pogik Bay, Smith R	-	-	-	-	-	4	9	7	-	-	-	-	-	-	-	12	5	-	6	-	38	18

LS ID	Geographic Place Names	1A	1B	1C	3A	3B	3C	4	5	6A	6B	6C	7	8A	8B	8C	8E	9A	9B	10A	10B	10E	U
92	Cape Halkett, Garry Creek	-	-	-	1	-	20	3	-	-	-	-	-	-	-	-	26	2	-	-	-	31	18
93	Atigaru Pt, Eskimo Isl., Kogru R.	-	-	-	9	-	30	2	1	-	-	-	-	-	-	-	20	1	3	1	-	34	-
94	Fish Creek, Tingmeachsiovik River	-	-	-	1	-	4	-	1	-	-	-	-	-	-	-	6	34	-	1	-	38	16
95	Colville River	-	-	-	5	-	1	-	-	-	-	-	-	-	-	-	10	31	-	1	-	2	50
96	Oliktok Point	-	-	-	4	-	8	12	10	3	-	-	-	-	-	-	11	10	-	9	-	32	1
97	Milne Point, Simpson Lagoon	-	-	-	6	-	2	37	19	-	-	-	-	-	-	-	17	1	5	4	-	8	2
98	Kuparuk River	-	-	-	1	-	1	-	36	-	-	-	-	1	-	-	7	21	3	1	-	16	11
99	Point Brower, Prudhoe Bay	-	-	-	2	-	5	-	1	-	-	-	-	-	1	-	12	55	-	11	-	7	4
100	Foggy Island Bay, Kadleroshilik R.	-	-	-	6	-	4	4	15	1	-	-	-	-	-	-	7	31	-	5	-	22	4
101	Bullen, Gordon & Reliance Points	-	-	-	7	-	4	3	44	-	-	-	-	-	-	-	2	2	-	12	-	22	3
102	Pt. Hopson & Sweeney, Staines R	-	-	-	2	-	4	12	35	3	-	-	4	-	-	-	16	6	-	3	-	17	-
103	Brownlow Point, Canning River	-	-	-	21	-	6	3	7	-	-	-	-	-	-	-	5	43	-	-	-	8	8
104	Collinson Point, Konganevik Point	-	-	-	21	-	13	-	21	-	-	-	2	-	-	-	10	11	6	-	-	15	-
105	Anderson Point, Sadlerochit River	-	-	-	18	-	3	-	24	-	-	-	22	-	-	-	1	13	4	1	-	14	-
106	Arey Island, Barter Island,	-	-	-	11	-	3	1	13	-	-	-	-	-	-	-	9	45	-	-	-	14	1
107	Kaktovik	-	-	-	-	-	10	3	45	-	-	-	-	-	1	-	7	17	1	-	-	4	11
108	Griffin Point, Oruktalik Lagoon	-	-	-	-	-	20	2	43	-	-	-	-	-	-	-	13	2	2	1	-	16	-
109	Angun Point, Beaufort Lagoon	-	-	-	-	-	18	30	23	-	-	-	-	-	-	-	14	4	1	-	-	7	3
110	Icy Reef, Kongakut River, Siku Lagoon	-	-	-	-	-	-	3	26	-	-	-	-	-	-	-	2	28	1	-	-	38	3
111	Demarcation Bay & Point	-	-	-	1	-	15	3	54	-	-	-	-	-	-	-	6	7	3	-	-	5	5

Source: USDOI, BOEM (2014) from Harper and Morris (2014)
Key:

ID = identification (number). Number Description		
1A Exposed rocky shores; exposed rocky banks	6A Gravel beaches; Gravel beaches (granules and pebbles) *	8E Peat shorelines
1B Exposed, solid man-made structures	6B Gravel beaches (cobbles and boulders) *	9A Sheltered tidal flats
1C Exposed rocky cliffs with boulder talus base	6C Rip rap (man-made) *	9B Vegetated low banks
3A Fine- to medium-grained sand beaches	7 Exposed tidal flats	10A Salt- and brackish-water marshes
3B Scarps and steep slopes in sand	8A Sheltered scarps in bedrock, mud, or clay; Sheltered rocky shores (impermeable) *	10B Freshwater marshes
3C Tundra cliffs	8B Sheltered, solid man-made structures; Sheltered rocky shores (permeable) *	10E Inundated low-lying tundra
4 Coarse-grained sand beaches	8C Sheltered rip rap	U Unknown
5 Mixed sand and gravel beaches	8D Sheltered rocky rubble shores	

Table A.1-4 Fate and Behavior of a Hypothetical 5,100-Barrel Diesel Oil Spill from a Platform in the Chukchi Sea.

	Summer Spill[1]				Meltout Spill[2]			
Time After Spill in Days	1	3	10	30	1	3	10	30
Oil Remaining (%)	86	54	5	1	92	73	36	2
Oil Dispersed (%)	7	26	65	68	1	7	29	51
Oil Evaporated (%)	7	20	30	31	7	20	36	47

Source: USDOI, BOEM, Alaska OCS Region (2014)
Note: The notes following Table A.1-6 apply.

Table A.1-5. Fate and Behavior of a Hypothetical 5,100-Barrel Condensate Oil Spill from a Platform in the Chukchi Sea.

	Summer Spill1				Meltout Spill[2]			
Time After Spill in Days	1	3	10	30	1	3	10	30
Oil Remaining (%)	11	0	na	na	17	5	0	na
Oil Dispersed (%)	12	21	na	na	3	11	15	na
Oil Evaporated (%)	77	79	na	na	80	84	85	na

Source: USDOI, BOEM, Alaska OCS Region (2014)
Note: The notes following Table A.1-6 apply.

Table A.1-6. Fate and Behavior of a Hypothetical 1,700-Barrel Condensate Oil Spill from a Pipeline in the Chukchi Sea.

	Summer Spill[1]				Meltout Spill[2]			
Time After Spill in Days	1	3	10	30	1	3	10	30
Oil Remaining (%)	7	0	na	na	13	6	0	na
Oil Dispersed (%)	15	21	na	na	5	10	15	na
Oil Evaporated (%)	78	79	na	na	82	84	85	na

Notes: Calculated with the SINTEF oil-weathering model Version 4.0 of Reed et al. (2005) and assuming an Sliepner Condensate or Marine Diesel type.

[1] Summer (July 1-October 31), 8-knot wind speed, 3 degrees Celsius, 0.4-meter wave height.

[2] Meltout Spill (November 1-May 31). Spill is assumed to occur into first-year pack ice, pools 2-centimeter thick on ice surface for 2 days at -1 degrees Celsius prior to meltout into 50% ice cover, 10-knot wind speed, and 0.1 meter wave heights.

na means not applicable.

Source: USDOI, BOEM, Alaska OCS Region (2014).

Table A.1-7. Fate and Behavior of a Hypothetical 5,100-Barrel Crude Oil Spill from a Platform in the Chukchi Sea.

	Summer Spill[1]				Meltout Spill[2]			
Time After Spill in Days	1	3	10	30	1	3	10	30
Oil Remaining (%)	70	65	57	44	72	67	62	56
Oil Dispersed (%)	1	2	6	16	0	1	2	3
Oil Evaporated (%)	29	33	37	40	28	33	37	40
Discontinuous Area (km2)[3, 4]	13	54	256	1063	4	18	85	351
Estimated Coastline Oiled (km) [5]	44				54			

Note: Notes following Table A.1-8 apply.

Table A.1-8 Fate and Behavior of a Hypothetical 1,700-Barrel Crude Oil Spill from a Pipeline in the Chukchi Sea.

	Summer Spill[1]				Meltout Spill[2]			
Time After Spill in Days	1	3	10	30	1	3	10	30
Oil Remaining (%)	70	65	57	44	71	67	62	53
Oil Dispersed (%)	1	2	6	16	0	1	2	4
Oil Evaporated (%)	29	33	37	40	29	33	37	40
Discontinuous Area (km2)[3, 4]	8	31	148	615	3	10	25	200
Estimated Coastline Oiled (km) [5]	26				32			

Notes: Calculated with the SINTEF oil-weathering model Version 4.0 of Reed et al. (2005) and assuming an Alpine Composite crude type.

[1] Summer (July 1-October 31), 8-knot wind speed, 3 degrees Celsius, 0.4-meter wave height.

[2] Meltout Spill (November 1-May 31). Spill is assumed to occur into first-year pack ice, pools 2-centimeter thick on ice surface for 2 days at -1 degrees Celsius prior to meltout into 50% ice cover, 10-knot wind speed, and 0.1 meter wave heights.

[3] This is the discontinuous area of oiled surface.

[4] Calculated from Equation 6 of Table 2 in Ford (1985) and is the discontinuous area of a continuing spill or the area swept by an instantaneous spill of a given volume. Note that ice dispersion occurs for about 30 days before meltout.

[5] Calculated from Equation 17 of Table 4 in Ford (1985) and is the result of stepwise multiple regressions for length of historical coastline affected.

Source: USDOI, BOEM, Alaska OCS Region (2014).

Table A.1-9. Identification Number (ID) and Name of Environmental Resource Areas, Represented in the Oil-Spill-Trajectory Model and Their Location on Environmental Resource Area Maps and Tables.

ID	NAME	GENERAL RESOURCE	MAP A-	Table A.1-
1	Kasegaluk Lagoon Area	Birds, Barrier Island, Seals, Whales	2f	10, 11
2	Point Barrow, Plover Islands	Birds, Barrier Island	2d	10
3	SUA: Uelen/Russia	Subsistence	2a	12
4	SUA:Naukan/Russia	Subsistence	2b	12
5	SUA: Shishmaref, North	Subsistence, Marine Mammals	2a	12
6	Hanna Shoal	Lower Trophics, Seals	2a	16
7	Krill Trap	Lower Trophics	2d	16
8	Maguire, Flaxman Islands	Birds, Barrier Island	2f	10
9	Stockton Islands, McClure Islands	Birds, Barrier Island	2e	10
10	Ledyard Bay SPEI Critical Habitat Area	Birds	2b	10
11	Wrangel Island 12 nmi & Offshore	Marine Mammals	2a	13
12	SUA: Nuiqsut - Colville Delta	Subsistence	2d	12
13	Kotzebue Sound	Subsistence, Whales	2a	12
14	Cape Thompson Seabird Colony Area	Birds	2a	10
15	Cape Lisburne Seabird Colony Area	Birds, Marine Mammals	2b	10, 13
16	Barrow Canyon	Lower Trophics	2d	16
17	Angun and Beaufort Lagoons	Birds, Barrier Island	2e	10
18	Murre Rearing and Molting Area	Birds	2a	10
19	Chukchi Spring Lead System	Birds	2f	10
20	East Chukchi Offshore	Whales	2b	11
21	AK BFT Bowhead FM 1	Whales	2e	11
22	AK BFT Bowhead FM 2	Whales	2e	11
23	Polar Bear Offshore	Marine Mammals	2a	13
24	AK BFT Bowhead FM 3	Whales	2e	11
25	AK BFT Bowhead FM 4	Whales	2e	11
26	AK BFT Bowhead FM 5	Whales	2e	11
27	AK BFT Bowhead FM 6	Whales	2e	11
28	AK BFT Bowhead FM 7	Whales	2e	11
29	AK BFT Bowhead FM 8	Whales	2e	11
30	Beaufort Spring Lead 1	Whales	2d	11
31	Beaufort Spring Lead 2	Whales	2d	11
32	Beaufort Spring Lead 3	Whales	2d	11
33	Beaufort Spring Lead 4	Whales	2d	11
34	Beaufort Spring Lead 5	Whales	2d	11
35	Beaufort Spring Lead 6	Whales	2d	11
36	Beaufort Spring Lead 7	Whales	2d	11
37	Beaufort Spring Lead 8	Whales	2d	11
38	SUA: Pt. Hope - Cape Lisburne	Subsistence	2f	12
39	SUA: Pt. Lay - Kasegaluk	Subsistence	2e	12
40	SUA: Icy Cape - Wainwright	Subsistence	2a	12
41	SUA: Barrow - Chukchi	Subsistence	2e	12
42	SUA: Barrow - East Arch	Subsistence	2f	12
43	SUA: Nuiqsut - Cross Island	Subsistence	2d	12
44	SUA: Kaktovik	Subsistence	2d	12
45	Beaufort Spring Lead 9	Whales	2d	11
46	Wrangel Island 12 nmi Buffer 2	Marine Mammals	2a	14
47	Hanna Shoal Walrus Use Area	Marine Mammals	2e	13
48	Chukchi Lead System 4	Marine Mammals	2c	14
49	Chukchi Spring Lead 1	Whales	2a	11
50	Pt Lay Walrus Offshore	Marine Mammals	2f	13
51	Pt Lay Walrus Nearshore	Marine Mammals	2a	13
52	Russian Coast Walrus Offshore	Marine Mammals	2b	13
53	Chukchi Spring Lead 2	Whales	2f	11
54	Chukchi Spring Lead 3	Whales	2f	11
55	Point Barrow, Plover Islands	Marine Mammals, Barrier Islands	2e	13
56	Hanna Shoal Area	Whales	2b	11
57	Skull Cliffs	Lower Trophics	2e	11
58	Russian Coast Walrus Nearshore	Marine Mammals	2b	13
59	Ostrov Kolyuchin	Marine Mammals	2b	13
60	King Pt.-Shallow Bay	Subsistence, Whales	2e	11, 12
61	Pt Lay-Barrow BH GW SSF	Whales	2b	11

ID	NAME	GENERAL RESOURCE	MAP A-	Table A.1-
62	Herald Shoal Polynya 2	Marine Mammals	2a	14
63	North Chukchi	Whales	2a	11
64	Peard Bay Area	Birds, Marine Mammals	2f	10
65	Smith Bay	Birds, Marine Mammals, Whales	2d	10, 11
66	Herald Island	Marine Mammals	2a	13
67	Herschel Island (Canada)	Birds	2d	10
68	Harrison Bay	Birds, Fish, Marine Mammals	2e	10
69	Harrison Bay/Colville Delta	Birds, Marine Mammals	2f	10
70	North Central Chukchi	Whales	2a	11
71	Simpson Lagoon, Thetis and Jones Island	Birds	2d	10
72	Gwyder Bay, West Dock, Cottle and Return Islands	Birds	2f	10
73	Prudhoe Bay	Birds	2e	10
74	Offshore Herald Island	Whales	2a	11
75	Boulder Patch Area	Lower Trophics	2f	16
76	Kendall Island Bird Sanctuary (Canada)	Birds	2d	10
77	Sagavanirktok River Delta/Foggy Island Bay	Birds	2f	10
78	Mikkelsen Bay	Birds	2f	10
79	Demarcation Bay Offshore	Birds	2d	10
80	Beaufort Outer Shelf 1	Lower Trophics	2d	16
81	Simpson Cove	Birds	2e	10
82	N Chukotka Nrshr 2	Whales	2a	11
83	N Chukotka Nrshr 3	Whales	2a	11
84	Canning River Delta	Fish	2d	15
85	Sagavanirktok River Delta	Fish	2e	15
86	Harrison Bay	Fish	2f	15
87	Colville River Delta	Fish	2e	15
88	Simpson Lagoon	Fish	2f	15
89	Mackenzie River Delta	Fish	2e	15
90	SUA: Gary & Kendall Is./Canada	Subsistence	2e	12
91	Hope Sea Valley	Whales	2a	11
92	Thetis & Jones Isls., Cottle & Return Isls., West Dock	Marine Mammals, Barrier Islands	2e	13
93	Cross and No Name Island	Marine Mammals, Barrier Islands	2f	13
94	Maguire Islands, Flaxman Island, Barrier Islands	Marine Mammals, Barrier Islands	2e	13
95	Arey and Barter Islands and Bernard Spit	Marine Mammals, Barrier Islands	2f	13
96	Midway, Cross and Bartlett Islands	Birds	2e	10
97	SUA: Tigvariak Island	Subsistence	2e	12
98	Anderson Point Barrier Islands	Birds, Barrier Island	2e	10
99	Arey and Barter Islands, Bernard Spit	Birds, Barrier Island	2e	10
100	Jago and Tapkaurak Spits	Birds, Barrier Island	2e	10
101	Beaufort Outer Shelf 2	Lower Trophics	2d	16
102	Opilio Crab EFH	Opilio Crab Habitat (EFH)	2b	15
103	Saffron Cod EFH	Saffron Cod Habitat (EFH)	2e	15
104	Kotzebue Sound	Fish, Marine Mammals	2a	15, 14
105	Fish Creek	Fish	2e	15
106	Shaviovik River	Fish	2d	15
107	Pt Hope Offshore	Whales	2f	11
108	Barrow Feeding Aggregation	Whales	2b	11
109	AK BFT Shelf Edge	Whales	2d	11
110	AK BFT Outer Shelf&Slope 1	Whales	2e	11
111	AK BFT Outer Shelf&Slope 2	Whales	2e	11
112	AK BFT Outer Shelf&Slope 3	Whales	2e	11
113	AK BFT Outer Shelf&Slope 4	Whales	2e	11
114	AK BFT Outer Shelf&Slope 5	Whales	2e	11
115	AK BFT Outer Shelf&Slope 6	Whales	2e	11
116	AK BFT Outer Shelf&Slope 7	Whales	2e	11
117	AK BFT Outer Shelf&Slope 8	Whales	2e	11
118	AK BFT Outer Shelf&Slope 9	Whales	2e	11
119	AK BFT Outer Shelf&Slope 10	Whales	2e	11
120	Russia CH GW Fall 1&2	Whales	2e	11
121	C Lisburne - Pt Hope	Whales	2e	11
122	North Chukotka Offshore	Whales	2a	11
123	AK Chukchi Offshore	Whales	2a	11
124	Central Chukchi Offshore	Whales	2b	11

Table A.1-10. Environmental Resource Areas Used in the Analysis of Large or Very Large Oil Spill Effects on Birds in Sections 4.3 and 4.4.

ERA	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
1	Kasegaluk Lagoon Area	A-2f	May-October	Birds, barrier island, seals, whales	Birds: BLBR, LTDU, eiders (STEI, COEI), loons (all 3 species)	Dau and Larned, 2004; Johnson, 1993; Johnson, Wiggins, and Wainwright, 1993; Laing and Platte, 1994; Lehnhausen and Quinlan, 1981.
2	Point Barrow, Plover Islands	A-2d	May-October	Birds, barrier island	Birds: SPEI, LTDU	Fischer and Larned, 2004; Troy, 2003.
8	Maguire, Flaxman Islands	A-2f	May-October	Birds, barrier island	Birds: nesting COEI, molting LTDU, PALO	Fischer and Larned, 2004; Flint et al., 2004; Johnson, Wiggins, and Wainwright, 1993; Johnson, 2000; Johnson et al., 2005; Noel et al., 2005.
9	Stockton Islands, McClure Islands	A-2e	May-October	Birds, barrier island	Birds: nesting COEI, molting LTDU, staging SPEI	Fischer and Larned, 2004; Flint et al., 2004; Johnson, Wiggins, and Wainwright, 1993; Johnson, 2000, (Table 2); Johnson et al., 2005; Noel et al., 2005; Troy, 2003.
10	Ledyard Bay SPEI Critical Habitat Unit	A-2b	July-November	Birds	Birds: seabirds, molting/staging SPEI, staging YBLO	66 FR 9146-9185; Laing and Platte, 1994; Petersen, Larned, and Douglas, 1999; Piatt and Springer, 2003.
14	Cape Thompson Seabird Colony Area	A-2a	May-October	Birds	Birds: seabirds, gulls, shorebirds, waterfowl, staging YBLO	Piatt et al., 1991; Piatt and Springer, 2003; Springer et al., 1984; Stephenson and Irons, 2003.
15	Cape Lisburne Seabird Colony Area	A-2b	May-October	Birds, marine mammals	Birds: seabird breeding colony, staging YBLO	Oppel, Dickson and Powell, 2009; Piatt et al., 1991; Piatt and Springer, 2003; Roseneau et al., 2000; Springer et al., 1984; Stephenson and Irons, 2003.
17	Angun and Beaufort Lagoons	A-2e	May-October	Birds, barrier island	Birds: molting LTDU, scoters, staging shorebirds	Johnson and Herter, 1989.
18	Murre Rearing and Molting Area	A-2a	May-October	Birds	Birds: murre foraging, rearing, and molting area	Piatt and Springer, 2003; Springer et al., 1984.
19	Chukchi Sea Spring Lead System	A-2f	April-June	Birds, whales	Birds: seabird foraging area; spring migration area for LTDU, eiders (KIEI, COEI), loons	Connors, Myers, and Pitelka, 1979; Gill, Handel, and Connors, 1985; Johnson and Herter, 1989; Oppel, Dickson, and Powell, 2009; Piatt et al., 1991; Piatt and Springer, 2003; Sowls, Hatch, and Lensink, 1978; Swartz, 1967.
64	Peard Bay Area	A-2f	May-October	Birds, marine mammals	Birds: eiders (all 4 species), loons (all 3 species)	Fischer and Larned, 2004; Laing and Platte, 1994.
65	Smith Bay	A-2d	May-October	Birds, marine mammals, whales	Birds: eiders (SPEI, KIEI), YBLO	Earnst et al., 2005; Powell et al., 2005; Ritchie, Burgess, and Suydam, 2000; Ritchie et al., 2004; Troy, 2003.
67	Herschel Island (Canada)	A-2d	May-October	Birds	Birds: LTDU, BLBR, scoters, eiders, loons, shorebirds	Johnson and Richardson, 1982; Richardson and Johnson, 1981.
68	Harrison Bay	A-2e	May-October	Birds, marine mammals	Birds: eiders (KIEI, COEI), scoters (BLSC, SUSC), geese (BLBR, CANG, GWFG), loons, shorebirds	Connors, Connors, and Smith, 1984; Dau and Larned, 2004, 2005; Fischer and Larned, 2004.
69	Harrison Bay/Colville Delta	A-2f	May-October	Birds, marine mammals	Birds: geese (BLBR), eiders (KIEI, COEI), LTDU, scoters (BLSC, SUSC), loons (all 3 species)	Bergman et al., 1977; Dau and Larned, 2004, 2005; Fischer and Larned, 2004; Johnson and Herter, 1989.
71	Simpson Lagoon, Thetis and Jones Islands	A-2d	May-October	Birds	Birds: geese (BLBR, LSGO, GWFG), eiders (COEI, KIEI), LTDU, scoters (SUSC, WWSC), shorebirds, loons (all 3 species)	Connors, Connors, and Smith, 1984; Divoky, 1984; Johnson, 2000; Johnson, Herter, and Bradstreet, 1987; Johnson and Herter, 1989; Noel and Johnson, 1997; Richardson and Johnson, 1981; Stickney and Ritchie, 1996; Truett, Miller, and Kertell, 1997.
72	Gwyder Bay, West Dock, Cottle and Return Islands	A-2f	May-October	Birds	Birds: geese (BLBR, LSGO, GWFG), eiders (COEI, KIEI), LTDU, scoters (SUSC, WWSC), shorebirds, loons (all 3 species)	Fischer and Larned, 2004; Johnson, 2000; Noel et al., 2005; Noel and Johnson, 1997; Powell et al., 2005; Truett, Miller, and Kertell, 1997; Stickney and Ritchie, 1996; Troy, 2003.
73	Prudhoe Bay	A-2e	May-October	Birds	Birds: geese (BLBR, LSGO, GWFG), eiders (COEI, KIEI), LTDU, scoters (SUSC, WWSC), shorebirds, loons (all 3 species)	Dau and Larned, 2004, 2005; Fischer and Larned, 2004; Johnson and Richardson, 1982; Noel and Johnson, 1997; Noel et al., 2005; Powell et al., 2005; Richardson and Johnson, 1981; Stickney and Ritchie, 1996; Troy, 2003; Truett, Miller, and Kertell, 1997.
76	Kendall Island Bird Sanctuary (Canada)	A-2d	May-October	Birds	Birds: eiders (KIEI, COEI), LTDU, scoters (all 3 species), loons (all 3 species)	Alexander, Dickson, and Westover, 1997; Dickson et al., 1997; Divoky, 1984; Johnson and Richardson, 1982; Richardson and Johnson, 1981.

ERA	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
77	Sagavanirktok River Delta/Foggy Island Bay	A-2f	May-October	Birds	Birds: eiders (SPEI, COE)I, LTDU, scoters (all 3 species), loons (all 3 species)	Dau and Larned, 2004, 2005; Divoky, 1984; Fischer and Larned, 2004; Johnson, 2000; Johnson, Wiggins, and Wainwright, 1993; Troy, 2003.
78	Mikkelsen Bay	A-2f	May-October	Birds	Birds: eiders (KIEI, COEI), LTDU, scoters, loons (PALO, RTLO)	Dau and Larned, 2004, 2005; Divoky, 1984; Fischer and Larned, 2004; Flint et al., 2004; Johnson, 2000; Noel et al., 2005.
79	Demarcation Bay Offshore	A-2d	May-October	Birds	Birds: eiders (KIEI, COEI), LTDU, scoters (SUSC, WWSC), loons, molting LTDU, staging shorebirds	Dau and Larned, 2004, 2005; Fischer and Larned, 2004; Johnson and Richardson, 1982; Johnson and Herter, 1989; Richardson and Johnson, 1981.
81	Simpson Cove	A-2e	May-October	Birds	Birds: COEI, LTDU, PALO, scoters (SUSC, WWSC)	Dau and Larned, 2004, 2005; Fischer and Larned, 2004; Johnson and Herter, 1989.
96	Midway, Cross and Bartlett Islands	A-2e	May-October	Birds, barrier islands	Birds: eiders (SPEI,COEI), LTDU, scoters (all 3 species), loons (all 3 species)	Dau and Larned, 2004, 2005; Divoky, 1984; Fischer and Larned, 2004; Johnson, 2000; Troy, 2003, (Figure 3).
98	Anderson Point Barrier Islands	A-2e	May-October	Birds, barrier islands	Birds: eiders (SPEI,COEI), LTDU, scoters (all 3 species), loons (all 3 species)	Dau and Larned, 2004, 2005; Divoky, 1984; Fischer and Larned, 2004; Johnson, 2000; Troy, 2003, (Figure 3).
99	Arey and Barter Islands, Bernard Spit	A-2e	May-October	Birds, barrier islands	Birds: eiders (SPEI,COEI), LTDU, scoters (all 3 species), loons (all 3 species)	Dau and Larned, 2004, 2005; Divoky, 1984; Fischer and Larned, 2004; Johnson, 2000; Troy, 2003, (Figure 3).
100	Jago and Tapkaurak Spits	A-2e	May-October	Birds, barrier islands	Birds: eiders (SPEI,COEI), LTDU, scoters (all 3 species), loons (all 3 species)	Dau and Larned, 2004, 2005; Divoky, 1984; Fischer and Larned, 2004; Johnson, 2000; Troy, 2003, (Figure 3).

Notes: Yellow-billed Loon (YBLO), Red-throated Loon (RTLO), Pacific Loon (PALO), COEI (Common Eider), KIEI (King Eider), SPEI (Spectacled Eider), STEI (Steller's Eider), LTDU (Long-tailed Duck), Black Scoter (BLSC), Surf Scoter (SUSC), White-winged Scoter (WWSC), Black Brant (BLBR), Greater White-fronted Goose (GWFG), Canada Goose (CANG), Lesser Snow Goose (LSGO): http://www.birdpop.org/DownloadDocuments/Alpha_codes_eng.pdf
Source: USDOI, BOEM, Alaska OCS Region (2014).

Table A.1-11. Environmental Resource Areas Used in the Analysis of Large or Very Large Oil Spill Effects on Whales in Sections 4.3 and 4.4.

ERA ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
1	Kasegaluk Lagoon Area	A-2f	May - October	Birds, Barrier Island, Seals, Whales	Beluga Whales	Clarke et al., In Review; Suydam et al., 2001; Suydam, Lowry, and Frost, 2005;
13	Kotzebue Sound	A-2a	January-December	Subsistence, Whales	Beluga Whales	Suydam et al., 2001; Suydam, Lowry, and Frost, 2005.
20	East Chukchi Offshore	A-2b	September-October	Whales	Bowhead Whales, Beluga Whales-fall migration, feeding	Clarke et al., 2013, 2014; Fraker, Sergeant, and Hoek, 1978; Harwood and Smith, 2002; Hauser et al., 2014; Ljungblad et al., 1988; Martell, Dickinson, and Casselman, 1984; Melnikov and Bobkov. 1993; Monnett and Treacy, 2005; Quakenbush and Citta, 2013; Quakenbush, Small and Citta. 2013; Treacy, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 2000, 2001, 2002.
21	AK BFT Bowhead FM 1	A-2e	September-October	Whales	Bowhead Whales, Beluga Whales-fall migration	Clarke et al., 2013, 2014; Hauser et al., 2014; Ljungblad et al., 1988; Monnett and Treacy, 2005; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013; Treacy, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 2000, 2001, 2002;
22	AK BFT Bowhead FM 2	A-2e	September-October	Whales	Bowhead Whales-fall migration	Clarke et al., 2013, 2014; Ljungblad et al., 1988; Monnett and Treacy, 2005; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013; Treacy, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 2000, 2001, 2002;
24	AK BFT Bowhead FM 3	A-2e	September-October	Whales	Bowhead Whales-fall migration	Clarke et al., 2013, 2014; Ljungblad et al., 1988; Monnett and Treacy, 2005; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013; Treacy, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 2000, 2001, 2002.
25	AK BFT Bowhead FM 4	A-2e	September-October	Whales	Bowhead Whales-fall migration	Clarke et al., 2013, 2014; Ljungblad et al., 1988; Monnett and Treacy, 2005; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013; Treacy, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 2000, 2001, 2002.
26	AK BFT Bowhead FM 5	A-2e	September-October	Whales	Bowhead Whales-fall migration	Clarke et al., 2013, 2014; Ljungblad et al., 1988; Monnett and Treacy, 2005; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013; Treacy, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 2000, 2001, 2002.

ERA ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
27	AK BFT Bowhead FM 6	A-2e	September-October	Whales	Bowhead Whales-fall migration	Clarke et al., 2013, 2014; Ljungblad et al., 1988; Monnett and Treacy, 2005; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013; Treacy, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 2000, 2001, 2002.
28	AK BFT Bowhead FM 7	A-2e	September-October	Whales	Bowhead Whales-fall migration	Clarke et al., 2013, 2014; Ljungblad et al., 1988; Monnett and Treacy, 2005; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013; Treacy, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 2000, 2001, 2002.
29	AK BFT Bowhead FM 8	A-2e	September-October	Whales	Bowhead Whales-fall migration	Clarke et al., 2013, 2014; Ljungblad et al., 1988; Monnett and Treacy, 2005; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013; Treacy, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 2000, 2001, 2002.
30	Beaufort Spring Lead 1	A-2d	April-June	Whales	Bowhead Whales, Beluga Whales-spring migration	Clarke et al., 2013; Ljungblad et al., 1988; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013.
31	Beaufort Spring Lead 2	A-2d	April-June	Whales	Bowhead Whales, Beluga Whales-spring migration	Clarke et al., 2013; Ljungblad et al., 1988; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013.
32	Beaufort Spring Lead 3	A-2d	April-June	Whales	Bowhead Whales, Beluga Whales-spring migration	Clarke et al., 2013; Ljungblad et al., 1988; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013.
33	Beaufort Spring Lead 4	A-2d	April-June	Whales	Bowhead Whales, Beluga Whales; Spring Migration	Clarke et al., 2013; Ljungblad et al., 1988; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013.
34	Beaufort Spring Lead 5	A-2d	April-June	Whales	Bowhead Whales, Beluga Whales-spring migration	Clarke et al., 2013; Ljungblad et al., 1988; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013.
35	Beaufort Spring Lead 6	A-2d	April-June	Whales	Bowhead Whales, Beluga Whales-spring migration	Clarke et al., 2013; Ljungblad et al., 1988; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013.
36	Beaufort Spring Lead 7	A-2d	April-June	Whales	Bowhead Whales, Beluga Whales-spring migration	Clarke et al., 2013; Ljungblad et al., 1988; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013.
37	Beaufort Spring Lead 8	A-2d	April-June	Whales	Bowhead Whales, Beluga Whales-spring migration	Clarke et al., 2013; Ljungblad et al., 1988; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013.
45	Beaufort Spring Lead 9	A-2d	April-June	Whales	Bowhead Whales, Beluga Whales-spring migration	Clarke et al., 2013; Ljungblad et al., 1988; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013.
49	Chukchi Spring Lead 1	A-2a	April-June	Whales	Bowhead Whales, Gray Whales, Beluga Whales – spring migration-spring leads-Chukchi	Bogoslovskaya, Votrogov, and Krupnik,1982; Clarke et al., 2013; Heide, 1979; Doroshenko, and Kolesnikov, 1984; George et al., 2012; Stringer and Groves, 1991; Ljungblad et al., 1986, 1988; Miller, Rugh, and Johnson,1986; Melnikov, Zelensky, and Ainana,1997; Melnikov et al., 2004; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Melnikov and Zeh, 2007.
53	Chukchi Spring Lead 2	A-2f	April-June	Whales	Bowhead Whales, Gray Whales, Beluga Whales – spring migration-spring leads-Chukchi	Bogoslovskaya, Votrogov, and Krupnik,1982; Clarke et al., 2013; Doroshenko, 1979; Doroshenko, and Kolesnikov, 1984; George et al., 2012; Stringer and Groves, 1991; Ljungblad et al., 1986, 1988; Miller, Rugh, and Johnson,1986; Melnikov, Zelensky, and Ainana,1997; Melnikov et al., 2004; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Melnikov, and Zeh, 2007.
54	Chukchi Spring Lead 3	A-2f	April-June	Whales	Bowhead Whales, Gray Whales, Beluga Whales – spring migration-spring leads-Chukchi	Bogoslovskaya, Votrogov, and Krupnik,1982; Clarke et al., 2013; Doroshenko, 1979; Doroshenko, and Kolesnikov, 1984; George et al., 2012; Stringer and Groves, 1991; Ljungblad et al., 1986, 1988; Miller, Rugh, and Johnson,1986; Melnikov, Zelensky, and Ainana,1997; Melnikov et al., 2004; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Melnikov, and Zeh, 2007.
56	Hanna Shoal Area	A-2b	August-October	Whales	Bowhead Whales, historically Gray whales (Hanna Shoal)	Clarke et al., 2013; Ljungblad et al., 1986; Moore, DeMaster and Dayton. 2000; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013.
60	King Pt.-Shallow Bay	A-2e	July	Whales, Subsistence	Beluga Whales	Harwood et al, 1996; Fraker, Sergeant, and Hoek, 1978; Harwood and Smith, 2002; Harwood et al., 2010; Martell, Dickinson, and Casselman, 1984.
61	Pt Lay –Barrow BH GW SSF	A-2b	July-October	Whales	Bowhead Whales, Gray Whales; summer-fall feeding, Gray and Bowhead Whale cow/calf aggregations and bowhead fall migration	Bogoslovskaya, Votrogov, and Krupnik, 1982; Clarke et al., 2013, 2014; George et al., 2012; Ljungblad et al., 1988; Melnikov and Bobkov, 1993; Melnikov, Zelensky, and Ainana, 1997; Miller, Rugh, and Johnson, 1986; Moore and DeMaster, 1997; Moore et al., 1995; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013.
63	North Chukchi	A-2a	October-December	Whales	Bowhead Whales	Martell, Dickinson, and Casselman, 1984; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013.

ERA ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
65	Smith Bay	A-2d	May-October	Whales, Birds, Marine Mammals	Bowhead Whales	
70	North Central Chukchi	A-2a	October-December	Whales	Bowhead Whales	Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013.
74	Offshore Herald Island	A-2a	October - December	Whales, Polar Bears, Walrus	Bowhead Whales	Bogoslovskaya, Votrogov, and Krupnik,1982; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013.
82	N Chukotka Nearshore 2	A-2a	July-October	Whales	Bowhead Whales, Gray Whales; summer-fall feeding and bowhead fall migration	Bogoslovskaya, Votrogov, and Krupnik, 1982; George et al., 2012; Heide-Jorgensen et al., 2012; Ljungblad et al., 1988; Melnikov and Bobkov, 1993; Melnikov, Zelensky, and Ainana, 1997; Miller, Rugh, and Johnson, 1986; Moore and DeMaster, 1997; Moore et al., 1995; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013.
83	N Chukotka Nearshore 3	A-2a	July-December	Whales	Bowhead Whales, Gray Whales; summer-fall feeding and bowhead fall migration	Bogoslovskaya, Votrogov, and Krupnik, 1982; George et al., 2012; Heide-Jorgensen et al., 2012;Ljungblad et al., 1988; Melnikov and Bobkov, 1993; Melnikov, Zelensky, and Ainana, 1997; Miller, Rugh, and Johnson, 1986; Moore and DeMaster, 1997; Moore et al., 1995; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013.
91	Hope Sea Valley	A-2a	October-December	Whales	Bowhead Whales	Bogoslovskaya, Votrogov, and Krupnik, 1982; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013.
107	Pt Hope Offshore	A-2f	June-September	Whales	Gray Whales, Fin Whales, Humpback Whales summer fall aggregation	Clarke et al., 2013 (Maps 6, 13); Friday et al., 2014; George et al., 2012; Miller, Johnson, and Doroshenko, 1985.
108	Barrow Feeding Aggregation	A-2b	September-October	Whales	Bowhead Whales, Gray Whales-feeding aggregation- fall	Clarke et al., 2012, 2013; Ljungblad et al., 1988; Monnett and Treacy, 2005; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013; Shelden and Mocklin, 2013;.
109	AK BFT Shelf Edge	A-2d	July, August	Whales	Bowhead Whales-cow/calf and feeding aggregation	Christman et al., 2013; Clarke et al., 2012, 2013.
110	AK BFT Outer Shelf & Slope 1	A-2e	July-October	Whales	Beluga Whales –summer- fall feeding concentration and movement corridor	Clarke et al., 2013, 2014; Richard, Martin and Orr, 1998, 2001.
111	AK BFT Outer & Slope 2	A-2e	July-October	Whales	Beluga Whales –summer- fall feeding concentration and movement corridor	Clarke et al., 2013, 2014; Richard, Martin and Orr, 1998, 2001.
112	AK BFT Outer & Slope 3	A-2e	July-October	Whales	Beluga Whales –summer- fall feeding concentration and movement corridor	Clarke et al., 2013, 2014; Richard, Martin and Orr, 1998, 2001.
113	AK BFT Shelf & Slope 4	A-2e	July-October	Whales	Beluga Whales –summer- fall feeding concentration and movement corridor	Clarke et al., 2013, 2014; Richard, Martin and Orr, 1998, 2001.
114	AK BFT Outer Shelf & Slope 5	A-2e	July-October	Whales	Beluga Whales –summer- fall feeding concentration and movement corridor	Clarke et al., 2013, 2014; Richard, Martin and Orr, 1998, 2001.
115	AK BFT Outer Shelf & Slope 6	A-2e	July-October	Whales	Beluga Whales –summer- fall feeding concentration and movement corridor	Clarke et al., 2013, 2014; Richard, Martin and Orr, 1998, 2001.
116	AK BFT Outer Shelf & Slope 7	A-2e	July-October	Whales	Beluga Whales –summer- fall feeding concentration and movement corridor	Clarke et al., 2013, 2014; Richard, Martin and Orr, 1998, 2001.
117	AK BFT Outer Shelf & Slope 8	A-2e	July-October	Whales	Beluga Whales –summer- fall feeding concentration and movement corridor	Clarke et al., 2013, 2014; Richard, Martin and Orr, 1998, 2001.
118	AK BFT Outer Shelf & Slope 9	A-2e	July-October	Whales	Beluga Whales –summer- fall feeding concentration and movement corridor	Clarke et al., 2013, 2014; Richard, Martin and Orr, 1998, 2001.
119	AK BFT Outer Shelf & Slope 10	A-2e	July-October	Whales	Beluga Whales –summer- fall feeding concentration and movement corridor	Clarke et al., 2013, 2014; Richard, Martin and Orr, 1998, 2001.
120	Rus CH GW Fall 1	A-2e	September-October	Whales	Gray Whales-fall feeding aggregation	Bogoslovskaya, Votrogov, and Krupnik, 1982; Doroshenko and Kolesnikov, 1983; George et al., 2012; Miller, Johnson, and Doroshenko, 1985.
121	C Lisburne – Pt Hope	A-2e	June-September	Whales	Gray Whale-cow/calf aggregation	Ljungblad et al., 1988.
122	North Chukotka Offshore	A-2a	October-December	Whales	Bowhead Whale- fall migration	Bogoslovskaya, Votrogov, and Krupnik, 1982; George et al., 2012; Ljungblad et al., 1986; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013.

ERA ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
123	AK Chukchi Offshore	A-2a	October-December	Whales	Bowhead Whale- fall migration	Ainana, Zelenski, and Bychkov, 2001; Bogoslovskaya, Votrogov, and Krupnik, 1982; Melnikov, V. V. 2000; Melnikov and Bobkov, 1993; Melnikov, Zelensky, and Ainana, 1997; Miller, Rugh, and Johnson, 1986; Mizroch, Rice, and Breiwick, 1984; Mizroch et al., 2009; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013.
124	Central Chukchi Offshore	A-2b	October-December	Whales	Bowhead Whale- fall migration	Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013.
BSs						
39 - 40	Amundsen Gulf BH Spring	A-1	May-July	Whales	Bowhead Whale-spring aggregation	Braham, Fraker, and Krogman, 1980; Fraker, Sergeant, and Hoek, 1978; Harwood and Smith, 2002; Martell, Dickinson, and Casselman, 1984; Quakenbush and Citta, 2013; Quakenbush, Small, and Citta, 2013.
2	RusCh C Dezhnev	A-1	May-October	Whales	Gray Whales, Beluga Whales, Humpback Whales, Bowhead Whales	Clarke et al., 2013 (Maps 6, 13); George et al., 2012; Miller, Johnson, and Doroshenko, 1985.

Source: USDOI, BOEM, Alaska OCS Region (2014).

Table A.1-12.Environmental Resource Areas Used in the Analysis of Large or Very Large Oil Spill Effects on Subsistence Resources in Sections 4.3 and 4.4.

ERA ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
3	SUA: Uelen/Russia	A-2a	September-October	Subsistence	Bowhead Whales, Grey Whales, Walrus	Melnikov and Bobkov, 1993; Ainana, Zelensky, and Bychkov, 2001.
4	SUA:Naukan/Russia	A-2a	January-December	Subsistence	Bowhead Whales, Grey Whales, Walrus	Melnikov and Bobkov, 1993; Ainana, Zelensky, and Bychkov, 2001.
5	SUA: Shishmaref, North	A-2a	March-October	Subsistence, Marine Mammals	Polar Bears, Walrus, Seals	Sobelman, 1985; Wisniewski, 2005.
12	SUA: Nuiqsut-Colville Delta	A-2d	April-October	Subsistence	Whales, Seals, Waterfowl, Ocean fish, Moose, Caribou	Galganaitis, 2009; 2014; S.R. Braund and Assocs, 2010; USDOI, BLM and MMS, 2003; USDOI, MMS, 1984.
13	Kotzebue Sound	A-2a	January-December	Subsistence, Whales	Polar Bears, Walrus, Seals, Bowhead Whales, Beluga Whales	Burch, 1985.
38	SUA: Pt. Hope- Cape Lisburne	A-2f	January-December	Subsistence	Beluga Whales, Bowhead Whales, Walrus, Seals	Braund and Burnham, 1984.
39	SUA: Pt. Lay- Kasegaluk	A-2e	January-December	Subsistence	Fish, Seals, Waterfowl, Beluga Whales	Braund and Burnham, 1984;Galginaitis and Impact Assessment, 1989; Huntington and Mymrin, 1996; S.R. Braund and Assocs, 2013 Maps 64-103; USDOI, BLM and MMS, 2003.
40	SUA: Icy Cape-Wainwright	A-2a	January-December	Subsistence	Bowhead Whales, Beluga Whales	Braund and Burnham, 1984; Kassam and Wainwright Traditional Council, 2001; USDOI, BLM and USDOI, MMS, 2003; S.R. Braund and Assocs. and University of Alaska Anchorage, ISER, 1993a; S.R. Braund and Assocs, 2013 Maps 4-26.
41	SUA: Barrow- Chukchi	A-2e	April-May	Subsistence	Bowhead Whales, Beluga Whales, Walrus, Waterfowl, Seals, Ocean Fish	Braund and Burnham, 1984; Pedersen, 1979; S.R. Braund and Assocs, 2010; S.R. Braund and Assocs. and University of Alaska Anchorage, ISER, 1993b; USDOI, BLM and USDOI, MMS, 2003.
42	SUA: Barrow - East Arch	A-2f	August-October	Subsistence	Bowhead Whales, Beluga Whales, Walrus, Waterfowl, Seals, Ocean Fish	Braund and Burnham, 1984; Pedersen, 1979; S.R. Braund and Assocs, 2010; S.R. Braund and Assocs. and University of Alaska Anchorage, ISER, 1993b; USDOI, BLM and USDOI, MMS, 2003.
43	SUA: Barrow- Cross Island	A-2d	August-October	Subsistence	Bowhead Whales, Seals, Waterfowl, Ocean Fish	Galganitis, 2009; Impact Assessment, 1990a; S.R Braund and Assocs., 2010
44	SUA: Kaktovik	A-2d	August-October	Subsistence	Bowhead Whales, Seals, Walrus, Beluga Whales, Waterfowl, Ocean Fish	Impact Assessment, 1990b; North Slope Borough, 2001; S.R. Braund and Assocs, 2010.
60	SUA: King Pt./Shallow Bay	A-2e	April-September	Subsistence, Whales	Polar Bears, Seals, Fish, Bowhead Whales, Beluga Whales	Environment Canada, 2000.
90	SUA: Gary & Kendall Is./Canada	A-2e	July-August	Subsistence	Beluga Whales	Environment Canada, 2000.
97	SUA: Tigvariak Island	A-2e	May-October	Subsistence	Traditional Whaling Area	Pedersen, 1979; S.R. Braund and Assocs., 2010.

USDOI, BOEM, Alaska OCS Region (2014). Notes: SUA=Subsistence Use Area; 1. ERA 5 Vulnerability March-October conservative estimate for April-October.

Table A.1-13. Environmental Resource Areas, Grouped Land Segments and Land Segments Used in the Analysis of Large or Very Large Oil Spill Effects on Marine Mammals (Polar Bears and Walrus) in Sections 4.3 and 4.4.

ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
ERAs						
11	Wrangel Island 12 nmi & Offshore	A-2a	July - November	Marine Mammals	Polar Bears, Walrus	Fay, 1982; Kochnev, 2004; Kochnev, 2006.
15	Cape Lisburne Seabird Colony Area	A-2b	May-October	Marine Mammals	Walrus	Fay, 1982.
23	Polar Bear Offshore	A-2a	November-June	Marine Mammals	Polar Bears	USFWS, 2013b.
47	Hanna Shoal Walrus Use Area	A-2e	May-October	Marine Mammals	Walrus	Jay, Fischbach, and Kochnev, 2012, Figures 4 & 5, pp. 8-9.
50	Pt Lay Walrus Offshore	A-2f	May-October	Marine Mammals	Walrus	Jay, Fischbach, and Kochnev, 2012, Figures 4 & 5, pp. 8-9.
51	Pt Lay Walrus Nearshore	A-2a	May-October	Marine Mammals	Walrus	Jay, Fischbach, and Kochnev, 2012, Figures 4 & 5, pp. 8-9.
52	Russian coast Offshore Tagging data	A-2b	May-November	Marine Mammals	Walrus	Jay, Fischbach, and Kochnev, 2012, Figures 4 & 5, pp. 8-9.
55	Point Barrow, Plover Islands	A-2e	January-December	Marine Mammals	Polar Bears	Kalxdorff et al., 2002.
58	Russian Coast nearshore Tagging data	A-2b	May-November	Marine Mammals	Walrus	Jay, Fischbach, and Kochnev, 2012, Figures 4 & 5, pp. 8-9.
59	Ostrov Kolyuchin	A-2b	July -November	Marine Mammals	Polar Bears, Walrus	Fay, 1982; Kochnev, 2006; Kochnev et al., 2003.
66	Herald Island	A-2a	July-November	Marine Mammals	Polar Bears, Walrus	Fay, 1982; Ovsyanikov,1998; Stishov, 1991.
92	Thetis, Jones, Cottle & Return Isl.	A-2e	January-December	Marine Mammals	Polar Bears (den)	Kalxdorff et al., 2002.
93	Cross and No Name Island	A-2f	January-December	Marine Mammals	Polar Bears	Miller, Schliebe, and Proffitt, 2006.
94	Maguire, Flaxman & Barrier Isl.	A-2e	January-December	Marine Mammals	Polar Bears (den)	Kalxdorff et al., 2002.
95	Arey & Barter Island, Bernard Spit	A-2f	January-December	Marine Mammals	Polar Bears	Miller, Schliebe, and Proffitt, 2006.
LSs						
28	Ostrov Karkarpko, Mys Vankarem,	A-2a	January-December	Marine Mammals	Walrus, July-November	Fay, 1982.; Kochnev, 2004.
29	Mys Onmyn,	A-2a	January-December	Marine Mammals	Walrus, July-November	Fay, 1982; Kochnev, 2004.
38	Mys Unikin,	A-2a	January-December	Marine Mammals	Walrus, July-November	Fay, 1982; Kochnev, 2004.
39	Mys Dezhnev, Mys Peek, Cape Peek	A-2a	January-December	Marine Mammals	Walrus, July-November	Fay, 1982; Kochnev, 2004.
85	Barrow, Browerville, Elson Lagoon	A-2b	January-December	Marine Mammals	Polar Bears, August-November	Kalxdorff et al., 2002.
GLSs						
133	Mys Blossom	A-4c	July-November	Marine Mammals	Walrus	Fay, 1982; Ovsyanikov, 2003; Kochnev, 2004; Kochnev, 2006.
134	Bukhta Somnitel'naya	A-4c	July-November	Marine Mammals	Polar Bears, Walrus	Fay, 1982; Ovsyanikov, 2003; Kochnev, 2004; Kochnev, 2006.
136	Ostrov Idlidlya	A-4c	July-November	Marine Mammals	Walrus	Fay, 1982; Kochnev, 2004.
137	Mys Serditse Kamen	A-4c	July-November	Marine Mammals	Walrus	Fay, 1982; Kochnev, 2004.
138	Chukotka Coast Haulout	A-4c	July-November	Marine Mammals	Walrus	Jay, Fischbach, and Kochnev, 2012, Figures 4 & 5, pp. 8-9.
145	Cape Lisburne	A-4b	August-November	Marine Mammals	Walrus	Fay, 1982.
147	Point Lay Haulout	A-4a	July-November	Marine Mammals	Walrus	Fischbach, Monson, and Jay, 2009.
157	96 -115 Summer	A-4a	June - August	Marine Mammals	Polar Bears	Derocher et al, 2013, (Figure 13, p. 59).
159	99-115 Fall	A-4b	September-November	Marine Mammals	Polar Bears	Derocher et al, 2013, (Figure 13, p. 59).
160	102-110 Winter	A-4b	December-February	Marine Mammals	Polar Bears	Derocher et al, 2013, (Figure 13, p. 59).
166	112-119 Spring	A-4b	March - May	Marine Mammals	Polar Bears	Derocher et al, 2013, (Figure 13, p. 59).
167	112-121 Winter	A-4a	December-February	Marine Mammals	Polar Bears	Derocher et al, 2013, (Figure 13, p. 59).
170	122-132 Spring	A-4a	March - May	Marine Mammals	Polar Bears	Derocher et al, 2013, (Figure 13, p. 59).
171	122-132 Winter	A-4a	December-February	Marine Mammals	Polar Bears	Derocher et al, 2013, (Figure 13, p. 59).
174	Russia Chukchi Coast Marine Mammals	A-4c	July-November	Marine Mammals	Polar Bears, Walrus	Kochnev, 2006.

Source: USDOI, BOEM, Alaska OCS Region (2014).

Table A.1-14. Environmental Resource Areas, Grouped Land Segments and Land Segments Used in the Analysis of Large or Very Large Oil Spill Effects on Marine Mammals (Ice Seals) in Sections 4.3 and 4.4.

ERA ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
1	Kasegaluk Lagoon Area	A-2f	May- October	Marine Mammals	Spotted Seals	ADF&G, 2001; Boveng et al., 2009.
5	SUA: Shismaref, North	A-2a	April-October[1]	Marine Mammals	Spotted Seals	ADF&G, 2001; Boveng et al., 2009.
46	Wrangel Island 12 nmi Buffer 2	A-2a	December-May	Marine Mammals	Bearded Seals Ringed Seals	Cameron et al., 2010; Kelly et al., 2010.
48	Chukchi Lead System 4	A-2c	December-May	Marine Mammals	Bearded Seals Ringed Seals	Cameron et al., 2010; Kelly et al., 2010.
62	Herald Shoal Polynya 2	A-2a	December-May	Marine Mammals	Ringed Seals Bearded Seals	Cameron et al., 2010; Kelly et al., 2010.
64	Peard Bay Area/Franklin Spit Area	A-2f	May-October	Marine Mammals	Spotted Seals	ADF&G, 2001; Boveng et al., 2009.

ERA ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
65	Smith Bay: Spotted Seal Haulout	A-2d	May-October	Marine Mammals	Spotted Seals	ADF&G, 2001; Boveng et al., 2009.
68	Harrison Bay	A-2e	May-October	Marine Mammals	Spotted seals	ADF&G, 2001; Boveng et al., 2009.
69	Harrison Bay/Colville Delta	A-2f	May-October	Marine Mammals	Spotted Seals	ADF&G, 2001; Boveng et al., 2009.
104	Kotzebue Sound	A-2a	January-December[2]	Marine Mammals	*Spotted Seals+Ringed Seals	ADF&G, 2001; Boveng et al., 2009; Kelly et al., 2010.
GLS ID						
135	Kolyuchin Bay	A-4c	June-November	Marine Mammals	Spotted Seal Ringed Seals	Kelly et al., 2010; Boveng et al., 2009; Heptner et al., 1996.
153	Smith Bay Spotted Seal Haulout	A-4b	May-October	Marine Mammals	Spotted Seals	ADF&G, 2001; Boveng et al., 2009.
155	Harrison Bay Spotted Seal Haulout	A-4b	June- September	Marine Mammals	Spotted Seals	ADF&G, 2001; Boveng et al., 2009.

Source: USDOI, BOEM, Alaska OCS Region (2014). Notes: 1. ERA 5 April– October was used as a conservative estimate for a vulnerability period May-October. 2. ERA 104 January - December was used as conservative vulnerability for March to October.

Table A.1-15. Environmental Resource Areas and Land Segments Used in the Analysis of Large or Very Large Oil Spill Effects on Fish in Sections 4.3 and 4.4.

ERA GLS or LS ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
ERAs Marine Waters						
84	Canning River Delta	A-2d	January - December	Anadromous and Marine Nearshore Fish	Pp, DVpr, CHp, Wp, Arctic cod, capelin, Arctic cisco, stickleback, sculpin spp.	Jarvela and Thorsteinson, 1998; Johnson and Daigneault, 2013.
85	Sagavanirktok River Delta	A-2e	January - December	Anadromous and Marine Nearshore Fish	CHp, Pp, DVpr, Wp Arctic char, Arctic cod, capelin, Arctic cisco, stickleback, sculpin spp.	Craig, 1984; Jarvela and Thorsteinson, 1998; Johnson and Daigneault, 2013.
86	Harrison Bay	A-2f	January - December	Marine Fish – nearshore	Arctic cod, Capelin, OM, Saffron cod, Fourhorn sculpin, Wp	Craig, 1984; Jarvela and Thorsteinson, 1998; Johnson and Daigneault, 2013.
87	Colville River Delta	A-2e	January - December	Anadromous and Marine Nearshore Fish	CHp, Pp, DVp, Wp, Arctic cod, Capelin, OM, Saffron cod, Fourhorn sculpin, Arctic cisco, Arctic char	Craig, 1984; Jarvela and Thorsteinson, 1998; Johnson and Daigneault, 2013; MBC Applied Environmental Sciences, 2004.
88	Simpson Lagoon	A-2f	January-December	Marine Fish – nearshore	Arctic cod, Capelin, OM, Saffron cod, Fourhorn sculpin, Wp, Arctic char	Craig, 1984; Jarvela and Thorsteinson, 1998; Johnson and Daigneault, 2013.
89	Mackenzie River Delta	A-2e	January - December	Anadromous and Marine Nearshore Fish	CHp, OMp, Wp, Sheefish, Saffron cod, Arctic cod, Arctic char, Arctic Cisco, Pacific herring, prickleback spp., sculpin spp.	Craig, 1984; MBC Applied Environmental Sciences, 2004; Sawatzky et.al, 2007; Wong et al., 2013.
102	Opilio Crab EFH	A-2b	January-December	Opilio Crab Habitat (EFH)	Opilio Crab	NMFS, 2009; NMFS, 2009.
103	Saffron Cod EFH	A-2e	January-December	Saffron Cod Habitat (EFH)	Saffron Cod	NMFS, 2009; NMFS, 2009.
104	Kotzebue Sound	A-2a	January-December	Anadromous and Marine Nearshore Fish	CHp, Pp, Kp, Sp, COp, DVp , Wp, OM, Saffron cod, herring, sheefish	Johnson and Daigneault, 2013; Magdanz et al., 2010; NMFS, 2009; Savereide, 2002.
105	Fish Creek	A-2e	January-December	Anadromous Fish	CHp, Kp, Pp,DVp, HWp, Wp	Johnson and Daigneault, 2013.
106	Shaviovik River	A-2d	January-December	Anadromous and Marine Nearshore Fish	Ps, DVp, Arctic char, Arctic cod, capelin, Arctic cisco, stickleback, sculpin spp.	Craig and Poulin, 1975; Jarvela and Thorsteinson, 1998; Johnson and Daigneault, 2013.
GLSs Marine Waters						
140	Noatak River	A-4c	January-December	Anadromous and Marine Nearshore Fish	CHs,Kp,Pp,COp,Sp,DVp, Wp, SF	Johnson and Daigneault, 2013.
141	Cape Krusenstern	A-4a	January-December	Anadromous and Marine Nearshore Fish	CHp.Sp,Pp,COp,Sp,DVp,Wp	Johnson and Daigneault, 2013.
142	Wulik and Kivalina Rivers	A-4a	January-December	Anadromous and Marine Nearshore Fish	CHs,COp,Ks,Pp,Ss,DVs,Wp	Johnson and Daigneault, 2013.
151	KuK River	A-4b	January-December	Anadromous and Marine Nearshore Fish	CHp,Pp,BWp,LCp, OMp	Johnson and Daigneault, 2013.
161	Arctic National Wildlife Refuge	A.-4c	January-December	Anadromous and Marine Nearshore Fish	CHp,Pp,DVr,Wp,Kp,COp,OMp, Arctic char, least cisco, herring, capelin, Arctic cod, saffron cod, sculpin species, eelpout species, Arctic flounder, starry flounder, sand lance	Johnson and Daigneault ADFG), 2013; U.S. Fish and Wildlife Service, 2013.
LSs Russia						
25	Amguema River	A-3a	May - October	Anadromous Fish	CHs, Ps, ALp, DVs, ACs, Kp, Sp, COp, Ws, OMp	Andreev, 2001.
31	Kolyuchinskaya Bay	A-3a	May - October	Anadromous Fish	Ps, Ks, DVs, ACs, Wp, OMp	Andreev, 2001.

ERA GLS or LS ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
37	Chegitun River	A-3a	May - October	Anadromous Fish	Bering Cisco, ACs, DVs, Ps, Ks, CHs, Ss, OMp	Andreev, 2001.
38	Inchoun Lagoon	A-3a	May - October	Anadromous Fish	CHp, Pp, Kp, COp, Sp, Bering Cisco, Least Cisco	Andreev, 2001.
39	Uelen Lagoon	A-3a	May - October	Anadromous Fish	CHp, Pp, Kp, COp, Sp, Bering Cisco, Least Cisco	Andreev, 2001.
LSs United States						
40	Mint River	A-3b	May - October	Anadromous Fish	CHs, Ps, Sp, DVpr	Johnson and Daigneault, 2013.
41	Pinguk River	A-3b	May - October	Anadromous Fish	CHs, Pp, DVp, Wp	Johnson and Daigneault, 2013.
42	Upkuarok Creek, Nuluk River, Kugrupaga River, Trout Creek	A-3b	May - October	Anadromous Fish	DVpr, CHs, Ps, DVp, Wp, DVp, DVpr, Wp	Johnson and Daigneault, 2013.
43	Shishmaref Airport	A-3b	May - October	Anadromous Fish	DVp	Johnson and Daigneault, 2013.
44	Shishmaref Inlet Arctic River, Sanaguich River, Serpentine River	A-3b	May - October	Anadromous Fish	DVp, SFp, Wp, DVp, SFp, Wp, DVp, CHp, DVp, SFp, Wp	Johnson and Daigneault, 2013.
47	Kitluk River	A-3b	May - October	Anadromous Fish	Pp	Johnson and Daigneault, 2013.
49	Kougachuk Creek	A-3b	May - October	Anadromous Fish	Pp	Johnson and Daigneault, 2013.
51	Inmachuk River, Kugruk River	A-3b	May - October	Anadromous Fish	CHs, Ps, DVp, CHp, Pp, DVp	Johnson and Daigneault, 2013.
53	Kiwalik River, Buckland River	A-3b	May - October	Anadromous Fish	CHp, Pp, DVp, CHp, COp, Kp, Pp, DVp, Wp	Johnson and Daigneault, 2013.
54	Baldwin Penn Kobuk River, & Channels	A-3b	May - October	Anadromous Fish	DVp, DVs, CHp, Kp, Pp, DVs, SFp, Wp	Johnson and Daigneault, 2013.
55	Hotham Inlet Ogriveg River	A-3b	May - October	Anadromous Fish	CHp, Pp, DVs, Wp CHp, Pp, DVp	Johnson and Daigneault, 2013.
56	Noatak River	A-3b	May - October	Anadromous Fish	CHp, COp, Kp, Pp, Sp, DVp, SFp, Wpr	Johnson and Daigneault, 2013.
57	Aukulak Lagoon	A-3b	May - October	Anadromous Fish	Wp	Johnson and Daigneault, 2013.
58	Tasaychek Lagoon	A-3b	May - October	Anadromous Fish	Pp	Johnson and Daigneault, 2013.
59	Kiligmak Inlet Jade Creek, Rabbit Creek, Imik Lagoon New Heart Creek, Omikviorok River	A-3b	May - October	Anadromous Fish	DVp, Wp DVp CHp, Sp, DVp Wp DVr DVp, Wp	Johnson and Daigneault, 2013.
60	Imikruk Lagoon Wulik River, Kivalina River	A-3b	May - October	Anadromous Fish	Wp, CHp, COp, Kp, Pp, Sp, DVs, Wp CHp, CHs, Pp, DVp	Johnson and Daigneault, 2013.
64	Sulupoaktak Chnl	A-3b	May - October	Anadromous Fish	Pp, DVp	Johnson and Daigneault, 2013.
67	Pitmegea River	A-3b	May - October	Anadromous Fish	CHp, Pp, DVp	Johnson and Daigneault, 2013.
70	Kuchiak Creek	A-3b	May - October	Anadromous Fish	CHs, COs	Johnson and Daigneault, 2013.
71	Kukpowruk River	A-3b	May - October	Anadromous Fish	CHp, Pp, DVp	Johnson and Daigneault, 2013.
72	Pt Lay, Kokolik River	A-3b	June - October	Anadromous Fish	CHp, Pp, DVp	Johnson and Daigneault, 2013.
74	Utukok River	A-3b	June - October	Anadromous Fish	CHp, Pp, DVp	Johnson and Daigneault, 2013.
80	Kugrua River	A-3b	June - October	Anadromous Fish	CHs,Ps	Johnson and Daigneault, 2013.
87	Inaru River, Meade River, Topagoruk River, Chipp River	A-3c	June - October	Anadromous Fish	Wsr CHs,Wp Wsr Ps,Wsr	Johnson and Daigneault, 2013.
89	Ikpikpuk River	A-3c	June - October	Anadromous Fish	Psr,Wsr	Johnson and Daigneault, 2013.
91	Smith River	A-3c	June - October	Anadromous Fish	DVp,Wp	Johnson and Daigneault, 2013.
93	Kalikpik River	A-3c	June - October	Anadromous Fish	Wp	Johnson and Daigneault, 2013.
94	Fish Creek, Nechelik Channel	A-3c	June - October	Anadromous Fish	CHp,Kp,Pp,DVp,Wp Wp	Johnson and Daigneault, 2013
95	Colville River & Delta	A-3c	June - October	Anadromous Fish	CHp,Pp,DVp,Wp	Johnson and Daigneault, 2013.
96	Kalubik River, Ugnuravik River	A-3c	June - October	Anadromous Fish	DVp,Wp Wr	Johnson and Daigneault, 2013.
97	Oogrukpuk River, Sakonowyak River	A-3c	June - October	Anadromous Fish	Wpr Wr	Johnson and Daigneault, 2013.
98	Kuparuk River, Fawn Creek, Unnamed 10435 Putuligayuk River	A-3c	June - October	Anadromous Fish	Wr Wp DVr DVr,OMp,Wr	Johnson and Daigneault, 2013.

ERA GLS or LS ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
99	Sagavanirktok River, E. Sagavanirktok Creek	A-3c	June - October	Anadromous Fish	ACp,Chp,Pp,DVr,Wp DVr	Johnson and Daigneault, 2013.
100	Kadleroshilik River, Shaviovik River, 10300	A-3c	June - October	Anadromous Fish	DVr DVp DVr	Johnson and Daigneault, 2013.
101	E Badami Creek, 10280 (AWC#)	A-3c	June - October	Anadromous Fish	DVr DVr	Johnson and Daigneault, 2013.
102	10246 (AWC#) 10238 (AWC#) 10234 (AWC#) Staines River	A-3c	June - October	Anadromous Fish	DVr DVr DVr Pp,DVp,Wp	Johnson and Daigneault, 2013.
103	W. Canning River, Canning River, Tamayariak River	A-3c	June - October	Anadromous Fish	Pp,DVp,Wp CHp,Pp,DVp,Wp DVr	Johnson and Daigneault, 2013.
104	Katakturik River, 10193 (AWC#)	A-3c	June - October	Anadromous Fish	DVp DVr	Johnson and Daigneault, 2013.
105	Marsh Creek, Carter Creek	A-3c	June - October	Anadromous Fish	DVr DVr	Johnson and Daigneault, 2013.
106	ERA 44, 83 (193) Nataroarok Creek, Hulahula River, Okpilak River, 10173 (AWC#)	A-3c	June - October	Anadromous Fish	DVr DVp DVp DVr	Johnson and Daigneault, 2013.
107	Jago River	A-3c	June - October	Anadromous Fish	DVp	Johnson and Daigneault, 2013.
108	Kimikpaurauk River	A-3c	June - October	Anadromous Fish	DVr	Johnson and Daigneault, 2013.
109	Siksik River, Sikrelurak River, Angun River, 10150-2004 (AWC#) Kogotpak 10140-2006 (AWC#)	A-3c	June - October	Anadromous Fish	DVr DVr DVr DVr DVp DVr	Johnson and Daigneault, 2013.
110	Aichilik River, Egaksrak River, Kongakut River	A-3c	June – October	Anadromous Fish	DVp DVp DVp	Johnson and Daigneault, 2013.
LSs Canada						
112	Fish River	A-3c	June - October	Anadromous Fish	ACp, Wp	Craig, 1984; Kendel et al., 1974.
113	Malcolm River	A-3c	June - October	Anadromous Fish	ACp, OMp	Craig, 1984.
114	Firth River	A-3c	June - October	Anadromous Fish	ACp,OMp	Craig, 1984.
116	Spring River	A-3c	June - October	Anadromous Fish	ACp, Wp, SFp, OMp, sculpin spp.	Craig, 1984; Majewski et al, 2013.
117	Babbage River	A-3c	June - October	Anadromous Fish	ACp, Wp	Craig, 1984.
119	Blow River	A-3c	June - October	Anadromous Fish	ACp, Wp, SFp	Craig, 1984.
122-126	Mackenzie River	A-3c	June - October	Anadromous Fish	ACp, Wp, CHp, OMp, SFp	Craig, 1984.
129-132	Kugmallit Bay Tuktoyaktuk Peninsula	A-3c	June - October	Anadromous and Marine Nearshore Fish	AC, DV, OM, Arctic cisco, Least Cisco, Whitefish spp., Arctic cod, Saffron cod, Pacific herring, Arctic flounder, Starry flounder, Sculpin spp.	Niemi, et al., 2012

Key:

AC	Arctic Char	**DV**	Dolly Varden	**W**	Whitefish (undifferentiated)
AL	Arctic lamprey	**P**	Pink salmon	**s**	spawning
K	Chinook salmon	**OM**	Rainbow smelt	**p**	present
CH	Chum salmon	**S**	Sockeye salmon	**r**	rearing
CO	Coho salmon	**SF**	Sheefish		

Source: USDOI, BOEM, Alaska OCS Region (2014).

Table A.1-16. Environmental Resource Areas Used in the Analysis of Large or Very Large Oil Spill Effects on Lower Trophic Level Organisms in Sections 4.3 and 4.4.

ERA ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
6	Hanna Shoal	A-2a	January-December	Lower Trophic Level Organisms	Invertebrates	Grebemier, 2012; Moore and Grebmeier, 2013
7	Krill Trap	A-2d	May-October	Lower Trophic Level Organisms	Invertebrates	Ashijan et al., 2010 (Figures 8 and 14, pp.187–189); Okkonen et al., 2011
16	Barrow Canyon	A-2d	January-December	Lower Trophic Level Organisms	Invertebrates	Moore and Grebmeier, 2013
57	Skull Cliffs	A-2e	January-December	Lower Trophic Level Organisms	Kelp/Invertebrates	Phillips et al., 1984. (pp. 13-14 and 16-19).
75	Boulder Patch Area	A-2f	January-December	Lower Trophic Level Organisms	Kelp/Invertebrates	Dunton and Schonberg, 2000 (p. 383, Fig 4. pp.388-392, Table 5. p. 393, Figure 6); Dunton et.al., 2009 (p. 17, Figure 1.3. p. 27, Table 2.1).
80	Beaufort Outer Shelf 1	A-2d	January-December	Lower Trophic Level Organisms	Invertebrates	Norcross, 2013 (Ongoing and unpublished Canada/USA Transboundary survey quarterly/annual reports); Norcross and Edenfield, 2013 (Ongoing and unpublished Canada/USA Transboundary survey quarterly/annual reports).
101	Beaufort Outer Shelf 2	A-2d	January-December	Lower Trophic Level Organisms	Invertebrates	Norcross, 2013 ; Norcross and Edenfield, 2013

Source: USDOI, BOEM, Alaska OCS Region (2014).

Table A.1-17. Grouped Land Segments Used in the Analysis of Large or Very Large Oil Spill Effects on Terrestrial Mammals in Sections 4.3 and 4.4.

GLS ID	Name	Map	Vulnerable	General Resource	Specific Resource	Reference
143	WAH Insect Relief	A.1-4c	July - August	Terrestrial Mammals	Caribou	Person et al., 2007; ADF&G, 2001
146	Ledyard Brown Bears	A.1-4b	June-October	Terrestrial Mammals	Brown Bears	ADF&G, 1986; ADF&G, 2001
148	Kasegaluk Brown Bears	A.1-4b	June-October	Terrestrial Mammals	Brown Bears	ADF&G, 1986; ADF&G, 2001
152	TCH Insect Relief/Calving	A.1-4b	May - August	Terrestrial Mammals	Caribou	ADF&G, 1986; ADF&G, 2001; Carroll et al., 2011; Person et al., 2007;
156	CAH Insect Relief/Calving	A.1-4b	May - August	Terrestrial Mammals	Caribou	ADF&G, 1986; ADF&G, 2001; Arthur and Del Vecchio, 2009; Cameron et al., 2002; Cameron et al., 2005;; Lawhead and Prichard, 2007; Wolfe, 2000
158	Beaufort Muskox	A.1-4b	November-May	Terrestrial Mammals	Muskox	Environment Yukon, 2009; Lawhead and Prichard, 2007; Reynolds, Wilson, and Klein, 2002 ; ADF&G, 2001
162	PCH Insect Relief	A.1-4b	July - August	Terrestrial Mammals	Caribou	Environment Yukon, 2009; Nixon and Russell, 1990; ADF&G, 2001
163	PCH Calving	A.1-4a	May-June	Terrestrial Mammals	Caribou	Fancy et al., 1989; Griffith et al., 2002; Environment Yukon, 2009 ; ADF&G, 2001
164	Yukon Muskox Wintering	A.1-4a	November-April	Terrestrial Mammals	Muskox	Environment Yukon, 2009
168	Yukon Moose	A.1-4b	January-December	Terrestrial Mammals	Caribou	Environment Yukon, 2009
173	Tuktoyaktuk & Cape Bathurst Caribou Insect Relief	A.1-4c	July - August	Terrestrial Mammals	Caribou	Nagy et al., 2005; Gunn, Russell, and Eamer, 2011

Source: USDOI, BOEM, Alaska OCS Region (2014).
Notes: CAH–Central Arctic Herd; PCH–Porcupine Caribou Herd ; TCH–Teshekpuk Caribou Herd ; WAH–Western Arctic Herd

Table A.1-18. Land Segment ID and the Geographic Place Names within the Land Segment.

ID	Geographic Place Names	ID	Geographic Place Names
1	Mys Blossom, Mys Fomy, Khishchnikov, Neozhidannaya, Laguna Vaygan	47	Kitluk River, Northwest Corner Light, West Fork Espenberg River
2	Mys Gil'der, Ushakovskiy, Mys Zapadnyy	48	Cape Espenberg, Espenberg, Espenberg River
3	Mys Florens, Gusinaya	49	Kungealoruk Creek, Kougachuk Creek, Pish River
4	Mys Ushakova, Laguna Drem-Khed	50	Clifford Point, Cripple River, Goodhope Bay, Goodhope River, Rex Point, Sullivan Bluffs
5	Mys Evans, Neizvestnaya, Bukhta Pestsonaya	51	Cape Deceit, Deering, Kugruk Lagoon, Kugruk River, Sullivan Lake, Toawlevic Point
6	Ostrov Mushtakova	52	Motherwood Point, Ninemile Point, Willow Bay
7	Kosa Bruch	53	Kiwalik, Kiwalik Lagoon, Middle Channel Kiwalk River, Minnehaha Creek, Mud Channel Creek, Mud Creek
8	Klark, Mys Litke, Mys Pillar, Skeletov, Mys Uering	54	Baldwin Peninsula, Lewis Rich Channel
9	Nasha, Mys Proletarskiy, Bukhta Rodzhers	55	Cape Blossom, Pipe Spit
10	Reka Berri, Bukhta Davidova, , Khishchnika, Reka Khishchniki	56	Kinuk Island, Kotzebue, Noatak River
11	Bukhta Somnitel'naya	57	Aukulak Lagoon, Igisukruk Mountain, Noak, Mount, Sheshalik, Sheshalik Spit
12	Zaliv Krasika, Mamontovaya, Bukhta Predatel'skaya	58	Cape Krusenstern, Eigaloruk, Evelukpalik River, Kasik Lagoon, Krusenstern Lagoon,
13	Mys Kanayen, Mys Kekurnyy, Mys Shalaurova, Veyeman	59	Imik Lagoon, Ipiavik Lagoon, Kotlik Lagoon, Omikviorok River
14	Innukay, Laguna Innukay, Umkuveyem, Mys Veuman	60	Imikruk Lagoon, Imnakuk Bluff, Kivalina, Kivalina Lagoon, Singigrak Spit, Kivalina River, Wulik River
15	Laguna Adtaynung, Mys Billingsa, Ettam, Gytkhelen, Laguna Uvargina	61	Asikpak Lagoon,Cape Seppings,Kavrorak Lagoon,Pusaluk Lagoon,Seppings Lagoon
16	Mys Emmatagen, Mys Enmytagyn, Uvargin	62	Atosik Lagoon,Chariot,Ikaknak Pond,Kisimilok Mountain,Kuropak Creek,Mad Hill
17	Enmaat'khyr, Kenmankautir, Mys Olennyy, Mys Yakan, Yakanvaam, Yakan	63	Akoviknak Lagoon, Cape Thompson, Crowbill Point, Igilerak Hill, Kemegrak Lagoon
18	Mys Enmykay, Laguna Olennaya, Pil'khikay, Ren, Rovaam, Laguna Rypil'khin	64	Aiautak Lagoon, Ipiutak Lagoon, Kowtuk Point, Kukpuk River, Pingu Bluff, Point Hope, Sinigrok Point, Sinuk
19	Laguna Kuepil'khin, Leningradskiy	65	Buckland, Cape Dyer, Cape Lewis, Cape Lisburne
20	Polyarnyy, Kuekvun', Notakatryn, Pil'gyn, Tynupytku	66	Ayugatak Lagoon
21	Laguna Kinmanyakicha, Laguna Pil'khikay, Amen, Pil'khikay, Bukhta Severnaya, Val'korkey	67	Cape Sabine, Pitmegea River
22	Ekiatan', Laguna Ekiatan, Kelyun'ya, Mys Shmidta, Rypkarpyy	68	Agiak Lagoon, Punuk Lagoon
23	Emuem, Kemuem, Koyvel'khveyergin, Laguna Tengergin, Tenkergin	69	Cape Beaufort, Omalik Lagoon
24	No place names	70	Kuchaurak Creek, Kuchiak Creek
25	Laguna Amguema, Ostrov Leny, Yulinu	71	Kukpowruk River, Naokok, Naokok Pass, Sitkok Point
26	Ekugvaam, Reka Ekugvam, Kepin, Pil'khin	72	Epizetka River, Kokolik River, Point Lay, Siksrikpak Point
27	Laguna Nut, Rigol'	73	Akunik Pass, Tungaich Point, Tungak Creek
28	Kamynga, Ostrov Kardkarpko, Kovlyuneskin, Mys Vankarem, Vankarema, Laguna Vankarem	74	Kasegaluk Lagoon, , Solivik Island, Utukok River
29	Akanatkhyrgyn, Nutpel'men, Mys Onman, Vel'may	75	Akeonik, Icy Cape, Icy Cape Pass
30	Laguna Kunergin, Nutepynmyn, Pyngopil'khin, Laguna Pyngopil'khin	76	Akoliakatat Pass, Avak Inlet, Tunalik River
31	Alyatki, Zaliv Tasytkhin, Kolyuchin Bay	77	Mitliktavik, Nivat Point, Nokotlek Point, Ongorakvik River
32	Mys Dzhenretlen, Eynenekvyk, Lit'khekay-Polar Station	78	Kilmantavi, Kuk River, Point Collie, Sigeakruk Point,
33	Neskan, Laguna Neskan, Mys Neskan	79	Point Belcher, Wainwright, Wainwright Inlet
34	Emelin, Ostrov Idlidlya, I, Memino, Tepken,	80	Eluksingiak Point, Igklo River, Kugrua Bay
35	Enurmino, Mys Keylu, Netakeniskhvin, Mys Neten,	81	Peard Bay, Point Franklin, Seahorse Islands, Tachinisok Inlet
36	Mys Chechan, Mys Ikigur, Keniskhvik, Mys Serditse Kamen	82	Skull Cliff
37	Chegitun, Utkan, Mys Volnistyy	83	Nulavik, Loran Radio Station
38	Enmytagyn, Inchoun, Inchoun, Laguna Inchoun, Mitkulino, Uellen, Mys Unikyn	84	Walakpa River, Will Rogers and Wiley Post Memorial
39	Cape Dezhnev, Mys Inchoun, Naukan, Mys Peek, Uelen, Laguna Uelen, Mys Uelen	85	Barrow, Browerville, Elson Lagoon
40	Ah-Gude-Le-Rock, Dry Creek, Lopp Lagoon, Mint River	86	Dease Inlet, Plover Islands, Sanigaruak Island
41	Ikpek, Ikpek Lagoon, Pinguk River, Yankee River	87	Igalik Island, Kulgurak Island, Kurgorak Bay, Tangent Point
42	Arctic Lagoon, Kugrupaga Inlet, Nuluk River	88	Cape Simpson, Piasuk River, Sinclair River, Tulimanik Island
43	Sarichef Island, Shishmaref Airport	89	Ikpikpuk River, Point Poleakoon, Smith Bay
44	Cape Lowenstern, Egg Island, Shishmaref, Shishmaref Inlet	90	Drew Point, Kolovik, McLeod Point,
45	No place names	91	Lonely AFS Airport, Pitt Point, Pogik Bay, Smith River
46	Cowpack Inlet, Cowpack River, Kalik River, Kividlo, Singeak, Singeakpuk River, White Fish Lake	92	Cape Halkett, Esook Trading Post, Garry Creek

ID	Geographic Place Names	ID	Geographic Place Names
93	Atigaru Point, Eskimo Islands, Harrison Bay, Kalikpik River, Saktuina Point	**114**	Nunaluk Spit
94	Fish Creek, Tingmeachsiovik River	**115**	Herschel Island
95	Anachlik Island, Colville River, Colville River Delta	**116**	Ptarmagin Bay
96	Kalubik Creek, Oliktok Point, Thetis Mound,	**117**	Roland & Phillips Bay, Kay Point
97	Beechey Point, Bertoncini , Bodfish, Cottle and, Jones Islands, Milne Point, Simpson Lagoon	**118**	Sabine Point
98	Gwydyr Bay, Kuparuk River, Long Island	**119**	Shingle Point
99	Duck Island, Foggy Island, Gull Island, Heald Point, Howe Island, Niakuk Islands, Point Brower	**120**	Trent and Shoalwater Bays
100	Foggy Island Bay, Kadleroshilik River, Lion Point, Shaviovik River, Tigvariak Island	**121**	Shallow Bay, West Channel
101	Bullen Point, Point Gordon, Reliance Point	**120**	Trent and Shoalwater Bays
102	Flaxman Island, Maguire Islands, North Star Island, Point Hopson, Point Sweeney, Point Thomson, Staines River	**121**	Shallow Bay, West Channel
103	Brownlow Point, Canning River, Tamayariak River	**122**	
104	Camden Bay, Collinson Point, Katakturuk River, Konganevik Point, Simpson Cove	**123**	Outer Shallow Bay, Olivier Islands
105	Anderson Point, Carter Creek, Itkilyariak Creek, Kajutakrok Creek, Marsh Creek, Sadlerochit River	**124**	Middle Channel, Gary Island
106	Arey Island, Arey Lagoon, Barter Island, Hulahula River, Okpilak River	**125**	Kendall Island
107	Bernard Harbor, Jago Lagoon, Kaktovik, Kaktovik Lagoon	**126**	North Point, Pullen Island
108	Griffin Point, Oruktalik Lagoon, Pokok Lagoon	**127**	Hendrickson Island, Kugmallit Bay
109	Angun Lagoon, Beaufort Lagoon, Nuvagapak Lagoon,	**128**	Tuktoyaktuk, Tuktoyaktuk Harbour
110	Aichilik River, Egaksrak Lagoon, Egaksrak River, Icy Reef, Kongakut River, Siku Lagoon	**129**	Warren Point
101	Demarcation Bay, Demarcation Point, Gordon, Pingokraluk Lagoon	**130**	Hutchison Bay
112	Clarence Lagoon, Backhouse River	**131**	McKinley Bay, Atkinson Point
113	Komakuk Beach, Fish Creek	**132**	Kidney Lake, Nuvorak Point

Key: ID = identification (number).
Source: USDOI, BOEM, Alaska OCS Region (2014).

Table A.1-19. Grouped Land Segment ID, Geographic Names, Land Segments ID's which make up the Grouped Land Segment and Vulnerability.

GLS ID	Grouped Land Segment Name	Land Segment ID's	Vunerable	MAP
133	Mys Blossom	1, 12	July-November	A-4c
134	Bukhta Somnitel'naya	10, 11	July-November	A-4c
135	Kolyuchin Bay	30, 31, 33, 34	June-November	A-4c
136	Ostrov Idlidlya	33,34	July-November	A-4c
137	Mys Serditse Kamen	35, 36	July-November	A-4c
138	Chukotka Coast Haulout	35-39	July-November	A-4c
139	Bering Land Bridge National Preserve	41, 42, 45-50	January-December	A-4c
140	Noatak River	54-57	January-December	A-4c
141	Cape Krusenstern National Monument	57-59	January-December	A-4a
142	Wulik and Kivilina Rivers	60-61	January-December	A-4a
143	WAH Insect Relief	61-71	July - August	A-4c
144	Alaska Maritime National Wildlife Refuge	62, 63, 65	January-December	A-4a
145	Cape Lisburne	65, 66, 67	August-November	A-4b
146	Ledyard Brown Bears	65-70	June-October	A-4b
147	Point Lay Haulout	71-74	January-December	A-4a
148	Kasegaluk Brown Bears	73-77	June-October	A-4b
149	National Petroleum Reserve Alaska	76, 77, 80-83, 86-93	January-December	A-4c
150	Kasegaluk Lagoon Special Area (NPR-A)	76-77	January-December	A-4c
151	Kuk River	78-79	January-December	A-4b
152	TCH Insect Relief/Calving	85-95	May - August	A-4b
153	Smith Bay Spotted Seal Haulout	88-89	May-October	A-4b
154	Teshekpuk Lake Special Area (NPR-A)	89-93	January-December	A-4c
155	Harrison Bay Spotted Seal Haulout	95, 96	June – September	A-4b
156	CAH Insect Relief/ Calving	96-103	July - August	A-4b
157	96-115 Summer	96-115	June- August	A-4a
158	Beaufort Muskox Habitat	97-98	November - May	A-4b
159	99-115 Fall	99-115	September-November	A-4b
160	102-110 Winter	102-110	December-February	A-4b
161	Arctic National Wildlife Refuge	103-111	January-December	A-4b
162	PCH Insect Relief	103-111	July - August	A-4b
163	PCH Calving	106-109, 112-117	May-June	A-4a
164	Yukon Musk Ox Wintering	111-115	November-April	A-4a
165	Ivvavik National Park (Canada)	112-117	January-December	A-4b
166	112-119 Spring	112-119	March-May	A-4b
167	112-121 Winter	112-121	December-February	A-4a
168	Yukon Moose	116-118	January-December	A-4b
169	Tarium Nirutait Marine Protected Area	119,120,121,122,124,127	January-December	A-4b
170	122-132 Spring	122-132	March-May	A-4a
171	122-132 Winter	122-132	December-February	A-4a
172	Kendall Island Bird Sanctuary (Canada)	124-125	May-October	A-4b
173	Tuktoyaktuk/Cape Bathurst Caribou Ins. R	126-132	July - August	A-4b
174	Russia Chukchi Coast Marine Mammals	1-39	July-November	A-4c
175	Russia Chukchi Coast	1-39	January-December	A-4c
176	United States Chukchi Coast	40-84	January-December	A-4c
177	United States Beaufort Coast	85-111	January-December	A-4a
178	Canada Beaufort Coast	112-132	January-December	A-4a

Source: USDOI, BOEM, Alaska OCS Region (2014).
Notes: CAH– Central Arctic Herd; PCH–Porcupine Caribou Herd; TCH–Teshekpuk Caribou Herd; WAH–Western Arctic Herd

Table A.1-20. Chukchi Sale 193 Leased Area: Assumptions about How Launch Areas are Serviced by Pipelines for the Oil-Spill-Trajectory.

Alternative I or IV		Alternative III	
Launch Area	**Serviced by Pipelines**	**Launch Area**	**Serviced by Pipelines**
LA01	P02, P03, P04, P05, P06	LA01	P02, P03, P04, P05, P06
LA04	P02, P03	LA04	P02, P03
LA05	P05, P06	LA05	P05, P06
LA06	P08, P09	LA06	P08, P09
LA10	P03	LA10a	P03
LA11	P06	LA11a	P06

Source: USDOI, BOEM, Alaska OCS Region (2014).

Table A.1-21. Leased Area: Estimated Mean Number of Large Platform, Pipeline and Total Spills for Alternative 1, 2, 3, or 4.

Alt.No.	Alternative Name	Mean Number of Platform/ Well Spills	Mean Number of Pipeline Spills	Mean Number of Spills Total
1, 3, or 4	Proposed Action and Alts	0.5	0.9	1.4
2	No Action	0	0	0

Source: USDOI, BOEM, Alaska OCS Region (2014).

Table A.1-22. Leased Area: Estimated Chance of One or More Large Platform, Pipeline and Total Spills Occurring for Alternative 1, 2, 3, or 4.

Alt.No.	Alternative Name	Percent Chance of One or More Platform/ Well Spills	Percent Chance of One or More Pipeline Spills	Percent Chance of One or More Spills Total
1, 3, or 4	Proposed Action and Alts	39	59	75
2	No Action	0	0	0

Source: USDOI, BOEM, Alaska OCS Region (2014).

Table A.1-23. Small Refined and Crude and Condensate Oil Spills: Range Assumed Showing Total Over the Life and Annual Number and Volume of Spills Over Exploration and Delineation and Development and Production Activities.

Activity Phase	Life of Exploration Estimated Total Number of Small Spills	Estimated Total Volume of Small Spills (bbls)	Estimated Annual Number of Small Spills	Estimated Annual Volume of Small Spills (bbls)
Refined Oil Spills				
Exploration G&G Activities	0 – 15	0 – <15 or <27	0 – 3	0 – <3 or <13
Exploration & Delineation Drilling Activities	0 – 20	0 - <145	0 – 2	0 - <55
Development and Production	0 – 520	0 -1,600	0 - 12	0 – 36
Small Crude and Natural Gas Liquid Oil Spills				
Development and Production	0– 222[1]	0- 2,000	0 - 5	0 - 700

Note: 1: 2 spills are the median spill size of 700 bbl; 220 spills are median spill size of 3 bbl.
Source: USDOI, BOEM, Alaska OCS Region (2014)

Table A.1-24. Fate and Behavior of a Hypothetical 50-Barrel Diesel Fuel Oil Spill.

Scenario Element	Summer Spill[1]				
Time After Spill in Hours	1	6	12	24	48
Oil Remaining (%)	96	65	31	4	0
Oil Naturally Dispersed (%)	3	28	57	79	83
Oil Evaporated (%)	1	7	12	17	17

Notes: Calculated with the SINTEF oil-weathering model Version 4.0 of Reed et al. (2005) and assuming diesel fuel no 2. Summer (July through October), 8-knot wind speed, 2 degrees Celsius water temperature, 0.4-meter wave height.

Table A.1-25. Fate and Behavior of a Hypothetical 1 or 13-Barrel Diesel Fuel Oil Spill.

Scenario Element	Summer Spill[1]				Meltout Spill[2]			
1 bbl								
Time After Spill in Hours	6	12	24	48	24	72	144	240
Oil Remaining (%)	52	15	0	na	47	9	0	na
Oil Dispersed (%)	37	67	79	na	23	50	56	na
Oil Evaporated (%)	11	18	21	na	30	41	44	na
13 bbl								
Time After Spill in Hours	6	12	24	48	24	72	144	240
Oil Remaining (%)	75	45	11	0	68	26	3	0
Oil Dispersed (%)	18	42	70	79	11	38	54	56
Oil Evaporated (%)	7	13	19	21	21	36	43	44

Notes: Calculated with the SINTEF oil-weathering model Version 4.0 of Reed et al. (2005) and assuming diesel fuel no 2, na means not applicable.
Summer (July through October), 8-knot wind speed, 2 degrees Celsius water temperature, 0.4-meter wave height.

Table A.1-26. Fate and Behavior of a Hypothetical 20,000-bbl Crude Oil Spill in the Chukchi Sea.

	Summer Spill[1]				Meltout Spill[2]			
Time After Spill (Days)	1	3	10	30	1	3	10	30
Oil Remaining (%)	61	53	36	13	67	58	47	35
Oil Dispersed (%)	10	16	29	50	4	10	17	27
Oil Evaporated (%)	29	31	35	37	29	32	36	38

Table A.1-27. Fate and Behavior of a Hypothetical 60,000-bbl Crude Oil Spill in the Chukchi Sea.

	Summer Spill[1]				Meltout Spill[2]			
Time After Spill in Days	1	3	10	30	1	3	10	30
Oil Remaining (%)	68	62	51	30	71	65	58	48
Oil Dispersed (%)	5	8	16	33	2	5	9	15
Oil Evaporated (%)	27	30	33	37	27	30	33	37

Notes for Tables A.1-26 and A.1-27:
Calculated with the SINTEF oil-weathering model Version 3.0 of Reed et al. (2005) and a 35 API crude oil.
[1] Summer (Open Water), Spill is assumed to occur in open water, 8-knot wind speed, 2 degrees Celsius, 0.4-meter wave height.
[2] Meltout Spill (Oil melts out of sea ice). Spill is assumed to occur into first-year pack ice, freeze into ice and melt out, pools 2-centimeter thick on ice surface for 2 days at -1 degrees Celsius prior to meltout into 50% ice cover, 10-knot wind speed, and 0.1 meter wave heights.
Source: USDOI, BOEMRE, Alaska OCS Region (2011)

Table A.1-28. Alaska North Slope Facility and Pipeline Crude Oil Spills 1985-2013 (≥ 500 bbl).

Spill Date	Facility Type	Facility Operator	Oil Type	Spill Location	Spill Cause	Low Spill Quantity (bbl)	High Spill Quantity (bbl)
28-Jul-89	Production Processing	Conoco, Inc.	Crude Oil	Milne Point Unit, Central Processing Facility	Facility Tank Leak–overfill	825	925
25-Aug-89	Pipeline	ARCO Alaska, Inc.	Crude Oil	Kuparuk River Unit, Drill Site 2-U	Pipeline Leak–corrosion of block valve	340[2]	603[2]
10-Dec-90	Production Well Site	ARCO Alaska, Inc.	Crude Oil	Lisburne Unit, Drill Site L-5	Facility Explosion	176[1]	600[1]
17-Aug-93	Production Processing	ARCO Alaska, Inc.	Crude Oil/ Produced Water	Kuparuk River Unit CPF 1	Tank Leak– Corrosion		675
26-Sep-93	Production Processing	BP Exploration (Alaska)	Crude Oil	Prudhoe Bay Unit, Gathering Center 2	Facility Tank Leak–overflow due to pump failure		650
21-Aug-00	Production Processing	BP Exploration (Alaska)	Crude Oil/ Produced Water	Prudhoe Bay Unit, Gathering Center 2	Facility Tank Leak–overflow due to control system failure	700	715[4]
19-Feb 01	Pipeline	BP Exploration (Alaska)	Crude Oil/	West Prudhoe Bay, between D-pad and gathering center	Pipeline Leak – Line Failure, Human Error	2254	608.33[2]
02-Mar-06	Pipeline	BP Exploration (Alaska)		Prudhoe Bay Unit, GC-2 34” Oil Transit Line	Pipeline Leak - Corrosion		5053.62[3]

Source: 1 Hart Crowser (2000), 2 ADEC 3. Unified Command 4. BPXA 5. Robertson et al., 2013

Table A.1-29. The Trans-Alaska Pipeline Crude Oil Spills 1977-2013 (≥ 500 bbl).

Spill Date	Facility Type	Spill Name	Spill Location	Spill Cause	Low Spill Quantity (bbl)	High Spill Quantity (bbl)	Quantity Used in Analysis
08-Jul-77	Pump Station	Pump Station 8	TAPS PS 8 (TAPS MP 489.2)	Facility Explosion [1,2,3] Unspecified 5	300 [2]	4,762 [2] 300 [1,3,5]	4,762[2]
19-Jul-77	Pipeline	Check Valve 7	TAPS MP 26 (Check Valve 7)	Pipeline Leak - equipment damage [1,2,3] Human Error [5]	1000 [1,2]	1,800 [1] 1,000 [3,5] 2,620 [2]	1,800 [1]
15-Feb-78	Pipeline	Steele Creek	TAPS MP 457	Pipeline Leak - intentional sabotage [1,3] Unspecified [5]	11,905 [1]	16,000 [1] 11,905 [3,5]	16,000[1]
10-Jun-79	Pipeline	Atigun Pass	TAPS MP 166 (N. side of Atigun Pass)	Pipeline Leak - line break [1,2,3,5]	1,500 [2]	7,143 [2] 1,500 [1,5] 5,267 [3]	7,143[2]
15-Jun-79	Pipeline	Little Tonsina	TAPS MP 734	Pipeline Leak - line break [1,2,3,5]	300 [2]	4000 [1,2] 300 [3,5]	4,000[1,2]
01-Jan-81	Pipeline	Check Valve 23	TAPS MP 114.6 (Check Valve 23)	Pipeline Leak - leaking valve	1,000 [2]	1,500 [1,3,4,5] 2,000 [6] 2,381[2]	2,381[2]
20-Apr-96	Pipeline	Check Valve 92	TAPS MP 539.7 (Check Valve 92)	Pipeline Leak - loose fitting	800 [1 2]	811 [1]	811[1]
4-Oct-01	Pipeline		TAPS MP 400	Pipeline Leak -intentional sabotage - bullet hole	6,800	6,800	6,800
12-May-10	Tank	Pump Station 9, Tank 190		Tank Leak - Circuit Failure Valve Control	na	2580[1,2]	2580[1,2]

Sources: [1] Alyeska Pipeline Service Company, [2] Alaska Department of Environmental Conservation, [3] Unknown, [4] Bureau of Land Management, [5] Joint Pipeline Office, [6] Oil Spill Intelligence Report

Table A.1-30. Oil Spill Rates and Spill-Size Categories Used To Estimate Large Crude Oil Spills For the Cumulative Analysis.

Location	Arctic Outer Continental Shelf		Alaska North Slope 1985-2013		Trans-Alaska Pipeline System Pipeline 1977-2013	
	Spill rate (spills/Bbbl)	Size category (bbl)	Spill rate (Spills/Bbbl)	Size category (bbl)	Spill rate Spills/Bbbl)	Size category (bbl)
Offshore	0.58 Beaufort 0.32 Chukchi	≥1,000	-	-	-	-
Onshore	-	-	0.63	≥500	0.54	≥500

Source: USDOI, BOEM, Alaska OCS Region (2014)

Table A.1-31. Cumulative Large Oil-Spill-Occurrence Estimates Resulting from Past, Present and Future Oil Production.

Category	Large Crude Oil Spills				
	Reserves and Resources (Bbbl)	Spill Rate[1]. (spills/Bbbl)	Size Category (bbl)	Assumed Size (bbl) Pipeline/Facility[2]	Assumed Number of Large Spills for Analysis
Sale 193					
Alternative1, 3 or 4	4.3	0.32	≥500	1.700/5,100	1-2
NPR-A (Future Production)					
Alternative D	0.76	0.63	≥500	700/700	0 -1
Colville Canning/State Beaufort Sea (Past, Present and Future)					
	3.15	0.63	≥500	700/700	2
Beaufort and Chukchi OCS [3] (Future)					
	3.1	0.58 & 0.32	≥1,000	1,700/5,100	0-1
TAPS Pipeline (Past, Present and Future)					
	11.21	0.54	≥500	4,000/na	2 on ANS[4]
Total[1]					
	11.21	-	-	-	5-8

Notes

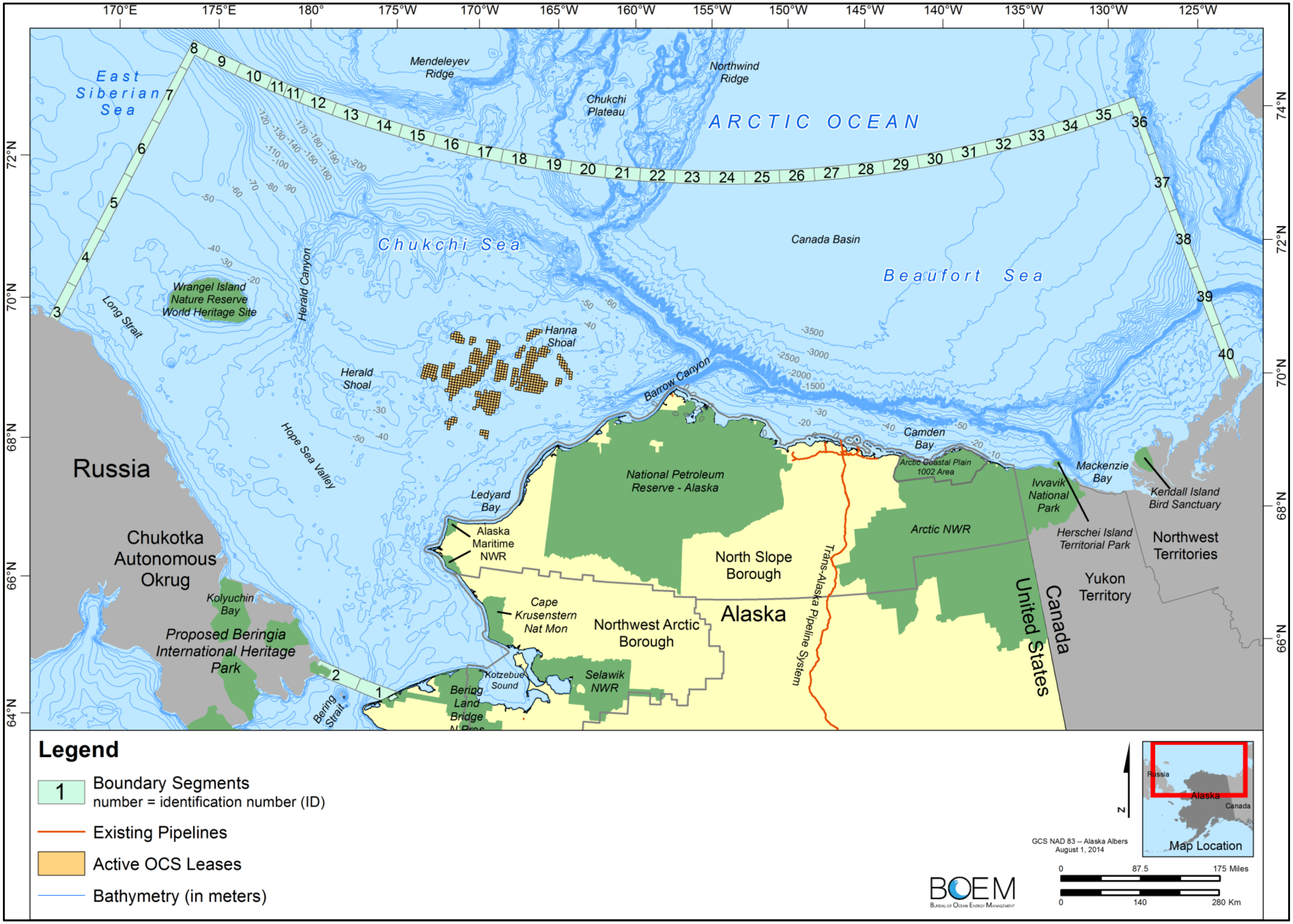
1 Large spill occurrence rates for Alaska North Slope, OCS and TAPS Pipeline are discussed in Appendix A. Section 4 and Section 8.

2. The first number is the assumed pipeline size and the second number is the assumed facility size. The median OCS pipeline or facility spill size is used for the assumed large spill size. For onshore North Slope the largest spill sizes are used.

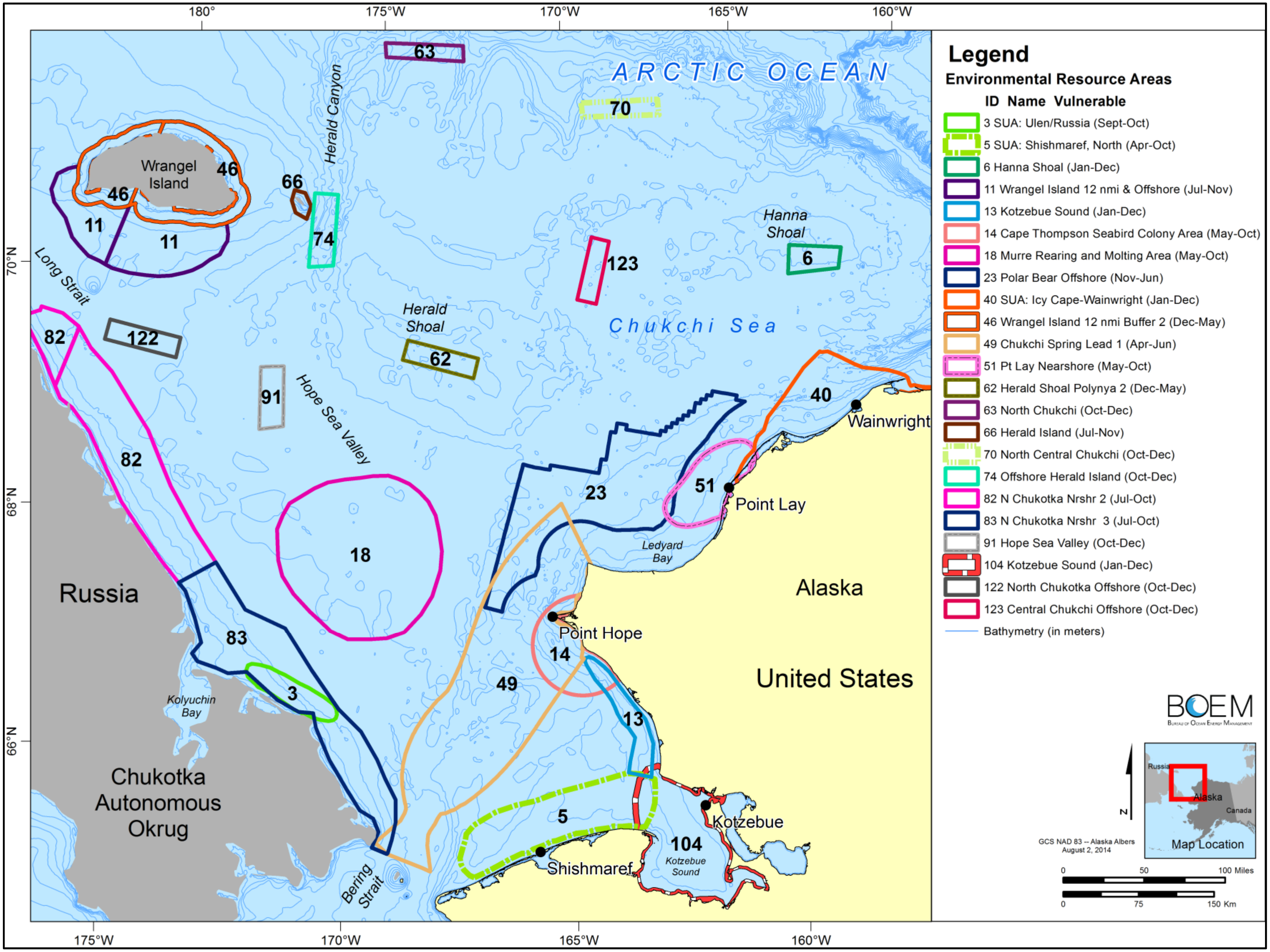
3. The values provided are the combined totals for the Beaufort and Chukchi OCS .

4 The estimated large TAPS pipeline spills include spills from the pipeline, pump stations, and associated tank farms and could occur along the entire length of TAPS. Of those spills, 2 could occur on the Alaska North Slope (ANS) and 4 along the rest of the pipeline length.

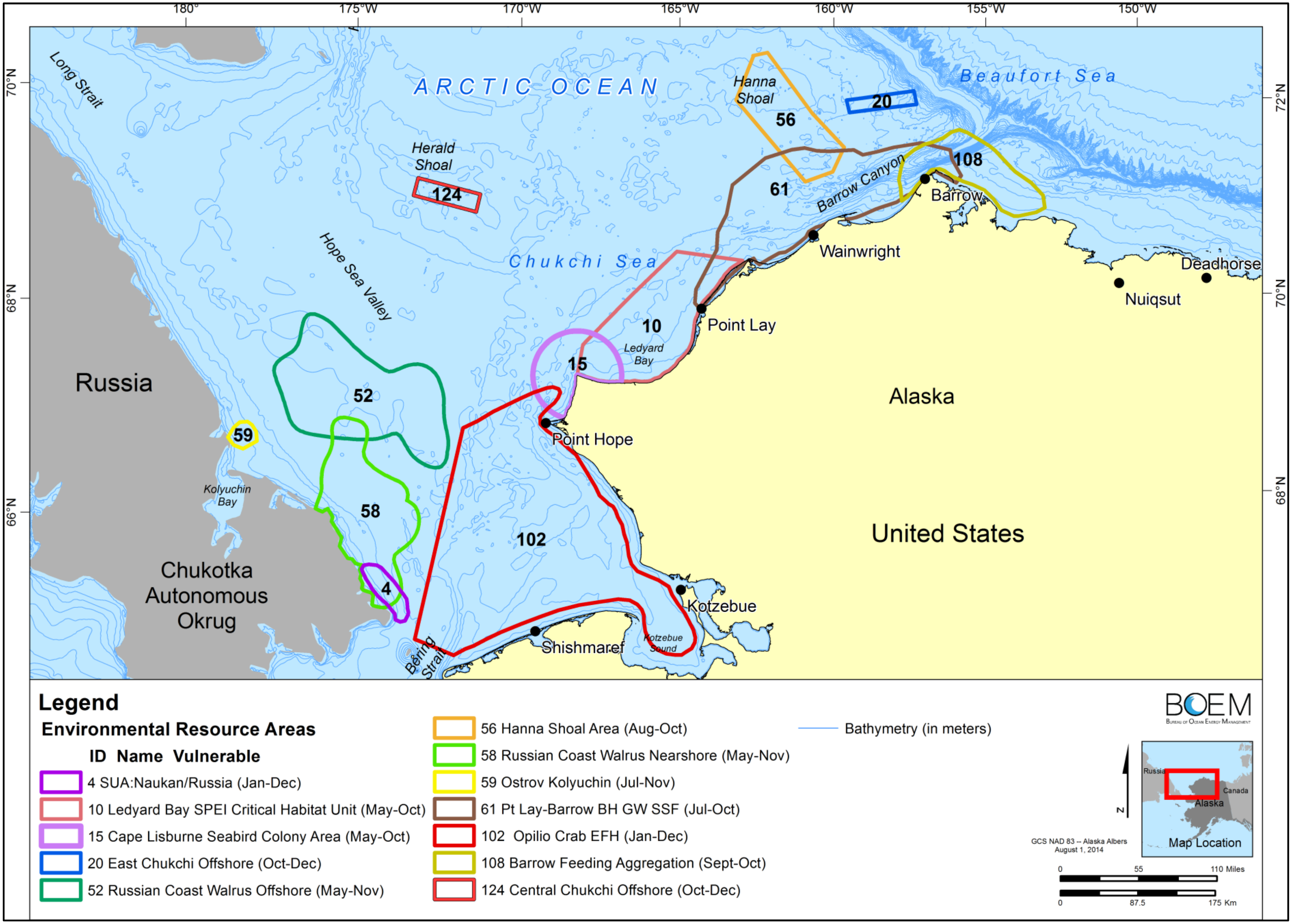
Appendix A Maps



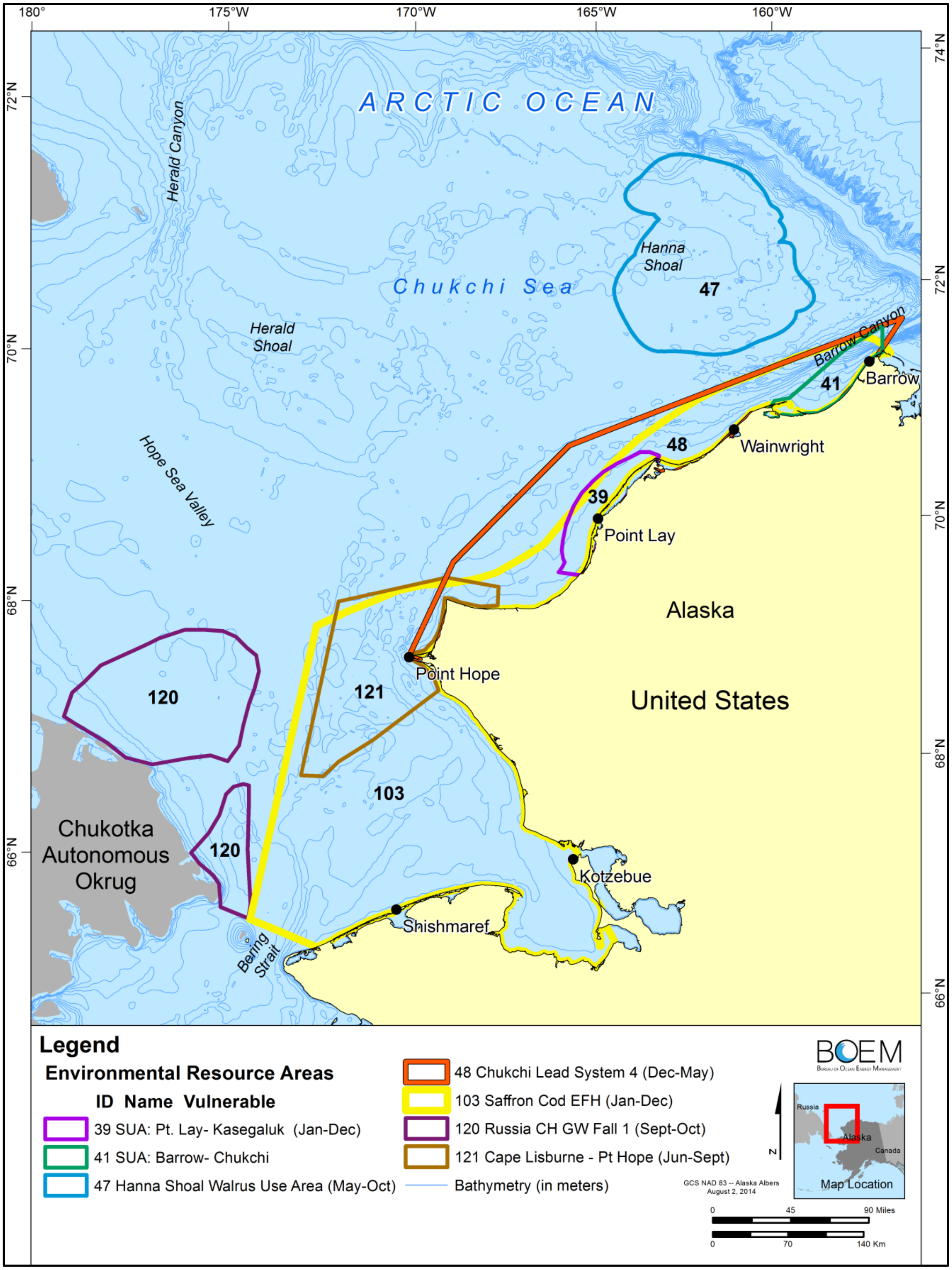
Map A-1. Study Area Used in the Oil-Spill Trajectory Analysis.



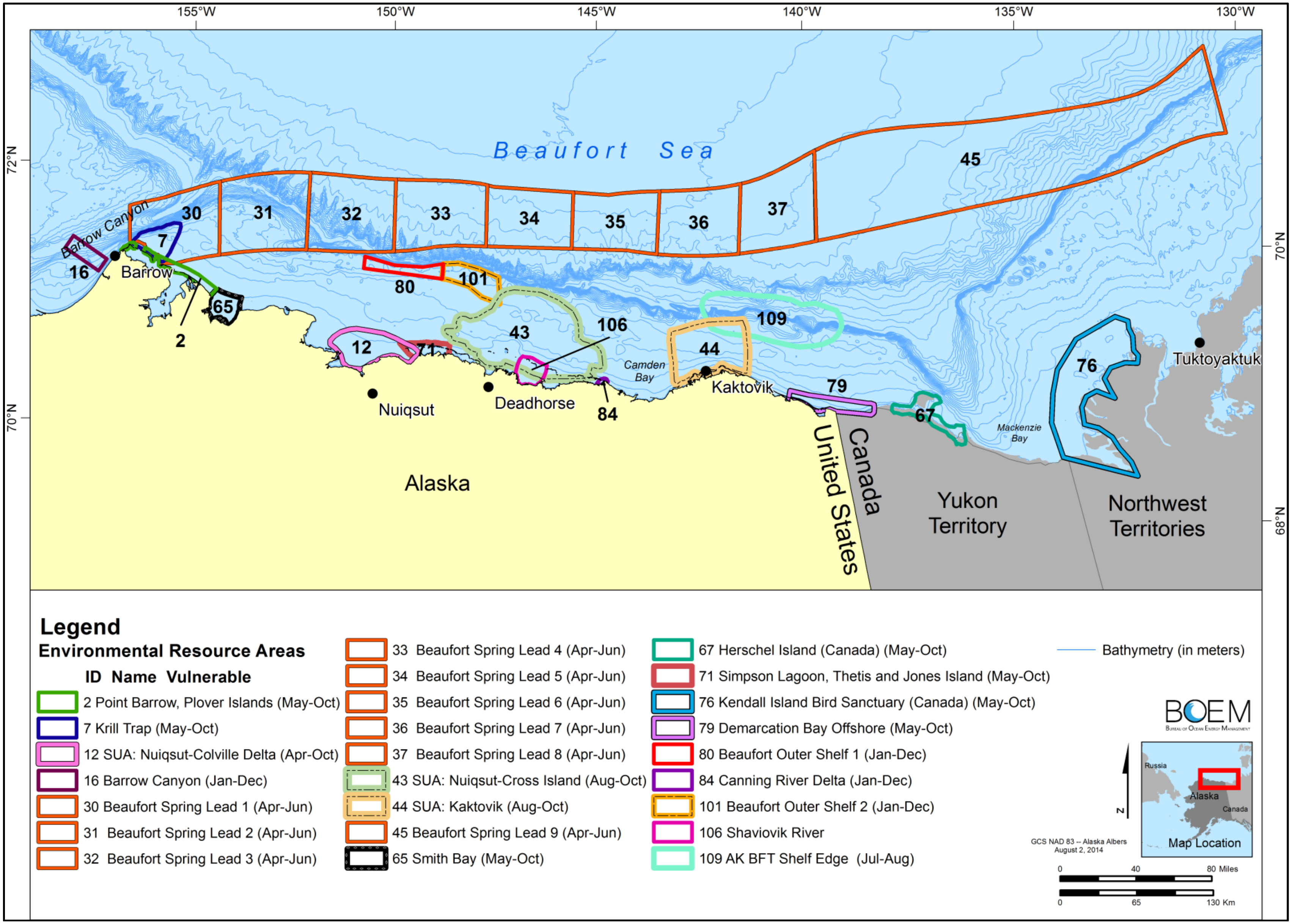
Map A-2a. Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.



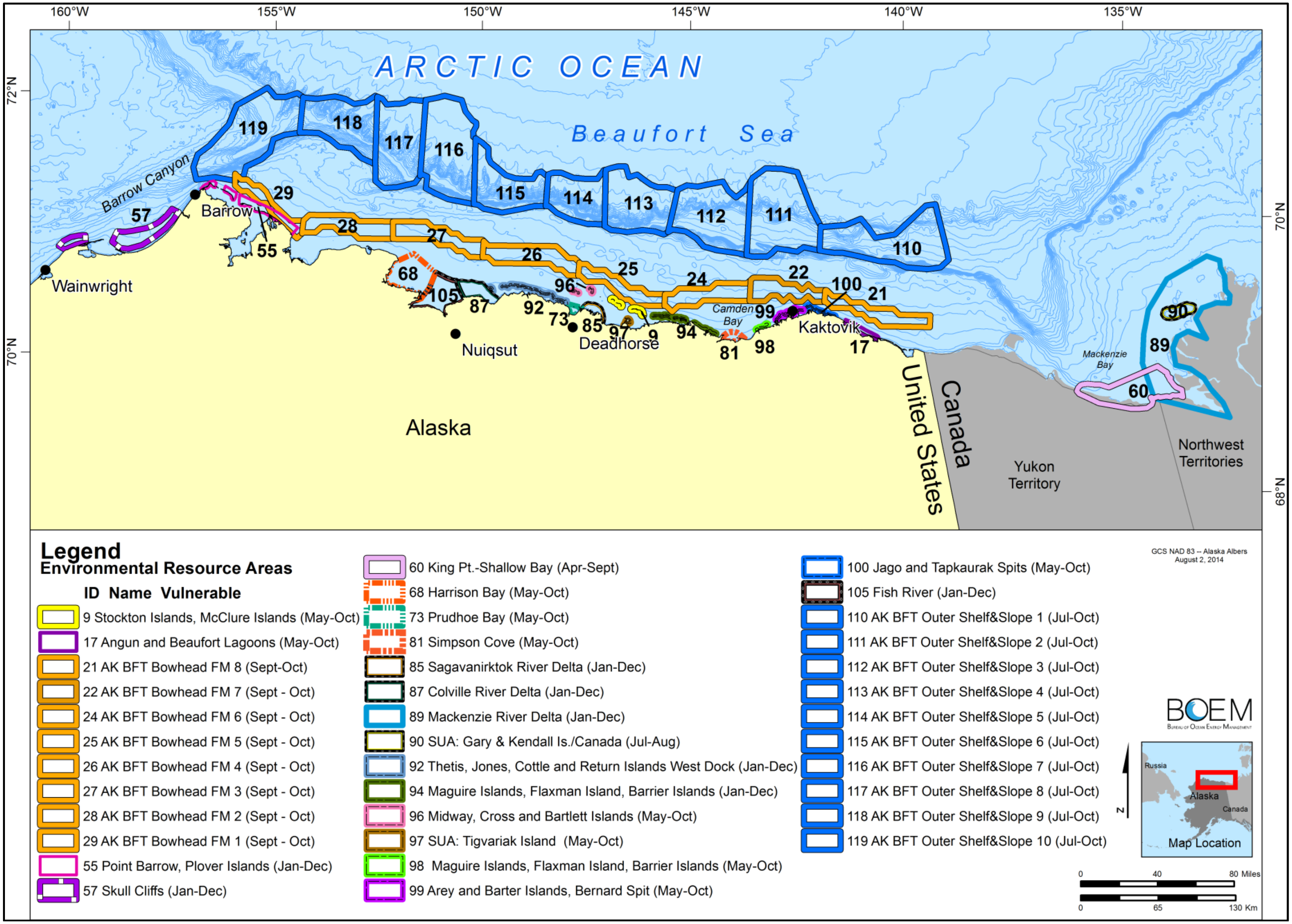
Map A-2b. Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.



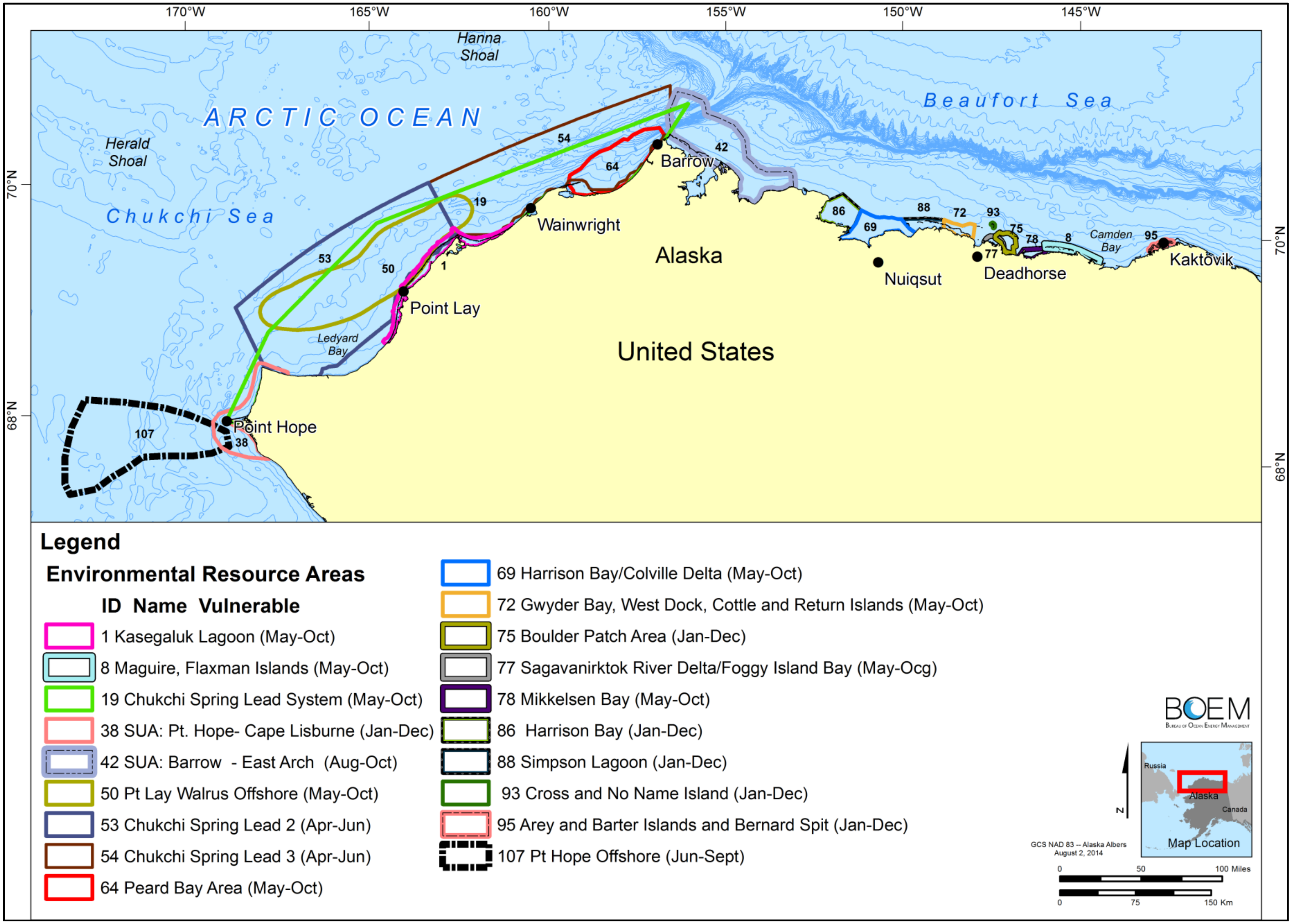
Map A-2c. Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.



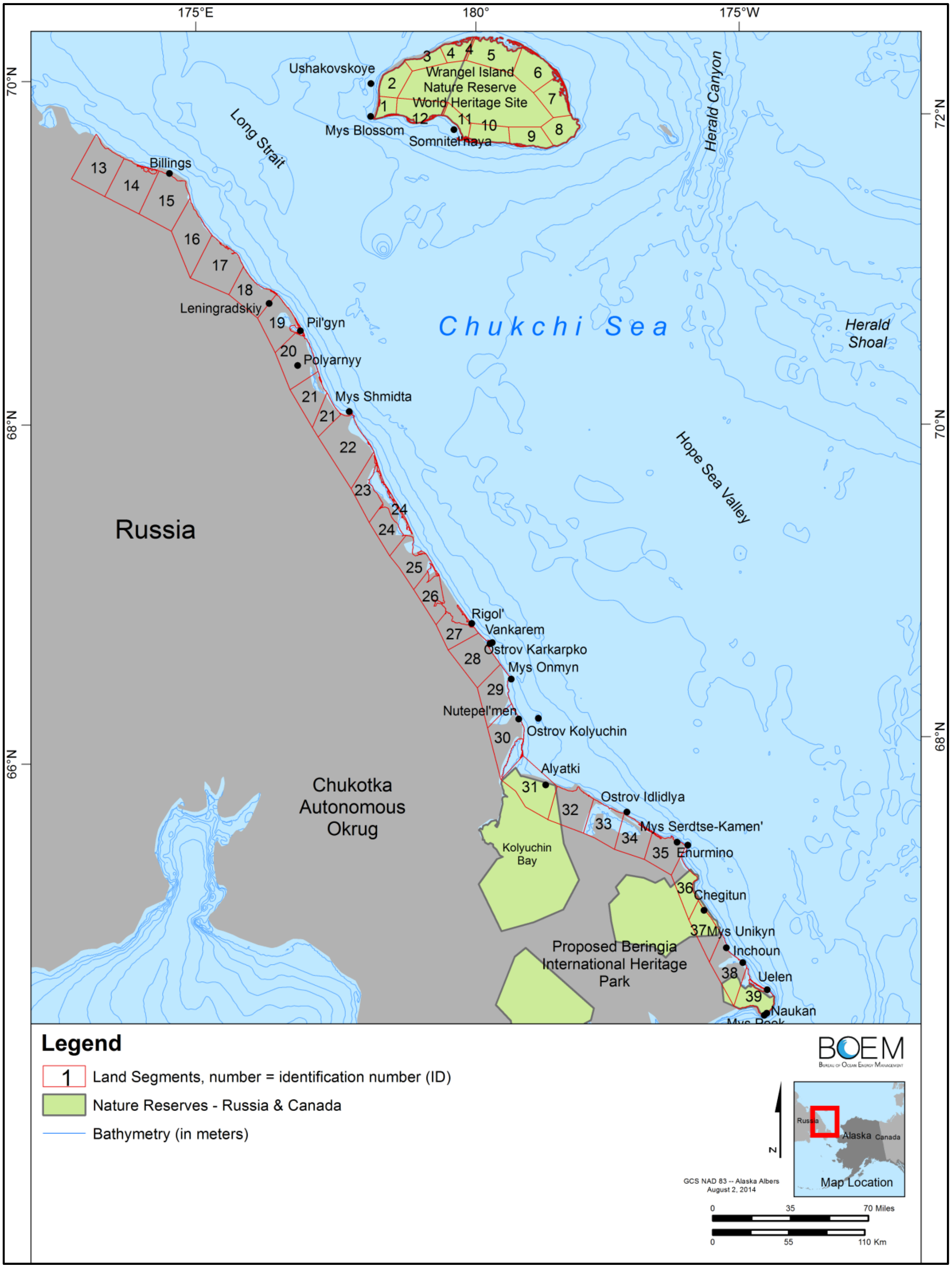
Map A-2d. Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.



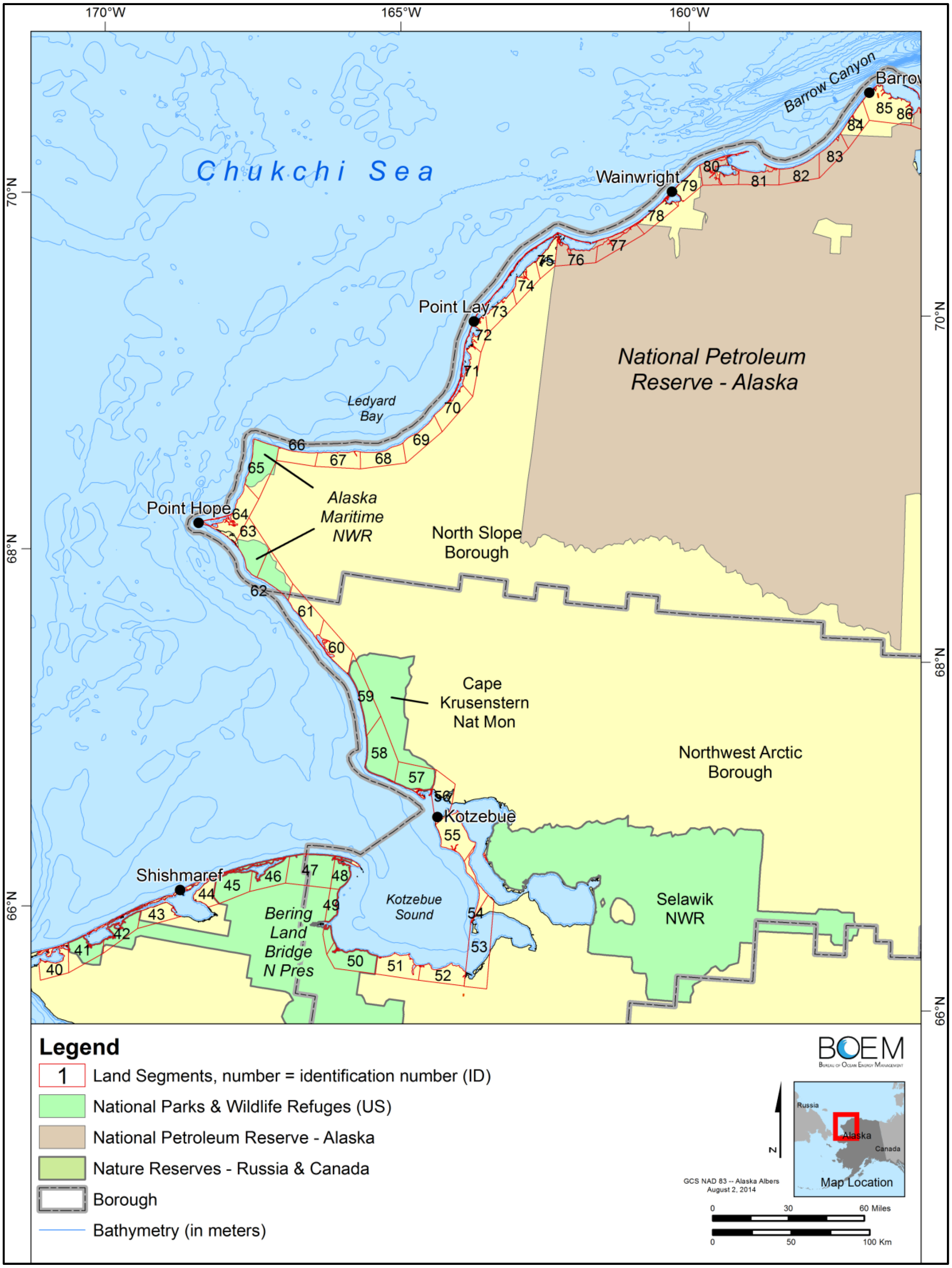
Map A-2e. Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.



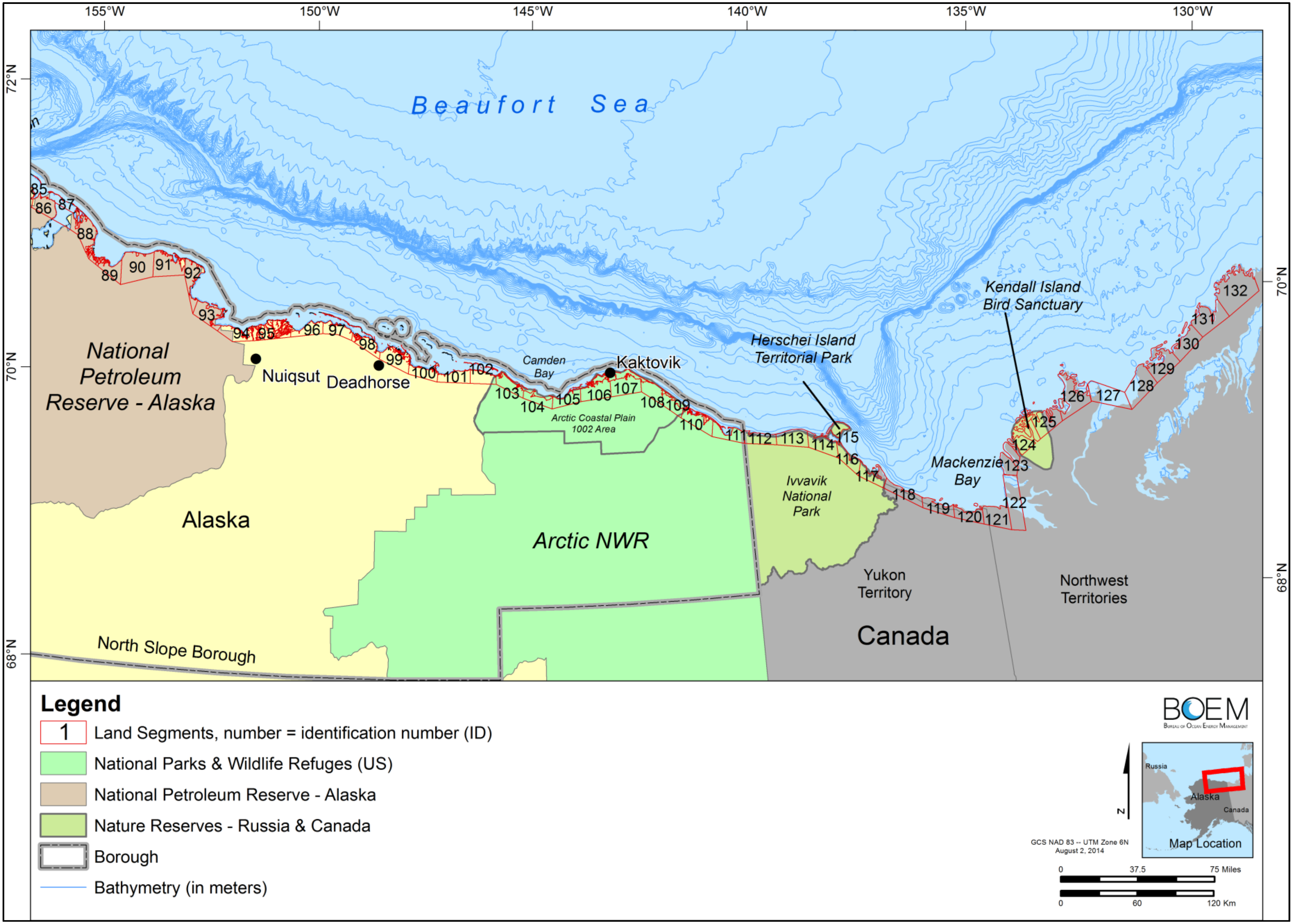
Map A-2f. Environmental Resource Areas Used in the Oil-Spill Trajectory Analysis.



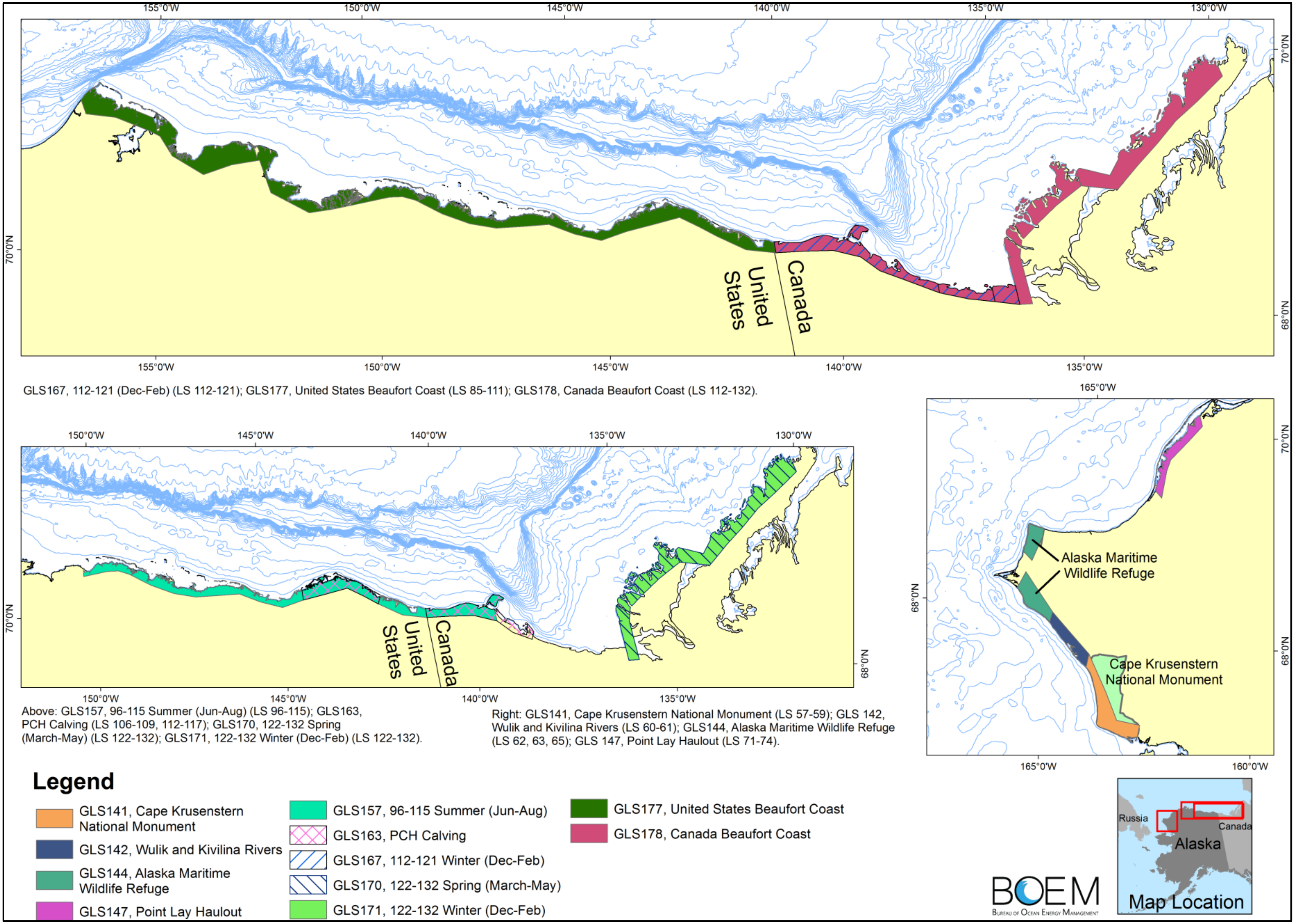
Map A-3a. Land Segments Used in the Oil-Spill Trajectory Analysis.



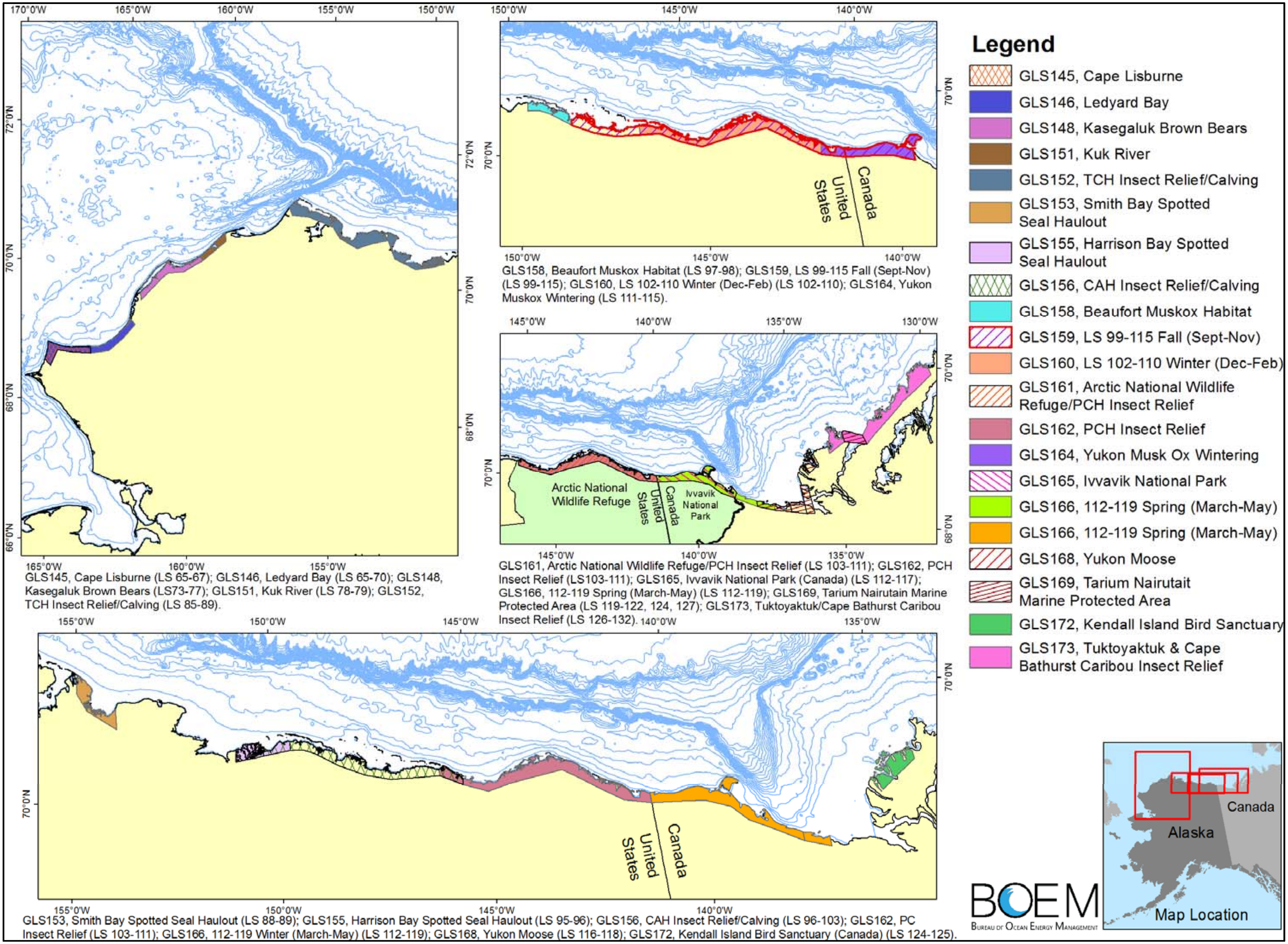
Map A-3b. Land Segments Used in the Oil-Spill Trajectory Analysis.



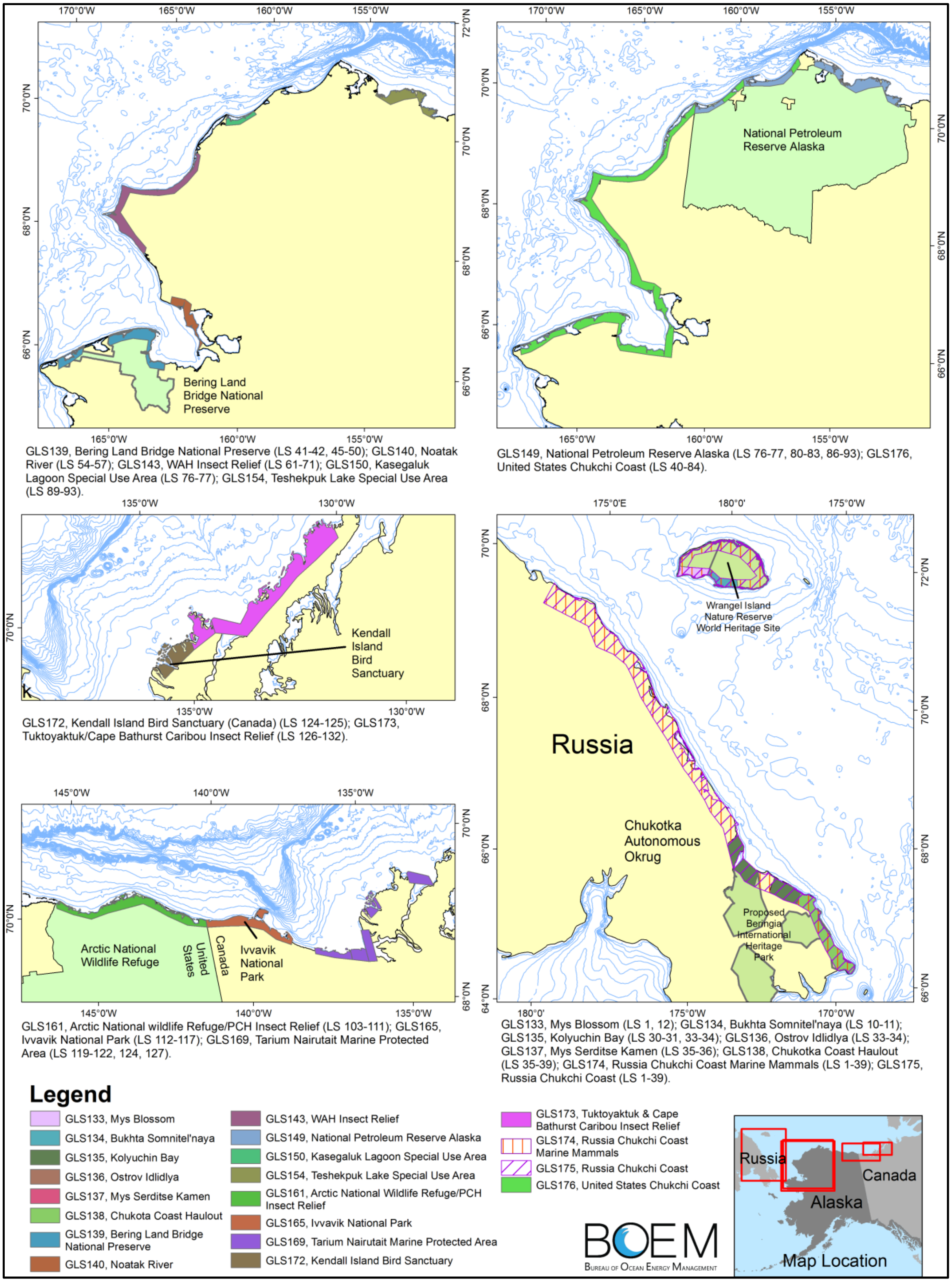
Map A-3c. Land Segments Used in the Oil-Spill Trajectory Analysis.



Map A-4a. Grouped Land Segments Used in the Oil-Spill Trajectory Analysis.



Map A-4b. Grouped Land Segments Used in the Oil-Spill Trajectory Analysis.



GLS139, Bering Land Bridge National Preserve (LS 41-42, 45-50); GLS140, Noatak River (LS 54-57); GLS143, WAH Insect Relief (LS 61-71); GLS150, Kasegaluk Lagoon Special Use Area (LS 76-77); GLS154, Teshekpuk Lake Special Use Area (LS 89-93).

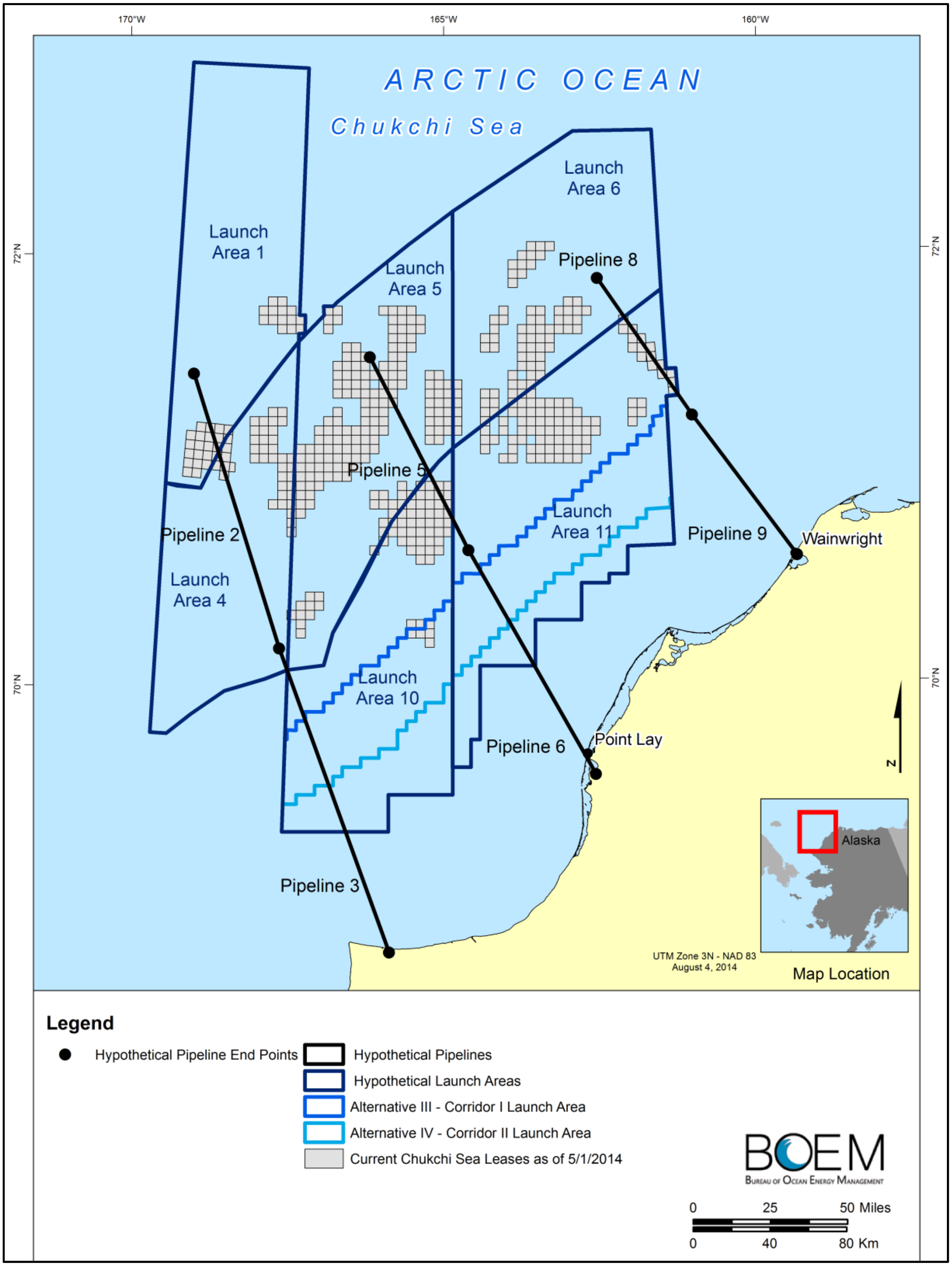
GLS149, National Petroleum Reserve Alaska (LS 76-77, 80-83, 86-93); GLS176, United States Chukchi Coast (LS 40-84).

GLS172, Kendall Island Bird Sanctuary (Canada) (LS 124-125); GLS173, Tuktoyaktuk/Cape Bathurst Caribou Insect Relief (LS 126-132).

GLS161, Arctic National wildlife Refuge/PCH Insect Relief (LS 103-111); GLS165, Ivvavik National Park (LS 112-117); GLS169, Tarium Nairutait Marine Protected Area (LS 119-122, 124, 127).

GLS133, Mys Blossom (LS 1, 12); GLS134, Bukhta Somnitel'naya (LS 10-11); GLS135, Kolyuchin Bay (LS 30-31, 33-34); GLS136, Ostrov Idlidlya (LS 33-34); GLS137, Mys Serditse Kamen (LS 35-36); GLS138, Chukotka Coast Haulout (LS 35-39); GLS174, Russia Chukchi Coast Marine Mammals (LS 1-39); GLS175, Russia Chukchi Coast (LS 1-39).

Map A-4c. Grouped Land Segments Used in the Oil-Spill Trajectory Analysis.



Map A-5. Hypothetical Launch Areas and Pipelines Used in the Oil-Spill Trajectory Analysis.

A.2. OSRA Conditional and Combined ProbabilityTables

Tables A.2-1 through A.2-72 represent conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location (launch area (LA) or pipeline (PL) will contact a certain location (environmental resource area, land segment, boundary segment, or grouped land segment). The tables are further organized as annual or seasonal (winter, summer). Tables A.2-1 through A.2-24 represent annual conditional probabilities while Table's A.2-25 through A.2-72 represent seasonal conditional probabilities. Tables A.2-73 through A.2-75 represent combined probabilities (expressed as percent chance) of one or more large spills, and the estimated number of spills (mean), occurring and contacting a resource over the assumed life of the leased area, Alternatives 1, 3, or 4.

If the probability of contacting a given resource area is >99.5%, it is shown with a double asterisk (**). If the probability of oil contacting a resource area is <0.5%, it is shown with a dash (-). Resource areas with a <0.5% chance of contact from all LAs and PLs are not shown.

Tables A.2-1 through A.2-6 represent annual conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain environmental resource area (ERA) within:

Table A.2-1. 3 Days-(Annual-ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	-	-	-	-	-	1	-	2	-	7	-	7
1	Kasegaluk Lagoon Area	-	-	-	-	-	-	-	-	-	5	-	-
6	Hanna Shoal	-	-	-	10	-	2	-	-	-	-	20	-
7	Krill Trap	-	-	-	-	-	-	-	-	-	-	-	1
10	Ledyard Bay SPEI Critical Habitat Area	-	-	-	-	8	4	-	9	-	27	-	-
15	Cape Lisburne Seabird Colony Area	-	-	-	-	2	-	-	8	-	1	-	-
16	Barrow Canyon	-	-	-	-	-	1	-	-	-	-	1	6
18	Murre Rearing and Molting Area	-	-	-	-	-	-	-	1	-	-	-	-
19	Chukchi Spring Lead System	-	-	-	-	3	4	-	3	-	14	-	10
23	Polar Bear Offshore	-	1	-	-	39	16	-	38	1	43	-	3
38	SUA: Pt. Hope - Cape Lisburne	-	-	-	-	-	-	-	3	-	-	-	-
39	SUA: Pt. Lay - Kasegaluk	-	-	-	-	1	1	-	-	-	23	-	-
40	SUA: Icy Cape - Wainwright	-	-	-	-	1	10	-	-	1	12	1	57
41	SUA: Barrow - Chukchi	-	-	-	-	-	-	-	-	-	-	-	1
42	SUA: Barrow - East Arch	-	-	-	-	-	-	-	-	-	-	-	1
47	Hanna Shoal Walrus Use Area	-	-	2	31	-	13	-	-	2	-	51	19
48	Chukchi Lead System 4	-	-	-	-	6	9	-	7	-	29	-	22
49	Chukchi Spring Lead 1	-	-	-	-	1	-	-	3	-	-	-	-
50	Pt Lay Walrus Offshore	-	-	-	-	12	5	-	11	-	24	-	2
51	Pt Lay Walrus Nearshore	-	-	-	-	1	1	-	1	-	17	-	-
53	Chukchi Spring Lead 2	-	-	-	-	10	6	-	11	-	19	-	1
54	Chukchi Spring Lead 3	-	-	-	-	-	4	-	-	-	2	-	17
56	Hanna Shoal Area	-	-	-	9	-	3	-	-	-	-	19	5
57	Skull Cliffs	-	-	-	-	-	1	-	-	-	-	-	7
61	Pt Lay-Barrow BH GW SSF	-	-	1	2	2	13	-	-	3	15	7	34
62	Herald Shoal Polynya 2	-	3	-	-	-	-	2	-	-	-	-	-
64	Peard Bay Area	-	-	-	-	-	1	-	-	-	-	1	8
70	North Central Chukchi	2	-	-	-	-	-	-	-	-	-	-	-
102	Opilio Crab EFH	-	-	-	-	1	-	-	2	-	-	-	-
103	Saffron Cod EFH	-	-	-	-	4	8	-	13	1	29	2	44
108	Barrow Feeding Aggregation	-	-	-	-	-	-	-	-	-	-	-	1
119	AK BFT Outer Shelf&Slope 10	-	-	-	-	-	-	-	-	-	-	-	1
121	C Lisburne - Pt Hope	Of-	-	-	-	1	-	-	4	-	-	-	-
123	AK Chukchi Offshore	3	4	5	2	-	-	1	-	3	-	1	-
124	Central Chukchi Offshore	-	2	-	-	-	-	2	-	-	-	-	-

Table A.2-2. 10 Days-(Annual ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	2	4	3	1	9	10	3	11	4	22	3	18
1	Kasegaluk Lagoon Area	-	1	-	-	2	1	-	2	-	7	-	-
6	Hanna Shoal	1	-	3	16	1	5	-	-	3	1	26	4
7	Krill Trap	-	-	-	1	-	1	-	-	1	1	1	3
10	Ledyard Bay SPEI Critical Habitat Area	-	1	1	-	11	5	1	13	1	29	-	2

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
11	Wrangel Island 12 nm & Offshore	1	1	-	-	-	-	1	-	-	-	-	-
15	Cape Lisburne Seabird Colony Area	-	-	-	-	5	1	-	10	-	4	-	-
16	Barrow Canyon	-	1	2	2	2	7	1	1	3	4	5	16
18	Murre Rearing and Molting Area	-	3	1	-	5	1	2	7	1	2	-	-
19	Chukchi Spring Lead System	-	-	-	-	6	7	-	6	1	17	1	13
20	East Chukchi Offshore	-	-	-	-	-	-	-	-	-	-	1	1
23	Polar Bear Offshore	-	4	3	1	45	23	3	45	7	50	2	11
30	Beaufort Spring Lead 1	-	-	-	-	-	1	-	-	-	-	-	2
31	Beaufort Spring Lead 2	-	-	-	-	-	-	-	-	-	-	-	1
38	SUA: Pt. Hope - Cape Lisburne	-	-	-	-	2	-	-	5	-	3	-	-
39	SUA: Pt. Lay - Kasegaluk	-	1	-	-	4	3	1	4	1	27	-	2
40	SUA: Icy Cape - Wainwright	1	3	4	2	10	21	3	6	8	26	5	61
41	SUA: Barrow - Chukchi	-	-	-	-	-	1	-	-	-	-	-	2
42	SUA: Barrow - East Arch	-	-	1	1	-	2	-	-	1	1	2	3
43	SUA: Nuiqsut - Cross Island	-	-	-	-	-	-	-	-	-	-	1	1
46	Wrangel Island 12 nmi Buffer 2	1	-	-	-	-	-	-	-	-	-	-	-
47	Hanna Shoal Walrus Use Area	5	3	9	35	3	19	3	1	10	4	51	25
48	Chukchi Lead System 4	-	1	2	2	11	16	1	11	4	34	5	29
49	Chukchi Spring Lead 1	-	-	-	-	3	1	-	4	-	2	-	-
50	Pt Lay Walrus Offshore	-	2	2	-	17	8	2	16	2	28	-	4
51	Pt Lay Walrus Nearshore	-	1	-	-	4	1	-	4	-	19	-	-
52	Russian Coast Walrus Offshore	-	3	1	-	5	1	2	7	1	3	-	1
53	Chukchi Spring Lead 2	-	-	-	-	12	7	-	13	1	21	-	4
54	Chukchi Spring Lead 3	-	-	1	1	2	7	-	1	2	6	2	19
56	Hanna Shoal Area	2	1	3	12	1	5	1	-	3	1	20	8
57	Skull Cliffs	-	1	1	1	1	4	1	1	2	4	1	11
58	Russian Coast Walrus Nearshore	-	-	-	-	1	-	-	2	-	1	-	-
61	Pt Lay-Barrow BH GW SSF	2	4	6	6	9	18	4	6	9	20	11	35
62	Herald Shoal Polynya 2	2	7	4	1	1	2	7	1	4	1	1	1
63	North Chukchi	1	-	-	-	-	-	-	-	-	-	-	-
64	Peard Bay Area	-	1	2	2	2	6	1	1	3	4	3	13
66	Herald Island	1	-	-	-	-	-	-	-	-	-	-	-
70	North Central Chukchi	3	-	-	1	-	-	-	-	-	-	-	-
74	Offshore Herald Island	2	1	1	1	-	-	1	-	1	-	-	-
82	N Chukotka Nrshr 2	-	1	-	-	-	-	-	-	-	-	-	-
83	N Chukotka Nrshr 3	-	1	-	-	1	-	1	1	-	-	-	-
91	Hope Sea Valley	1	2	1	-	1	-	1	1	1	-	-	-
102	Opilio Crab EFH	-	-	-	-	5	1	-	7	-	3	-	1
103	Saffron Cod EFH	1	4	6	4	22	25	4	28	10	47	10	55
107	Pt Hope Offshore	-	-	-	-	1	-	-	2	-	-	-	-
108	Barrow Feeding Aggregation	-	-	1	1	-	1	-	-	1	1	2	3
116	AK BFT Outer Shelf&Slope 7	-	-	-	-	-	-	-	-	-	-	1	1
117	AK BFT Outer Shelf&Slope 8	-	-	-	-	-	1	-	-	-	-	1	1
118	AK BFT Outer Shelf&Slope 9	-	-	-	1	-	1	-	-	-	-	1	2
119	AK BFT Outer Shelf&Slope 10	-	-	1	2	-	3	-	-	1	1	4	6
120	Russia CH GW Fall 1&2	-	1	-	-	1	-	1	2	-	1	-	-
121	C Lisburne - Pt Hope	-	-	-	-	2	-	-	6	-	2	-	-
123	AK Chukchi Offshore	4	5	8	5	1	2	2	1	5	-	4	1
124	Central Chukchi Offshore	2	5	3	1	1	1	5	1	3	1	1	1

Table A.2-3. 30 Days-(Annual ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	17	30	24	17	38	32	28	42	27	47	19	36
1	Kasegaluk Lagoon Area	-	1	1	-	4	2	1	4	1	9	-	1
2	Point Barrow, Plover Islands	-	-	-	1	-	-	-	-	-	-	1	1
3	SUA: Uelen/Russia	-	1	1	-	2	1	1	2	1	1	-	-
4	SUA:Naukan/Russia	-	-	-	-	2	1	-	3	-	1	-	1
6	Hanna Shoal	4	3	7	20	3	9	3	2	7	3	30	9
7	Krill Trap	1	1	1	2	2	3	1	1	2	2	3	4
10	Ledyard Bay SPEI Critical Habitat Area	1	3	2	1	14	7	3	16	2	30	1	3
11	Wrangel Island 12 nm & Offshore	5	4	4	3	2	1	4	2	3	1	2	1
14	Cape Thompson Seabird Colony Area	-	-	-	-	1	-	-	1	-	-	-	-
15	Cape Lisburne Seabird Colony Area	-	1	1	-	6	2	1	12	1	5	-	1
16	Barrow Canyon	2	4	5	5	7	12	4	5	7	8	9	20
18	Murre Rearing and Molting Area	2	7	4	2	11	5	5	14	4	7	2	3
19	Chukchi Spring Lead System	-	1	1	1	8	9	1	8	3	19	3	16
20	East Chukchi Offshore	-	-	-	1	-	1	-	-	-	-	1	1
23	Polar Bear Offshore	2	7	7	4	47	28	6	47	11	52	8	18

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
30	Beaufort Spring Lead 1	-	-	-	-	1	2	-	1	1	1	1	4
31	Beaufort Spring Lead 2	-	-	-	-	-	1	-	-	-	1	-	2
38	SUA: Pt. Hope - Cape Lisburne	-	1	1	-	4	2	1	6	1	5	-	1
39	SUA: Pt. Lay - Kasegaluk	-	2	2	1	7	5	2	6	2	29	1	4
40	SUA: Icy Cape - Wainwright	4	8	9	6	18	26	8	14	13	32	10	64
41	SUA: Barrow - Chukchi	-	-	-	-	1	1	-	-	-	1	1	3
42	SUA: Barrow - East Arch	1	1	2	3	1	3	1	1	2	2	4	4
43	SUA: Nuiqsut - Cross Island	-	-	1	1	1	1	-	-	1	-	2	2
46	Wrangel Island 12 nmi Buffer 2	5	2	2	2	1	1	3	-	2	-	2	1
47	Hanna Shoal Walrus Use Area	11	10	16	38	9	24	10	6	17	9	52	30
48	Chukchi Lead System 4	2	3	5	5	14	20	3	13	7	36	10	32
49	Chukchi Spring Lead 1	-	-	-	-	4	2	-	6	-	4	-	1
50	Pt Lay Walrus Offshore	1	5	4	1	19	10	4	19	5	30	2	5
51	Pt Lay Walrus Nearshore	-	1	1	-	5	2	1	6	1	19	-	1
52	Russian Coast Walrus Offshore	3	9	5	2	13	6	7	16	6	9	2	4
53	Chukchi Spring Lead 2	-	1	1	-	14	9	1	15	2	22	1	5
54	Chukchi Spring Lead 3	-	2	2	2	6	10	1	4	4	9	4	21
55	Point Barrow, Plover Islands	-	-	-	1	-	1	-	-	-	-	1	1
56	Hanna Shoal Area	5	3	5	13	3	7	3	2	5	3	21	10
57	Skull Cliffs	1	2	2	2	4	6	2	3	4	6	3	14
58	Russian Coast Walrus Nearshore	1	2	2	1	5	2	2	7	1	3	1	1
59	Ostrov Kolyuchin	-	1	1	-	1	1	1	1	1	1	-	-
61	Pt Lay-Barrow BH GW SSF	6	9	11	9	15	22	9	12	14	24	15	36
62	Herald Shoal Polynya 2	4	11	8	5	4	5	11	4	7	3	4	4
63	North Chukchi	3	-	1	1	-	-	1	-	1	-	-	-
64	Peard Bay Area	2	3	4	3	6	9	4	4	6	8	6	16
66	Herald Island	2	1	1	1	1	1	1	1	1	-	1	-
70	North Central Chukchi	3	-	1	2	-	1	-	-	1	-	1	1
74	Offshore Herald Island	4	2	3	3	1	2	3	1	3	1	3	1
80	Beaufort Outer Shelf 1	-	-	-	1	-	1	-	-	1	-	1	1
82	N Chukotka Nrshr 2	2	4	2	1	3	2	3	3	2	2	1	1
83	N Chukotka Nrshr 3	1	3	2	1	4	2	3	5	2	2	1	1
91	Hope Sea Valley	3	4	3	2	3	2	4	3	4	2	2	2
101	Beaufort Outer Shelf 2	-	-	-	-	-	1	-	-	-	-	1	1
102	Opilio Crab EFH	1	3	2	1	9	4	2	12	2	8	1	3
103	Saffron Cod EFH	6	14	15	12	37	37	14	41	21	58	19	62
107	Pt Hope Offshore	-	-	-	-	2	1	-	3	-	1	-	-
108	Barrow Feeding Aggregation	1	1	1	2	1	2	1	-	1	1	3	4
113	AK BFT Outer Shelf&Slope 4	-	-	-	-	-	-	-	-	-	-	1	1
114	AK BFT Outer Shelf&Slope 5	-	-	-	1	-	-	-	-	-	-	1	1
115	AK BFT Outer Shelf&Slope 6	1	-	1	1	-	1	-	-	1	-	1	1
116	AK BFT Outer Shelf&Slope 7	1	-	1	1	-	1	-	-	1	-	2	2
117	AK BFT Outer Shelf&Slope 8	1	1	1	2	1	2	1	-	1	1	3	3
118	AK BFT Outer Shelf&Slope 9	1	1	1	2	1	2	1	1	1	1	3	3
119	AK BFT Outer Shelf&Slope 10	2	2	3	4	3	6	2	2	4	4	7	9
120	Russia CH GW Fall 1&2	1	3	2	1	4	2	2	5	2	2	1	1
121	C Lisburne - Pt Hope	-	1	-	-	3	1	1	7	-	2	-	-
122	North Chukotka Offshore	2	2	2	1	1	1	2	1	2	1	1	1
123	AK Chukchi Offshore	5	5	9	7	2	3	3	2	6	1	6	3
124	Central Chukchi Offshore	4	7	5	4	3	4	7	3	5	3	4	2

Table A.2-4. 60 Days-(Annual ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	28	45	39	29	52	45	43	54	41	59	32	47
1	Kasegaluk Lagoon Area	-	1	1	-	4	2	1	4	1	9	-	1
2	Point Barrow, Plover Islands	-	-	-	1	-	-	-	-	-	-	1	1
3	SUA: Uelen/Russia	1	1	1	-	2	1	1	2	1	1	-	-
4	SUA:Naukan/Russia	-	1	1	-	3	1	1	4	1	2	-	1
6	Hanna Shoal	6	5	8	21	4	10	5	3	8	4	31	11
7	Krill Trap	1	1	2	2	2	3	1	1	2	2	3	5
10	Ledyard Bay SPEI Critical Habitat Area	1	3	2	1	14	7	3	16	3	30	1	3
11	Wrangel Island 12 nm & Offshore	6	5	4	4	2	2	5	2	4	1	3	1
14	Cape Thompson Seabird Colony Area	-	-	-	-	1	-	-	1	-	-	-	-
15	Cape Lisburne Seabird Colony Area	-	1	1	-	7	2	1	12	1	6	-	1
16	Barrow Canyon	3	5	6	6	8	13	5	6	8	10	9	21
18	Murre Rearing and Molting Area	2	7	5	3	12	6	6	15	5	8	3	4
19	Chukchi Spring Lead System	-	1	2	1	9	10	1	9	3	20	3	16
20	East Chukchi Offshore	1	-	-	1	-	1	-	-	-	-	2	2

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
23	Polar Bear Offshore	3	9	8	5	47	28	8	47	12	52	9	19
29	AK BFT Bowhead FM 8	-	-	-	-	-	-	-	-	-	-	-	1
30	Beaufort Spring Lead 1	-	-	1	-	1	2	-	1	1	2	1	4
31	Beaufort Spring Lead 2	-	-	-	-	1	1	-	-	-	1	-	2
32	Beaufort Spring Lead 3	-	-	-	-	-	-	-	-	-	-	-	1
38	SUA: Pt. Hope - Cape Lisburne	-	1	1	1	4	2	1	7	1	5	-	1
39	SUA: Pt. Lay - Kasegaluk	1	2	2	1	7	5	2	7	2	29	2	4
40	SUA: Icy Cape - Wainwright	4	9	11	7	20	28	9	15	15	34	11	64
41	SUA: Barrow - Chukchi	-	-	-	-	1	1	-	1	1	1	1	3
42	SUA: Barrow - East Arch	2	2	2	3	2	3	2	1	2	2	4	4
43	SUA: Nuiqsut - Cross Island	1	1	1	1	1	1	1	-	1	1	2	2
46	Wrangel Island 12 nmi Buffer 2	8	5	5	5	2	3	6	2	4	2	4	2
47	Hanna Shoal Walrus Use Area	13	13	18	39	12	26	13	9	19	12	53	32
48	Chukchi Lead System 4	2	4	6	7	15	21	4	14	9	37	11	33
49	Chukchi Spring Lead 1	-	1	1	-	5	2	-	6	1	4	1	2
50	Pt Lay Walrus Offshore	1	5	4	1	20	11	5	19	5	30	2	6
51	Pt Lay Walrus Nearshore	-	1	1	-	5	2	1	6	1	20	-	1
52	Russian Coast Walrus Offshore	3	10	6	3	14	7	8	18	6	10	3	5
53	Chukchi Spring Lead 2	-	1	1	1	14	9	1	15	2	22	2	6
54	Chukchi Spring Lead 3	-	2	3	2	7	11	2	5	5	10	5	22
55	Point Barrow, Plover Islands	-	-	-	1	-	1	-	-	-	-	1	1
56	Hanna Shoal Area	6	4	6	14	3	8	4	2	6	3	22	10
57	Skull Cliffs	1	2	3	2	4	7	2	3	4	6	3	15
58	Russian Coast Walrus Nearshore	1	3	2	1	5	2	2	7	2	4	1	1
59	Ostrov Kolyuchin	-	1	1	-	1	1	1	1	1	1	-	-
61	Pt Lay-Barrow BH GW SSF	7	11	12	10	17	23	11	14	15	25	15	36
62	Herald Shoal Polynya 2	5	12	9	6	6	6	12	4	9	5	6	5
63	North Chukchi	3	1	1	1	-	-	1	-	1	-	1	-
64	Peard Bay Area	2	4	5	4	7	10	4	5	7	8	6	16
66	Herald Island	2	1	1	2	1	1	1	1	1	1	1	1
70	North Central Chukchi	3	-	1	2	-	1	-	-	1	-	1	1
74	Offshore Herald Island	5	2	3	3	1	2	3	1	3	1	3	1
80	Beaufort Outer Shelf 1	-	-	1	1	-	1	-	-	1	-	1	2
82	N Chukotka Nrshr 2	2	4	2	1	3	2	3	4	2	2	1	1
83	N Chukotka Nrshr 3	1	4	2	1	4	2	3	5	2	2	1	1
91	Hope Sea Valley	3	4	4	3	3	3	4	3	4	2	3	2
101	Beaufort Outer Shelf 2	-	-	-	1	-	1	-	-	-	-	1	1
102	Opilio Crab EFH	1	3	3	1	10	5	3	13	3	9	2	3
103	Saffron Cod EFH	8	17	18	14	40	40	16	43	23	60	21	63
107	Pt Hope Offshore	-	1	-	-	2	1	-	3	-	1	-	-
108	Barrow Feeding Aggregation	2	1	2	3	1	2	1	-	2	1	3	4
111	AK BFT Outer Shelf&Slope 2	-	-	-	-	-	-	-	-	-	-	1	1
112	AK BFT Outer Shelf&Slope 3	-	-	-	-	-	1	-	-	-	-	1	1
113	AK BFT Outer Shelf&Slope 4	-	-	1	1	-	1	-	-	1	-	1	1
114	AK BFT Outer Shelf&Slope 5	1	-	1	1	-	1	-	-	1	-	1	1
115	AK BFT Outer Shelf&Slope 6	1	1	1	1	-	1	1	-	1	1	2	2
116	AK BFT Outer Shelf&Slope 7	1	1	1	2	1	2	1	-	1	1	2	3
117	AK BFT Outer Shelf&Slope 8	2	1	2	2	1	2	1	1	2	1	3	3
118	AK BFT Outer Shelf&Slope 9	2	1	2	3	2	3	1	1	2	2	4	4
119	AK BFT Outer Shelf&Slope 10	3	3	4	5	4	7	3	4	5	5	7	10
120	Russia CH GW Fall 1&2	1	3	2	1	4	2	2	5	2	2	1	1
121	C Lisburne - Pt Hope	-	1	-	-	4	1	1	8	1	3	-	1
122	North Chukotka Offshore	2	2	2	2	1	1	2	1	2	1	1	1
123	AK Chukchi Offshore	5	5	9	8	2	4	3	2	7	2	7	3
124	Central Chukchi Offshore	4	7	5	4	3	4	7	3	5	3	4	3

Table A.2-5. 180 Days-(Annual ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	35	52	46	37	58	52	50	60	49	63	40	54
1	Kasegaluk Lagoon Area	-	1	1	-	4	2	1	4	1	9	-	1
2	Point Barrow, Plover Islands	-	-	1	1	-	1	-	-	-	-	1	1
3	SUA: Uelen/Russia	1	2	1	1	2	1	2	2	1	1	1	-
4	SUA:Naukan/Russia	-	1	1	1	3	2	1	4	1	2	1	1
6	Hanna Shoal	6	7	10	22	6	12	7	4	10	6	32	12
7	Krill Trap	1	2	2	2	2	3	2	2	2	3	3	5
10	Ledyard Bay SPEI Critical Habitat Area	1	3	2	1	14	7	3	16	3	30	1	3
11	Wrangel Island 12 nm & Offshore	6	7	6	5	4	4	7	4	5	3	4	3
14	Cape Thompson Seabird Colony Area	-	-	-	-	1	-	-	1	-	-	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
15	Cape Lisburne Seabird Colony Area	-	1	1	-	7	2	1	12	1	6	1	1
16	Barrow Canyon	3	5	7	6	9	13	6	7	9	10	10	22
18	Murre Rearing and Molting Area	3	8	6	3	13	7	7	16	6	9	4	4
19	Chukchi Spring Lead System	-	2	2	2	10	10	1	10	4	20	3	16
20	East Chukchi Offshore	1	-	1	2	-	1	-	-	1	1	2	2
23	Polar Bear Offshore	3	9	8	5	47	29	8	47	12	53	9	19
29	AK BFT Bowhead FM 8	-	-	-	-	-	-	-	-	-	-	1	1
30	Beaufort Spring Lead 1	-	-	1	1	2	3	-	1	1	2	1	4
31	Beaufort Spring Lead 2	-	-	-	-	1	1	-	1	-	1	1	2
32	Beaufort Spring Lead 3	-	-	-	-	-	-	-	-	-	-	-	1
38	SUA: Pt. Hope - Cape Lisburne	-	1	1	1	4	2	1	7	1	5	-	1
39	SUA: Pt. Lay - Kasegaluk	1	2	2	1	7	5	2	7	2	29	2	4
40	SUA: Icy Cape - Wainwright	5	10	11	8	20	28	10	16	15	35	12	65
41	SUA: Barrow - Chukchi	-	-	-	-	1	2	-	1	1	1	1	3
42	SUA: Barrow - East Arch	2	3	3	4	3	4	3	2	3	3	5	5
43	SUA: Nuiqsut - Cross Island	1	1	1	1	1	2	1	1	2	1	2	2
44	SUA: Kaktovik	-	-	-	-	-	-	-	-	-	-	1	1
46	Wrangel Island 12 nmi Buffer 2	9	6	6	7	3	4	6	2	6	2	5	3
47	Hanna Shoal Walrus Use Area	14	15	20	40	14	28	15	11	22	14	55	34
48	Chukchi Lead System 4	3	4	6	7	15	21	4	14	9	37	11	33
49	Chukchi Spring Lead 1	-	1	1	1	5	2	-	6	1	4	1	2
50	Pt Lay Walrus Offshore	2	5	4	2	20	11	5	20	5	30	2	6
51	Pt Lay Walrus Nearshore	-	2	1	-	5	2	1	6	1	20	-	1
52	Russian Coast Walrus Offshore	4	10	7	4	15	8	9	18	7	10	4	5
53	Chukchi Spring Lead 2	-	1	1	1	14	9	1	15	2	23	2	6
54	Chukchi Spring Lead 3	-	3	3	2	7	11	2	6	5	11	5	22
55	Point Barrow, Plover Islands	-	-	1	1	-	1	-	-	1	1	2	2
56	Hanna Shoal Area	6	6	8	15	5	9	6	4	8	5	24	12
57	Skull Cliffs	2	2	3	2	4	7	2	3	4	6	4	15
58	Russian Coast Walrus Nearshore	1	3	2	1	6	3	3	7	3	4	1	1
59	Ostrov Kolyuchin	-	1	1	-	1	1	1	1	1	1	-	-
61	Pt Lay-Barrow BH GW SSF	7	12	13	10	18	24	12	15	16	26	16	37
62	Herald Shoal Polynya 2	6	12	10	7	6	7	12	5	9	5	6	6
63	North Chukchi	3	1	1	2	-	1	1	-	1	-	1	1
64	Peard Bay Area	3	5	5	4	7	10	5	6	7	9	6	16
66	Herald Island	2	2	2	2	1	1	2	1	2	1	2	1
70	North Central Chukchi	4	1	1	3	1	1	1	1	1	1	2	1
74	Offshore Herald Island	5	3	3	4	1	2	3	1	3	1	3	2
80	Beaufort Outer Shelf 1	1	1	1	1	1	1	1	1	1	1	2	2
82	N Chukotka Nrshr 2	2	4	2	1	3	2	4	4	2	2	1	1
83	N Chukotka Nrshr 3	2	4	3	2	4	2	3	5	3	3	1	1
91	Hope Sea Valley	3	4	4	3	3	3	4	3	4	2	3	2
101	Beaufort Outer Shelf 2	1	1	1	1	1	1	1	-	1	1	1	1
102	Opilio Crab EFH	1	3	3	1	10	5	3	13	3	9	2	4
103	Saffron Cod EFH	9	18	19	15	41	41	17	44	24	61	23	64
107	Pt Hope Offshore	-	1	-	-	2	1	-	3	-	1	-	-
108	Barrow Feeding Aggregation	2	1	2	3	1	3	1	1	2	1	4	4
110	AK BFT Outer Shelf&Slope 1	-	-	-	-	-	1	-	-	1	1	1	1
111	AK BFT Outer Shelf&Slope 2	1	1	1	1	1	1	1	-	1	1	1	1
112	AK BFT Outer Shelf&Slope 3	1	1	1	1	1	1	1	1	1	1	1	1
113	AK BFT Outer Shelf&Slope 4	1	1	1	1	1	1	1	1	1	1	1	1
114	AK BFT Outer Shelf&Slope 5	1	1	1	1	1	1	1	1	1	1	1	1
115	AK BFT Outer Shelf&Slope 6	1	1	1	1	1	2	1	1	2	1	2	2
116	AK BFT Outer Shelf&Slope 7	1	2	2	2	1	2	2	1	2	1	3	3
117	AK BFT Outer Shelf&Slope 8	2	2	2	3	2	3	2	2	3	2	4	4
118	AK BFT Outer Shelf&Slope 9	2	2	3	3	3	4	2	2	3	3	4	5
119	AK BFT Outer Shelf&Slope 10	4	5	5	5	6	8	5	5	6	6	8	10
120	Russia CH GW Fall 1&2	1	3	2	1	4	2	3	5	2	3	1	1
121	C Lisburne - Pt Hope	-	1	1	-	4	1	1	8	1	3	-	1
122	North Chukotka Offshore	2	2	2	2	1	1	3	1	2	1	1	1
123	AK Chukchi Offshore	5	5	9	8	2	4	3	2	7	2	7	3
124	Central Chukchi Offshore	4	7	6	4	3	4	7	3	5	3	4	3

Table A.2-6. 360 Days-(Annual ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	35	52	46	37	58	52	51	60	49	64	40	54
1	Kasegaluk Lagoon Area	-	1	1	-	4	2	1	4	1	9	-	1
2	Point Barrow, Plover Islands	-	-	1	1	-	1	-	-	-	-	1	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
3	SUA: Uelen/Russia	1	2	1	1	2	1	2	2	1	1	1	-
4	SUA:Naukan/Russia	-	1	1	1	3	2	1	4	1	2	1	1
6	Hanna Shoal	6	7	10	22	6	12	7	5	10	6	33	12
7	Krill Trap	1	2	2	2	2	3	2	2	2	3	3	5
10	Ledyard Bay SPEI Critical Habitat Area	1	3	2	1	14	7	3	16	3	30	1	3
11	Wrangel Island 12 nm & Offshore	6	7	6	5	4	4	7	4	5	3	4	3
14	Cape Thompson Seabird Colony Area	-	-	-	-	1	-	-	1	-	-	-	-
15	Cape Lisburne Seabird Colony Area	-	1	1	-	7	2	1	12	1	6	1	1
16	Barrow Canyon	3	5	7	6	9	13	6	7	9	10	10	22
18	Murre Rearing and Molting Area	3	8	6	3	13	7	7	16	6	9	4	4
19	Chukchi Spring Lead System	-	2	2	2	10	10	1	10	4	20	3	16
20	East Chukchi Offshore	1	-	1	2	-	1	-	-	1	1	2	3
23	Polar Bear Offshore	3	9	8	5	47	29	8	47	12	53	9	19
29	AK BFT Bowhead FM 8	-	-	-	-	-	-	-	-	-	-	1	1
30	Beaufort Spring Lead 1	-	-	1	1	2	3	-	1	1	2	1	4
31	Beaufort Spring Lead 2	-	-	-	-	1	1	-	1	-	1	1	2
32	Beaufort Spring Lead 3	-	-	-	-	-	-	-	-	-	-	-	1
38	SUA: Pt. Hope - Cape Lisburne	-	1	1	1	4	2	1	7	1	5	-	1
39	SUA: Pt. Lay - Kasegaluk	1	2	2	1	7	5	2	7	2	29	2	4
40	SUA: Icy Cape - Wainwright	5	10	11	8	20	28	10	16	15	35	12	65
41	SUA: Barrow - Chukchi	-	-	-	-	1	2	-	1	1	1	1	3
42	SUA: Barrow - East Arch	2	3	3	4	3	4	3	2	3	3	5	5
43	SUA: Nuiqsut - Cross Island	1	1	1	1	1	2	1	1	2	1	2	2
44	SUA: Kaktovik	-	-	-	-	-	1	-	-	-	-	1	1
46	Wrangel Island 12 nmi Buffer 2	9	6	6	7	3	4	7	2	6	2	5	3
47	Hanna Shoal Walrus Use Area	14	15	20	40	14	28	15	11	22	14	55	34
48	Chukchi Lead System 4	3	4	6	7	15	21	4	14	9	37	11	33
49	Chukchi Spring Lead 1	-	1	1	1	5	2	-	6	1	4	1	2
50	Pt Lay Walrus Offshore	2	5	4	2	20	11	5	20	5	30	2	6
51	Pt Lay Walrus Nearshore	-	2	1	-	5	2	1	6	1	20	-	1
52	Russian Coast Walrus Offshore	4	10	7	4	15	8	9	18	7	10	4	5
53	Chukchi Spring Lead 2	-	1	1	1	14	9	1	15	2	23	2	6
54	Chukchi Spring Lead 3	-	3	3	2	7	11	2	6	5	11	5	22
55	Point Barrow, Plover Islands	-	-	1	1	-	1	-	-	1	1	2	2
56	Hanna Shoal Area	6	6	8	15	5	9	6	4	8	5	24	12
57	Skull Cliffs	2	2	3	2	4	7	2	3	4	6	4	15
58	Russian Coast Walrus Nearshore	1	3	2	1	6	3	3	7	3	4	1	1
59	Ostrov Kolyuchin	-	1	1	-	1	1	1	1	1	1	-	-
61	Pt Lay-Barrow BH GW SSF	7	12	13	10	18	24	12	15	16	26	16	37
62	Herald Shoal Polynya 2	6	12	10	7	a 7	7	12	5	9	5	6	6
63	North Chukchi	3	1	1	2	-	1	1	-	1	-	1	1
64	Peard Bay Area	3	5	5	4	7	10	5	6	7	9	6	16
66	Herald Island	2	2	2	2	1	1	2	1	2	1	2	1
70	North Central Chukchi	4	1	1	3	1	1	1	1	1	1	2	1
74	Offshore Herald Island	5	3	3	4	1	2	3	1	3	1	3	2
80	Beaufort Outer Shelf 1	1	1	1	1	1	1	1	1	1	1	2	2
82	N Chukotka Nrshr 2	2	4	2	1	3	2	4	4	2	2	1	1
83	N Chukotka Nrshr 3	2	4	3	2	4	2	3	5	3	3	1	1
91	Hope Sea Valley	3	4	4	3	3	3	4	3	4	2	3	2
101	Beaufort Outer Shelf 2	1	1	1	1	1	1	1	-	1	1	1	1
102	Opilio Crab EFH	1	3	3	1	10	5	3	13	3	9	2	4
103	Saffron Cod EFH	9	18	19	15	41	41	17	44	24	61	23	64
107	Pt Hope Offshore	-	1	-	-	2	1	-	3	-	1	-	-
108	Barrow Feeding Aggregation	2	1	2	3	1	3	1	1	2	1	4	4
110	AK BFT Outer Shelf&Slope 1	-	-	-	-	-	1	-	-	1	1	1	1
111	AK BFT Outer Shelf&Slope 2	1	1	1	1	1	1	1	-	1	1	1	1
112	AK BFT Outer Shelf&Slope 3	1	1	1	1	1	1	1	1	1	1	1	1
113	AK BFT Outer Shelf&Slope 4	1	1	1	1	1	1	1	1	1	1	1	1
114	AK BFT Outer Shelf&Slope 5	1	1	1	1	1	1	1	1	1	1	1	1
115	AK BFT Outer Shelf&Slope 6	1	1	1	1	1	2	1	1	2	1	2	2
116	AK BFT Outer Shelf&Slope 7	1	2	2	2	1	2	2	1	2	1	3	3
117	AK BFT Outer Shelf&Slope 8	2	2	2	3	2	3	2	2	3	2	4	4
118	AK BFT Outer Shelf&Slope 9	2	2	3	3	3	4	2	2	3	3	4	5
119	AK BFT Outer Shelf&Slope 10	4	5	5	5	6	8	5	5	6	6	8	10
120	Russia CH GW Fall 1&2	1	3	2	1	4	2	3	5	2	3	1	1
121	C Lisburne - Pt Hope	-	1	1	-	4	1	1	8	1	3	-	1
122	North Chukotka Offshore	2	2	2	2	1	1	3	1	2	1	1	1
123	AK Chukchi Offshore	5	5	9	8	2	4	3	2	7	2	7	3
124	Central Chukchi Offshore	4	7	6	4	3	4	7	3	5	3	4	3

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Tables A.2-7 through A.2-12 represent annual conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain land segment:

Table A.2-7. 3 Days-(Annual LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
65	Buckland, Cape Lisburne	-	-	-	-	-	-	-	1	-	-	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	-	-	-	-	-	2	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	-	-	-	-	-	2	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	-	-	-	-	-	1	-	-
75	Akeonik, Icy Cape	-	-	-	-	-	-	-	-	-	1	-	-
79	Point Belcher, Wainwright	-	-	-	-	-	-	-	-	-	-	-	2
80	Eluksingiak Point, Kugrua Bay	-	-	-	-	-	-	-	-	-	-	-	2
84	Will Rogers & Wiley Post Mem.	-	-	-	-	-	-	-	-	-	-	-	1
85	Barrow, Browerville, Elson Lag.	-	-	-	-	-	-	-	-	-	-	-	1

Table A.2-8. 10 Days-(Annual LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
64	Kukpuk River, Point Hope	-	-	-	-	-	-	-	1	-	-	-	-
65	Buckland, Cape Lisburne	-	-	-	-	1	-	-	2	-	1	-	-
66	Ayugatak Lagoon	-	-	-	-	-	-	-	1	-	1	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	-	-	-	-	-	3	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	-	-	-	-	-	2	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	1	-	-	-	-	2	-	-
75	Akeonik, Icy Cape	-	-	-	-	1	1	-	-	-	2	-	-
76	Avak Inlet, Tunalik River	-	-	-	-	-	-	-	-	-	1	-	1
77	Nivat Point, Nokotlek Point	-	-	-	-	-	-	-	-	-	1	-	-
78	Point Collie, Sigeakruk Point	-	-	-	-	-	1	-	-	-	1	-	1
79	Point Belcher, Wainwright	-	-	-	-	1	2	-	-	1	2	-	3
80	Eluksingiak Point, Kugrua Bay	-	-	-	-	-	1	-	-	-	1	-	3
81	Peard Bay, Point Franklin	-	-	-	-	-	-	-	-	-	-	-	1
82	Skull Cliff	-	-	-	-	-	-	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	-	-	-	-	-	-	-	1
84	Will Rogers & Wiley Post Mem.	-	-	-	-	-	1	-	-	-	1	1	3
85	Barrow, Browerville, Elson Lag.	-	-	1	1	1	2	-	-	1	1	1	4

Table A.2-9. 30 Days-(Annual LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
5	Mys Evans	1	-	-	-	-	-	-	-	-	-	-	-
6	Ostrov Mushtakova	1	1	1	1	-	-	1	-	-	-	-	-
7	Kosa Bruch	1	1	1	1	-	-	1	-	1	-	1	-
8	E. Wrangel Island, Skeletov	1	1	1	1	-	-	1	-	1	-	1	-
20	Polyarnyy, Pil'gyn	-	-	-	-	-	-	1	-	-	-	-	-
21	Laguna Pil'khikay, Pil'khikay	-	1	-	-	-	-	1	-	1	-	-	-
22	Rypkarpyy, Mys Shmidta	1	1	1	-	-	-	1	-	1	-	-	-
23	Emuem, Tenkergin	-	1	1	-	-	-	1	-	1	-	-	-
24	LS 24	1	1	1	-	1	-	1	1	1	-	-	-
25	Laguna Amguema, Yulinu	1	1	1	-	1	1	1	1	1	-	-	-
26	Ekugvaam, Kepin, Pil'khin	1	1	1	1	1	1	1	1	1	1	-	-
27	Laguna Nut, Rigol'	1	1	1	1	1	1	1	1	1	1	1	1
28	Vankarem,Vankarem Laguna	1	2	1	1	1	1	1	1	1	1	1	1
29	Mys Onman, Vel'may	-	1	1	1	1	1	1	1	1	1	1	1
30	Nutepynmin, Pyngopil'gyn	1	2	1	1	2	1	1	2	1	1	1	1
31	Alyatki, Zaliv Tasytkhin	1	2	1	1	2	1	2	3	1	2	1	1
32	Mys Dzhenretlen, Eynenekvyk	-	1	1	-	2	1	1	2	1	1	-	1
33	Neskan, Laguna Neskan	-	1	1	-	1	1	1	2	1	1	-	1
34	Tepken, Memino	-	1	1	-	1	1	1	2	1	1	-	1
35	Enurmino, Mys Neten	-	1	-	-	2	1	1	2	1	1	-	1
36	Mys Serdtse-Kamen	-	1	-	-	1	1	-	2	-	1	-	1
37	Chegitun, Utkan	-	-	-	-	1	-	-	1	-	1	-	-
38	Enmytagyn, Inchoun, Mitkulen	-	-	-	-	1	-	-	1	-	1	-	-
39	Cape Dezhnev, Naukan, Uelen	-	-	-	-	1	-	-	1	-	1	-	-
64	Kukpuk River, Point Hope	-	-	-	-	1	-	-	1	-	1	-	-
65	Buckland, Cape Lisburne	-	-	-	-	1	1	-	3	-	2	-	-
66	Ayugatak Lagoon	-	-	-	-	1	-	-	1	-	1	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	1	-	1	-	-
71	Kukpowruk River, Sitkok Point	-	-	-	-	-	-	-	1	-	1	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	1	-	-	1	-	3	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	1	-	-	1	-	3	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	1	1	-	1	-	3	-	-
75	Akeonik, Icy Cape	-	-	-	-	1	1	-	1	-	2	-	1
76	Avak Inlet, Tunalik River	-	-	-	-	-	1	-	-	-	1	-	1
77	Nivat Point, Nokotlek Point	-	-	-	-	-	-	-	-	-	1	-	-
78	Point Collie, Sigeakruk Point	-	-	-	-	1	1	1	1	1	2	-	1
79	Point Belcher, Wainwright	-	1	1	1	2	2	1	1	1	3	1	4
80	Eluksingiak Point, Kugrua Bay	-	-	1	-	1	2	-	1	1	2	-	4
81	Peard Bay, Point Franklin	-	-	-	-	-	-	-	-	-	-	-	1
82	Skull Cliff	-	-	-	-	-	-	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	-	1	-	-	-	-	-	1
84	Will Rogers & Wiley Post Mem.	-	1	1	1	1	2	1	1	1	2	1	4
85	Barrow, Browerville, Elson Lag.	1	1	2	2	2	4	1	1	2	2	3	6

Table A.2-10. 60 Days-(Annual LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
5	Mys Evans	1	-	1	1	-	-	1	-	-	-	-	-
6	Ostrov Mushtakova	2	1	1	1	-	-	1	-	1	-	1	-
7	Kosa Bruch	2	1	1	1	-	1	1	-	1	-	1	1
8	E. Wrangel Island, Skeletov	2	1	1	1	1	1	2	-	1	-	1	1
9	Mys Proletarskiy	1	1	1	-	-	-	1	-	-	-	-	-
19	Laguna Kuepil'khin, Leningradskiy	1	1	1	-	-	-	-	-	-	-	-	-
20	Polyarnyy, Pil'gyn	1	1	1	1	-	-	1	-	1	-	1	-
21	Laguna Pil'khikay, Pil'khikay	1	1	1	1	1	-	1	-	1	-	1	-
22	Rypkarpyy, Mys Shmidta	1	1	1	1	1	1	1	1	1	1	1	-
23	Emuem, Tenkergin	1	1	1	1	1	1	1	1	1	1	1	-
24	LS 24	1	1	1	1	1	1	1	1	1	1	1	-
25	Laguna Amguema, Yulinu	1	2	1	1	1	1	2	1	1	1	1	1
26	Ekugvaam, Kepin, Pil'khin	1	2	1	1	1	1	2	1	1	1	1	1
27	Laguna Nut, Rigol'	1	2	2	1	1	1	2	1	2	1	1	1
28	Vankarem,Vankarem Laguna	1	2	2	1	2	1	2	2	2	1	1	1
29	Mys Onman, Vel'may	1	2	1	1	2	1	2	2	2	1	1	1
30	Nutepynmin, Pyngopil'gyn	1	2	2	1	3	2	2	3	2	2	2	1
31	Alyatki, Zaliv Tasytkhin	1	3	2	1	3	2	2	3	2	2	2	2
32	Mys Dzhenretlen, Eynenekvyk	1	2	1	1	2	2	2	2	1	2	1	1
33	Neskan, Laguna Neskan	1	2	1	1	2	1	2	2	1	2	1	1
34	Tepken, Memino	-	2	1	-	2	1	1	2	1	1	1	1
35	Enurmino, Mys Neten	-	1	1	-	2	1	1	2	1	2	-	1
36	Mys Serdtse-Kamen	-	1	1	-	2	1	1	3	1	2	-	1
37	Chegitun, Utkan	-	1	-	-	2	1	1	2	-	1	-	-
38	Enmytagyn, Inchoun, Mitkulen	-	-	-	-	1	1	-	1	-	1	-	-
39	Cape Dezhnev, Naukan, Uelen	-	-	-	-	1	1	-	1	-	1	-	-
64	Kukpuk River, Point Hope	-	-	-	-	1	-	-	1	-	1	-	-
65	Buckland, Cape Lisburne	-	-	-	-	2	1	-	3	-	2	-	-
66	Ayugatak Lagoon	-	-	-	-	1	-	-	1	-	1	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	1	-	1	-	-
71	Kukpowruk River, Sitkok Point	-	-	-	-	-	-	-	1	-	1	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	1	-	-	1	-	3	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	1	-	-	1	-	3	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	1	1	-	1	-	3	-	-
75	Akeonik, Icy Cape	-	-	-	-	1	1	-	1	-	2	-	1
76	Avak Inlet, Tunalik River	-	-	-	-	-	1	-	-	-	1	-	1
77	Nivat Point, Nokotlek Point	-	-	-	-	-	1	-	-	-	1	-	-
78	Point Collie, Sigeakruk Point	-	1	1	-	1	1	1	1	1	2	-	1
79	Point Belcher, Wainwright	1	1	1	1	2	3	1	1	2	3	1	4
80	Eluksingiak Point, Kugrua Bay	-	1	1	1	1	2	1	1	1	2	-	4
81	Peard Bay, Point Franklin	-	-	-	-	-	1	-	-	-	-	-	1
82	Skull Cliff	-	-	-	-	-	-	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	-	1	-	-	-	-	1	1
84	Will Rogers & Wiley Post Mem.	-	1	1	1	1	2	1	1	1	2	2	4
85	Barrow, Browerville, Elson Lag.	1	1	2	2	2	4	1	2	3	3	3	6

Table A.2-11. 180 Days-(Annual LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
3	Mys Florens, Gusinaya	1	-	-	-	-	-	-	-	-	-	-	-
4	Mys Ushakova, Laguna Drem-Khed	1	-	-	-	-	-	-	-	-	-	-	-
5	Mys Evans	1	1	1	1	-	-	1	-	1	-	1	-
6	Ostrov Mushtakova	2	1	1	1	-	1	1	-	1	1	1	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
7	Kosa Bruch	2	1	2	1	1	1	2	1	1	1	1	1
8	E. Wrangel Island, Skeletov	2	2	2	2	1	1	2	1	2	1	2	1
9	Mys Proletarskiy	1	1	1	1	1	1	1	-	1	-	1	-
10	Bukhta Davidova	1	1	1	-	-	-	1	-	-	-	-	-
19	Laguna Kuepil'khin, Leningradskiy	1	1	1	1	-	-	1	-	-	-	-	-
20	Polyarnyy, Pil'gyn	1	1	1	1	-	-	1	-	1	-	1	-
21	Laguna Pil'khikay, Pil'khikay	1	1	1	1	1	1	1	1	1	-	1	-
22	Rypkarpyy, Mys Shmidta	1	1	1	1	1	1	2	1	1	1	1	1
23	Emuem, Tenkergin	1	1	1	1	1	1	1	1	1	1	1	-
24	LS 24	1	2	1	1	1	1	2	1	1	1	1	1
25	Laguna Amguema, Yulinu	1	2	2	1	1	1	2	1	1	1	1	1
26	Ekugvaam, Kepin, Pil'khin	1	2	2	1	1	1	2	1	1	1	1	1
27	Laguna Nut, Rigol'	1	2	2	1	2	1	2	2	2	1	1	1
28	Vankarem,Vankarem Laguna	1	2	2	1	2	2	2	2	2	1	1	1
29	Mys Onman, Vel'may	1	2	2	1	2	2	2	2	2	2	1	1
30	Nutepynmin, Pyngopil'gyn	1	3	2	1	3	2	2	3	2	2	2	1
31	Alyatki, Zaliv Tasytkhin	1	3	2	1	3	2	3	4	2	3	2	2
32	Mys Dzhenretlen, Eynenekvyk	1	2	2	1	2	2	2	3	2	2	1	2
33	Neskan, Laguna Neskan	1	2	2	1	2	1	2	2	2	2	1	1
34	Tepken, Memino	1	2	1	1	2	1	2	3	2	2	1	1
35	Enurmino, Mys Neten	1	2	1	1	2	1	2	3	1	2	1	1
36	Mys Serdtse-Kamen	1	1	1	1	2	1	1	3	1	2	1	1
37	Chegitun, Utkan	-	1	1	-	2	1	1	2	1	1	-	1
38	Enmytagyn, Inchoun, Mitkulen	-	-	-	-	1	1	-	1	-	1	-	1
39	Cape Dezhnev, Naukan, Uelen	-	-	-	-	1	1	-	1	-	1	-	-
64	Kukpuk River, Point Hope	-	-	-	-	1	-	-	1	-	1	-	-
65	Buckland, Cape Lisburne	-	-	-	-	2	1	-	3	-	2	-	-
66	Ayugatak Lagoon	-	-	-	-	1	-	-	1	-	1	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	1	-	1	-	-
71	Kukpowruk River, Sitkok Point	-	-	-	-	-	-	-	1	-	1	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	1	-	-	1	-	3	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	1	-	-	1	-	3	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	1	1	-	1	-	3	-	-
75	Akeonik, Icy Cape	-	-	-	-	1	1	-	1	-	2	-	1
76	Avak Inlet, Tunalik River	-	-	-	-	-	1	-	-	-	1	-	1
77	Nivat Point, Nokotlek Point	-	-	-	-	-	1	-	-	-	1	-	-
78	Point Collie, Sigeakruk Point	-	1	1	-	1	1	1	1	1	2	-	1
79	Point Belcher, Wainwright	1	1	1	1	2	3	1	1	2	4	1	4
80	Eluksingiak Point, Kugrua Bay	-	1	1	1	1	2	1	1	1	2	1	4
81	Peard Bay, Point Franklin	-	-	-	-	-	1	-	-	-	-	-	1
82	Skull Cliff	-	-	-	-	-	-	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	-	1	-	-	1	-	1	1
84	Will Rogers & Wiley Post Mem.	1	1	1	1	1	2	1	1	1	2	2	4
85	Barrow, Browerville, Elson Lag.	1	2	2	2	2	4	2	2	3	3	4	7
86	Dease Inlet, Plover Islands	-	-	-	-	-	-	-	-	-	-	1	-

Table A.2-12. 360 Days-(Annual LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
3	Mys Florens, Gusinaya	1	-	-	-	-	-	-	-	-	-	-	-
4	Mys Ushakova, Laguna Drem-Khed	1	-	-	-	-	-	-	-	-	-	-	-
5	Mys Evans	1	1	1	1	-	-	1	-	1	-	1	-
6	Ostrov Mushtakova	2	1	1	1	-	1	1	-	1	1	1	1
7	Kosa Bruch	2	1	2	1	1	1	2	1	1	1	1	1
8	E. Wrangel Island, Skeletov	2	2	2	2	1	1	2	1	2	1	2	1
9	Mys Proletarskiy	1	1	1	1	1	1	1	-	1	-	1	1
10	Bukhta Davidova	1	1	1	-	-	-	1	-	-	-	-	-
19	Laguna Kuepil'khin, Leningradskiy	1	1	1	1	-	-	1	-	1	-	-	-
20	Polyarnyy, Pil'gyn	1	1	1	1	-	-	1	-	1	-	1	-
21	Laguna Pil'khikay, Pil'khikay	1	1	1	1	1	1	1	1	1	-	1	-
22	Rypkarpyy, Mys Shmidta	1	1	1	1	1	1	2	1	1	1	1	1
23	Emuem, Tenkergin	1	1	1	1	1	1	1	1	1	1	1	-
24	LS 24	1	2	1	1	1	1	2	1	1	1	1	1
25	Laguna Amguema, Yulinu	1	2	2	1	1	1	2	1	1	1	1	1
26	Ekugvaam, Kepin, Pil'khin	1	2	2	1	1	1	2	1	1	1	1	1
27	Laguna Nut, Rigol'	1	2	2	1	2	1	2	2	2	1	1	1
28	Vankarem,Vankarem Laguna	1	2	2	1	2	2	2	2	2	1	1	1
29	Mys Onman, Vel'may	1	2	2	1	2	2	2	2	2	2	1	1
30	Nutepynmin, Pyngopil'gyn	1	3	2	1	3	2	2	3	2	2	2	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
31	Alyatki, Zaliv Tasytkhin	1	3	2	1	3	2	3	4	2	3	2	2
32	Mys Dzhenretlen, Eynenekvyk	1	2	2	1	2	2	2	3	2	2	1	2
33	Neskan, Laguna Neskan	1	2	2	1	2	1	2	2	2	2	1	1
34	Tepken, Memino	1	2	1	1	2	1	2	3	2	2	1	1
35	Enurmino, Mys Neten	1	2	1	1	2	1	2	3	1	2	1	1
36	Mys Serdtse-Kamen	1	1	1	1	2	1	1	3	1	2	1	1
37	Chegitun, Utkan	-	1	1	-	2	1	1	2	1	1	-	1
38	Enmytagyn, Inchoun, Mitkulen	-	-	-	-	1	1	-	1	-	1	-	1
39	Cape Dezhnev, Naukan, Uelen	-	-	-	-	1	1	-	1	-	1	-	-
64	Kukpuk River, Point Hope	-	-	-	-	1	-	-	1	-	1	-	-
65	Buckland, Cape Lisburne	-	-	-	-	2	1	-	3	-	2	-	-
66	Ayugatak Lagoon	-	-	-	-	1	-	-	1	-	1	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	1	-	1	-	-
71	Kukpowruk River, Sitkok Point	-	-	-	-	-	-	-	1	-	1	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	1	-	-	1	-	3	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	1	-	-	1	-	3	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	1	1	-	1	-	3	-	-
75	Akeonik, Icy Cape	-	-	-	-	1	1	-	1	-	2	-	1
76	Avak Inlet, Tunalik River	-	-	-	-	-	1	-	-	-	1	-	1
77	Nivat Point, Nokotlek Point	-	-	-	-	-	1	-	-	-	1	-	-
78	Point Collie, Sigeakruk Point	-	1	1	-	1	1	1	1	1	2	-	1
79	Point Belcher, Wainwright	1	1	1	1	2	3	1	1	2	4	1	4
80	Eluksingiak Point, Kugrua Bay	-	1	1	1	1	2	1	1	1	2	1	4
81	Peard Bay, Point Franklin	-	-	-	-	-	1	-	-	-	-	-	1
82	Skull Cliff	-	-	-	-	-	-	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	-	1	-	-	1	-	1	1
84	Will Rogers & Wiley Post Mem.	1	1	1	1	1	2	1	1	1	2	2	4
85	Barrow, Browerville, Elson Lag.	1	2	2	2	2	4	2	2	3	3	4	7
86	Dease Inlet, Plover Islands	-	-	-	-	-	-	-	-	-	-	1	-

Tables A.2-13 through A.2-18 represent annual conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain group of land segments within:

Table A.2-13. 3 Days-(Annual GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
144	Alaska Maritime Wildlife Refuge	-	-	-	-	-	-	-	1	-	-	-	-
145	Cape Lisburne	-	-	-	-	-	-	-	1	-	-	-	-
146	Ledyard Bay	-	-	-	-	-	-	-	1	-	-	-	-
147	Point Lay Haulout	-	-	-	-	-	-	-	-	-	5	-	-
148	Kasegaluk Brown Bears	-	-	-	-	-	-	-	-	-	3	-	-
149	National Petroleum Reserve Alaska	-	-	-	-	-	-	-	-	-	-	-	3
151	Kuk River	-	-	-	-	-	-	-	-	-	1	-	2
152	TCH Insect Relief/Calving	-	-	-	-	-	-	-	-	-	-	-	1
176	United States Chukchi Coast	-	-	-	-	-	1	-	2	-	7	-	6
177	United States Beaufort Coast	-	-	-	-	-	-	-	-	-	-	-	1

Table A.2-14. 10 Days-(Annual GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	1	-	-	-	-	-	-	-	-	-	-	-
143	WAH Insect Relief	-	-	-	-	-	-	-	1	-	-	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	1	-	-	2	-	1	-	-
145	Cape Lisburne	-	-	-	-	1	-	-	1	-	1	-	-
146	Ledyard Bay	-	-	-	-	1	-	-	2	-	1	-	-
147	Point Lay Haulout	-	-	-	-	2	1	-	2	-	7	-	-
148	Kasegaluk Brown Bears	-	-	-	-	2	1	-	1	-	5	-	-
149	National Petroleum Reserve Alaska	-	-	1	-	1	2	-	1	1	3	1	6
150	Kasegaluk Lagoon Special Use Area	-	-	-	-	-	1	-	-	-	1	-	1
151	Kuk River	-	1	1	-	1	2	1	1	1	3	-	3
152	TCH Insect Relief/Calving	-	-	-	-	-	1	-	-	1	1	-	2
174	Russia Chukchi Coast Marine Mammals	1	1	-	-	1	-	1	2	-	-	-	-
175	Russia Chukchi Coast	1	2	1	-	2	-	2	3	1	1	-	-
176	United States Chukchi Coast	-	2	2	1	7	7	1	8	3	20	1	13
177	United States Beaufort Coast	-	-	1	1	1	2	-	-	1	1	1	4

Table A.2-15. 30 Days-(Annual GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	3	2	2	1	1	1	2	1	1	-	1	-
135	Kolyuchin Bay	1	2	1	-	2	1	2	3	1	1	1	1
136	Ostrov Idlidlya	-	1	-	-	1	-	1	1	1	1	-	-
137	Mys Serditse Kamen	-	-	-	-	1	-	-	1	-	1	-	-
138	Chukota Coast Haulout	-	1	1	-	2	1	1	3	1	2	1	1
143	WAH Insect Relief	-	-	-	-	1	-	-	2	-	1	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	1	1	-	3	-	2	-	-
145	Cape Lisburne	-	-	-	-	1	-	-	2	-	1	-	-
146	Ledyard Bay	-	-	-	-	2	1	-	3	-	2	-	-
147	Point Lay Haulout	-	1	1	-	3	1	1	3	1	9	-	1
148	Kasegaluk Brown Bears	-	1	1	-	3	2	1	2	1	6	-	1
149	National Petroleum Reserve Alaska	1	1	2	2	3	5	1	2	3	5	3	9
150	Kasegaluk Lagoon Special Use Area	-	-	-	-	1	1	-	1	-	2	-	1
151	Kuk River	1	1	1	1	3	3	1	2	2	5	1	4
152	TCH Insect Relief/Calving	-	1	1	1	1	2	1	1	1	2	1	3
174	Russia Chukchi Coast Marine Mammals	8	12	9	6	10	7	11	12	8	7	6	5
175	Russia Chukchi Coast	15	24	17	11	22	14	22	25	16	16	11	10
176	United States Chukchi Coast	2	5	5	3	14	14	5	15	8	28	5	19
177	United States Beaufort Coast	1	1	2	2	2	4	1	1	3	3	4	7

Table A.2-16. 60 Days-(Annual GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	3	2	2	2	1	1	3	1	2	1	2	1
135	Kolyuchin Bay	1	2	1	1	2	1	2	3	1	1	1	1
136	Ostrov Idlidlya	-	1	1	-	1	-	1	1	1	1	-	-
137	Mys Serditse Kamen	-	-	-	-	1	-	-	1	-	1	-	-
138	Chukota Coast Haulout	1	1	1	1	3	2	1	3	1	2	1	1
143	WAH Insect Relief	-	-	-	-	1	-	-	2	-	1	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	1	1	-	3	-	2	-	-
145	Cape Lisburne	-	-	-	-	1	-	-	2	-	1	-	-
146	Ledyard Bay	-	1	-	-	2	1	-	3	-	2	-	-
147	Point Lay Haulout	-	1	1	-	3	1	1	3	1	9	1	1
148	Kasegaluk Brown Bears	-	1	1	1	3	2	1	2	1	6	-	1
149	National Petroleum Reserve Alaska	1	2	2	2	3	5	2	2	3	5	3	10
150	Kasegaluk Lagoon Special Use Area	-	1	-	-	1	1	-	1	1	2	-	1
151	Kuk River	1	2	2	1	3	3	1	2	2	5	1	4
152	TCH Insect Relief/Calving	-	1	1	1	1	2	1	1	1	2	1	3
174	Russia Chukchi Coast Marine Mammals	12	16	13	10	14	10	15	15	12	10	9	7
175	Russia Chukchi Coast	25	38	30	23	34	26	36	37	30	26	22	20
176	United States Chukchi Coast	3	6	6	4	15	15	6	16	9	29	6	20
177	United States Beaufort Coast	1	2	2	3	3	5	1	2	3	3	5	7

Table A.2-17. 180 Days-(Annual GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	4	4	4	3	3	3	5	3	4	2	3	2
135	Kolyuchin Bay	1	2	1	1	2	1	2	3	1	1	1	1
136	Ostrov Idlidlya	-	1	1	-	1	1	1	1	1	1	-	-
137	Mys Serditse Kamen	-	-	-	-	1	-	-	1	-	1	-	-
138	Chukota Coast Haulout	1	2	1	1	3	2	2	3	2	3	1	2
143	WAH Insect Relief	-	-	-	-	1	-	-	2	-	1	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	1	1	-	3	-	2	-	-
145	Cape Lisburne	-	-	-	-	1	-	-	2	-	1	-	-
146	Ledyard Bay	-	1	-	-	2	1	1	3	-	2	-	-
147	Point Lay Haulout	-	1	1	-	3	1	1	3	1	9	1	1
148	Kasegaluk Brown Bears	-	1	1	1	3	2	1	2	1	6	1	1
149	National Petroleum Reserve Alaska	1	2	3	2	3	5	2	2	3	5	4	10
150	Kasegaluk Lagoon Special Use Area	-	1	-	-	1	1	-	1	1	2	-	1
151	Kuk River	1	2	2	1	3	3	1	2	2	5	1	5
152	TCH Insect Relief/Calving	1	1	1	1	2	2	1	1	2	2	1	3
174	Russia Chukchi Coast Marine Mammals	15	19	17	13	17	14	19	17	16	13	13	11
175	Russia Chukchi Coast	31	44	38	30	40	33	43	42	37	31	29	26
176	United States Chukchi Coast	3	7	7	5	16	15	6	16	9	30	7	21
177	United States Beaufort Coast	1	2	3	3	3	5	2	2	4	3	5	8

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Table A.2-18. 360 Days-(Annual GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	4	5	4	3	3	3	5	3	4	2	3	2
135	Kolyuchin Bay	1	2	1	1	2	1	2	3	1	1	1	1
136	Ostrov Idlidlya	-	1	1	-	1	1	1	1	1	1	-	-
137	Mys Serditse Kamen	-	-	-	-	1	-	-	1	-	1	-	-
138	Chukota Coast Haulout	1	2	1	1	3	2	2	3	2	3	1	2
143	WAH Insect Relief	-	-	-	-	1	-	-	2	-	1	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	1	1	-	3	-	2	-	-
145	Cape Lisburne	-	-	-	-	1	-	-	2	-	1	-	-
146	Ledyard Bay	-	1	-	-	2	1	1	3	-	2	-	-
147	Point Lay Haulout	-	1	1	-	3	1	1	3	1	9	1	1
148	Kasegaluk Brown Bears	-	1	1	1	3	2	1	2	1	6	1	1
149	National Petroleum Reserve Alaska	1	2	3	2	3	5	2	2	3	5	4	10
150	Kasegaluk Lagoon Special Use Area	-	1	-	-	1	1	-	1	1	2	-	1
151	Kuk River	1	2	2	1	3	3	1	2	2	5	1	5
152	TCH Insect Relief/Calving	1	1	1	1	2	2	1	1	2	2	1	3
174	Russia Chukchi Coast Marine Mammals	15	19	17	14	17	14	19	18	16	13	13	11
175	Russia Chukchi Coast	31	44	38	30	40	33	43	42	37	31	29	26
176	United States Chukchi Coast	3	7	7	5	16	15	6	16	9	30	7	21
177	United States Beaufort Coast	1	2	3	3	3	5	2	2	4	3	5	8

Tables A.2-19 through A.2-24 represent annual conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain boundary segment within:

Table A.2-19. 3 Days-(Annual BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9

Note: All rows have all values less than 0.5 percent and are not shown

Table A.2-20. 10 Days-(Annual BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9

Note: All rows have all values less than 0.5 percent and are not shown

Table A.2-21. 30 Days-(Annual BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
2	Bering Strait	-	-	-	-	-	-	-	1	-	-	-	-
3	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
4	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
5	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	-	-
6	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
7	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
17	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
18	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	1
19	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	-

Table A.2-22. 60 Days-(Annual BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
1	Bering Strait	-	-	-	-	1	-	-	1	-	-	-	-
2	Bering Strait	-	-	-	-	1	-	-	1	-	1	-	-
3	Chukchi Sea	1	1	1	1	-	-	1	-	1	-	1	-
4	Chukchi Sea	2	1	1	1	-	-	1	-	1	-	1	-
5	Chukchi Sea	3	1	1	1	-	-	1	-	1	-	1	-
6	Chukchi Sea	3	1	1	2	-	1	2	-	1	-	1	-
7	Chukchi Sea	3	1	1	1	-	-	1	-	1	-	1	-
8	Chukchi Sea	2	1	1	1	-	-	1	-	-	-	1	-
9	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	-	-
10	Chukchi Sea	1	-	1	1	-	-	-	-	-	-	-	-
11	Chukchi Sea	2	-	1	1	-	-	-	-	-	-	1	-
12	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	-
13	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	-	-
14	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	-	-
15	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	-	-
16	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	-
17	Chukchi Sea	2	-	1	2	-	1	-	-	-	-	1	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
18	Chukchi Sea	2	-	1	3	-	1	1	-	1	-	2	2
19	Chukchi Sea	2	-	1	2	-	1	1	-	1	-	2	1
20	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	1
21	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-

Table A.2-23. 180 Days-(Annual BS

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
1	Bering Strait	-	-	-	-	1	-	-	1	-	-	-	-
2	Bering Strait	-	-	-	-	1	-	-	1	-	1	-	-
3	Chukchi Sea	1	1	1	1	-	1	1	-	1	-	1	-
4	Chukchi Sea	2	1	1	2	1	1	1	1	1	-	2	1
5	Chukchi Sea	4	2	2	2	1	1	2	1	1	1	2	1
6	Chukchi Sea	5	3	3	3	1	2	3	1	2	1	3	2
7	Chukchi Sea	5	3	3	4	1	2	3	1	3	1	4	2
8	Chukchi Sea	3	1	2	2	1	1	2	1	1	1	2	1
9	Chukchi Sea	2	1	1	1	1	1	1	-	1	-	1	-
10	Chukchi Sea	2	1	1	2	1	1	1	1	1	-	1	1
11	Chukchi Sea	3	1	2	2	1	1	1	1	1	1	2	1
12	Chukchi Sea	2	1	1	2	1	1	1	-	1	1	1	1
13	Chukchi Sea	2	1	1	1	1	1	1	-	1	1	1	1
14	Chukchi Sea	2	1	1	2	1	1	1	1	1	-	1	1
15	Chukchi Sea	1	1	1	2	1	1	1	1	1	1	1	1
16	Chukchi Sea	1	1	1	2	1	1	1	1	1	1	1	1
17	Chukchi Sea	2	1	2	3	1	2	1	1	2	1	3	2
18	Chukchi Sea	3	2	3	4	3	3	2	2	3	2	4	4
19	Chukchi Sea	3	2	2	4	2	2	2	1	2	2	3	3
20	Chukchi Sea	1	1	1	2	1	1	1	1	1	1	1	1
21	Chukchi Sea	1	-	1	1	-	1	1	-	1	-	1	1
22	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	-
23	Beaufort Sea	-	-	-	1	-	-	-	-	-	-	-	1
24	Beaufort Sea	-	-	1	1	-	-	-	-	-	-	1	1
25	Beaufort Sea	-	-	-	1	-	-	-	-	-	-	1	-
26	Beaufort Sea	-	-	-	-	-	-	-	-	-	-	1	-
38	Beaufort Sea	-	-	1	-	-	-	-	-	1	-	-	-

Table A.2-24. 360 Days-(Annual BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
1	Bering Strait	-	-	-	-	1	-	-	1	-	-	-	-
2	Bering Strait	-	-	-	-	1	-	-	1	-	1	-	-
3	Chukchi Sea	1	1	1	1	-	1	1	-	1	-	1	1
4	Chukchi Sea	2	1	1	2	1	1	1	1	1	-	2	1
5	Chukchi Sea	4	2	2	2	1	1	2	1	1	1	2	1
6	Chukchi Sea	5	3	3	4	1	2	3	1	2	1	3	2
7	Chukchi Sea	5	3	3	4	1	2	3	1	3	1	4	2
8	Chukchi Sea	3	1	2	2	1	1	2	1	1	1	2	1
9	Chukchi Sea	2	1	1	2	1	1	1	-	1	-	1	-
10	Chukchi Sea	2	1	1	2	1	1	1	1	1	-	1	1
11	Chukchi Sea	3	1	2	2	1	1	1	1	1	1	2	1
12	Chukchi Sea	2	1	1	2	1	1	1	-	1	1	1	1
13	Chukchi Sea	2	1	1	1	1	1	1	-	1	1	1	1
14	Chukchi Sea	2	1	1	2	1	1	1	1	1	-	1	1
15	Chukchi Sea	2	1	1	2	1	1	1	1	1	1	2	1
16	Chukchi Sea	1	1	1	2	1	1	1	1	1	1	1	1
17	Chukchi Sea	3	1	2	3	1	2	2	1	2	1	3	2
18	Chukchi Sea	3	2	3	4	3	3	2	2	3	2	4	4
19	Chukchi Sea	3	2	2	4	2	3	2	1	2	2	3	3
20	Chukchi Sea	1	1	1	2	1	1	1	1	1	1	1	1
21	Chukchi Sea	1	-	1	1	-	1	1	-	1	-	1	1
22	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	-
23	Beaufort Sea	-	-	-	1	-	-	-	-	-	-	1	1
24	Beaufort Sea	-	-	1	1	-	-	-	-	-	-	1	1
25	Beaufort Sea	-	-	-	1	-	-	-	-	-	-	1	-
26	Beaufort Sea	-	-	-	-	-	-	-	-	-	-	1	-
38	Beaufort Sea	-	-	1	-	-	-	-	-	1	-	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Tables A.2-25 through A.2-30 represent summer conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain environmental resource area within:

Table A.2-25. 3 Days-(Summer ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	-	-	-	-	1	2	-	2	-	11	-	12
1	Kasegaluk Lagoon Area	-	-	-	-	1	1	-	-	-	11	-	-
6	Hanna Shoal	-	-	-	12	-	2	-	-	-	-	24	-
7	Krill Trap	-	-	-	-	-	-	-	-	-	-	-	2
10	Ledyard Bay SPEI Critical Habitat Area	-	-	-	-	16	8	-	19	-	54	-	1
15	Cape Lisburne Seabird Colony Area	-	-	-	-	5	-	-	16	-	2	-	-
16	Barrow Canyon	-	-	-	-	-	1	-	-	-	-	1	11
18	Murre Rearing and Molting Area	-	1	-	-	1	-	-	1	-	-	-	-
19	Chukchi Spring Lead System	-	-	-	-	3	4	-	3	-	12	-	9
23	Polar Bear Offshore	-	-	-	-	11	4	-	11	-	11	-	-
38	SUA: Pt. Hope - Cape Lisburne	-	-	-	-	-	-	-	3	-	-	-	-
39	SUA: Pt. Lay - Kasegaluk	-	-	-	-	2	1	-	1	-	25	-	-
40	SUA: Icy Cape - Wainwright	-	-	1	-	2	14	-	-	3	19	1	56
42	SUA: Barrow - East Arch	-	-	-	-	-	-	-	-	-	-	-	2
43	SUA: Nuiqsut - Cross Island	-	-	-	-	-	-	-	-	-	-	-	1
47	Hanna Shoal Walrus Use Area	1	-	4	62	1	27	-	-	5	1	**	37
49	Chukchi Spring Lead 1	-	-	-	-	1	-	-	1	-	-	-	-
50	Pt Lay Walrus Offshore	-	-	-	-	25	12	-	22	1	50	-	3
51	Pt Lay Walrus Nearshore	-	-	-	-	3	1	-	2	-	35	-	-
53	Chukchi Spring Lead 2	-	-	-	-	9	5	-	9	-	16	-	-
54	Chukchi Spring Lead 3	-	-	-	-	-	4	-	-	-	3	-	15
56	Hanna Shoal Area	-	-	1	21	-	6	-	-	-	-	44	13
57	Skull Cliffs	-	-	-	-	-	1	-	-	-	-	-	10
61	Pt Lay-Barrow BH GW SSF	-	-	2	4	4	31	-	-	7	35	16	81
64	Peard Bay Area	-	-	-	-	-	2	-	-	-	-	1	18
70	North Central Chukchi	2	-	-	-	-	-	-	-	-	-	-	-
102	Opilio Crab EFH	-	-	-	-	-	-	-	1	-	-	-	-
103	Saffron Cod EFH	-	-	-	-	5	13	-	13	2	34	3	49
107	Pt Hope Offshore	-	-	-	-	-	-	-	1	-	-	-	-
108	Barrow Feeding Aggregation	-	-	-	-	-	-	-	-	-	-	1	3
119	AK BFT Outer Shelf&Slope 10	-	-	-	-	-	-	-	-	-	-	1	3
121	C Lisburne - Pt Hope	-	-	-	-	1	-	-	10	-	-	-	-
123	AK Chukchi Offshore	2	3	5	1	-	-	1	-	3	-	-	-
124	Central Chukchi Offshore	-	2	-	-	-	-	2	-	-	-	-	-

Table A.2-26. 10 Days-(Summer ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	2	5	5	2	14	15	5	15	8	30	5	23
1	Kasegaluk Lagoon Area	-	1	1	-	6	3	1	5	1	16	-	1
3	SUA: Uelen/Russia	-	-	-	-	1	-	-	1	-	-	-	-
6	Hanna Shoal	2	1	4	19	1	6	1	-	4	-	31	5
7	Krill Trap	-	-	1	2	1	3	-	-	1	1	3	6
10	Ledyard Bay SPEI Critical Habitat Area	-	3	2	-	24	11	2	28	2	57	1	3
11	Wrangel Island 12 nm & Offshore	2	1	1	-	-	-	1	-	-	-	-	-
14	Cape Thompson Seabird Colony Area	-	-	-	-	1	-	-	1	-	-	-	-
15	Cape Lisburne Seabird Colony Area	-	1	-	-	10	2	-	21	1	8	-	1
16	Barrow Canyon	1	1	4	3	3	11	1	1	6	7	8	24
18	Murre Rearing and Molting Area	1	7	3	-	9	3	5	13	3	5	-	1
19	Chukchi Spring Lead System	-	-	1	-	6	6	-	6	2	14	1	11
20	East Chukchi Offshore	-	-	-	-	-	-	-	-	-	-	1	1
23	Polar Bear Offshore	-	1	-	-	13	5	1	14	1	14	-	1
29	AK BFT Bowhead FM 8	-	-	-	-	-	-	-	-	-	-	-	1
30	Beaufort Spring Lead 1	-	-	-	-	-	1	-	-	-	-	-	2
31	Beaufort Spring Lead 2	-	-	-	-	-	-	-	-	-	-	-	1
38	SUA: Pt. Hope - Cape Lisburne	-	-	-	-	2	-	-	4	-	2	-	-
39	SUA: Pt. Lay - Kasegaluk	-	2	1	-	7	3	1	7	1	29	-	1
40	SUA: Icy Cape - Wainwright	2	6	8	2	17	27	6	11	13	38	4	60
42	SUA: Barrow - East Arch	1	-	1	3	1	4	-	-	2	2	5	7
43	SUA: Nuiqsut - Cross Island	-	-	-	1	-	1	-	-	1	-	1	2
47	Hanna Shoal Walrus Use Area	12	6	20	71	6	37	7	2	22	7	**	48
49	Chukchi Spring Lead 1	-	-	-	-	1	-	-	2	-	-	-	-
50	Pt Lay Walrus Offshore	1	5	4	1	35	18	5	34	5	57	1	7
51	Pt Lay Walrus Nearshore	-	1	1	-	8	3	1	9	1	37	-	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
52	Russian Coast Walrus Offshore	1	5	2	-	8	2	4	11	2	4	-	-
53	Chukchi Spring Lead 2	-	-	-	-	10	5	-	11	1	16	-	1
54	Chukchi Spring Lead 3	-	1	1	1	3	7	1	1	2	7	2	16
56	Hanna Shoal Area	5	2	7	28	2	13	2	1	7	3	48	20
57	Skull Cliffs	-	1	2	1	3	6	1	1	3	6	2	13
58	Russian Coast Walrus Nearshore	-	1	-	-	2	-	1	3	-	1	-	-
61	Pt Lay-Barrow BH GW SSF	5	9	15	13	22	44	10	14	23	49	27	83
63	North Chukchi	1	-	-	-	-	-	-	-	-	-	-	-
64	Peard Bay Area	1	2	4	4	4	13	2	2	7	9	8	28
66	Herald Island	1	-	-	-	-	-	1	-	-	-	-	-
70	North Central Chukchi	3	-	1	1	-	-	-	-	-	-	-	-
74	Offshore Herald Island	1	1	1	1	-	-	1	-	1	-	-	-
80	Beaufort Outer Shelf 1	-	-	-	-	-	-	-	-	-	-	1	1
82	N Chukotka Nrshr 2	-	1	-	-	1	-	1	1	-	-	-	-
83	N Chukotka Nrshr 3	-	2	-	-	2	-	1	3	-	1	-	-
91	Hope Sea Valley	1	1	1	-	1	-	1	1	-	-	-	-
102	Opilio Crab EFH	-	-	-	-	3	1	-	5	-	1	-	-
103	Saffron Cod EFH	2	8	10	6	28	33	7	31	16	54	14	59
107	Pt Hope Offshore	-	-	-	-	2	-	-	4	-	1	-	-
108	Barrow Feeding Aggregation	1	-	1	2	1	3	-	-	2	1	5	7
115	AK BFT Outer Shelf&Slope 6	-	-	-	-	-	-	-	-	-	-	1	1
116	AK BFT Outer Shelf&Slope 7	-	-	-	1	-	1	-	-	-	-	1	2
117	AK BFT Outer Shelf&Slope 8	-	-	-	1	-	1	-	-	-	-	2	3
118	AK BFT Outer Shelf&Slope 9	-	-	-	1	-	1	-	-	1	-	2	4
119	AK BFT Outer Shelf&Slope 10	1	-	2	5	1	6	-	-	3	3	9	13
120	Russia CH GW Fall 1&2	-	2	-	-	3	1	1	5	-	1	-	-
121	C Lisburne - Pt Hope	-	-	-	-	5	1	-	14	-	4	-	-
123	AK Chukchi Offshore	3	4	7	5	1	2	3	1	6	1	3	1
124	Central Chukchi Offshore	2	5	3	1	1	1	5	1	2	1	1	-

Table A.2-27. 30 Days-(Summer ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	17	32	26	16	44	37	30	46	30	54	20	39
1	Kasegaluk Lagoon Area	1	3	2	1	9	4	3	9	2	19	1	1
2	Point Barrow, Plover Islands	-	-	1	1	-	1	-	-	1	1	2	2
3	SUA: Uelen/Russia	1	3	2	1	4	1	3	5	2	2	1	1
4	SUA:Naukan/Russia	-	-	-	-	1	-	-	1	-	-	-	-
6	Hanna Shoal	7	6	10	23	4	11	6	2	10	3	36	12
7	Krill Trap	2	2	3	4	3	6	2	2	4	4	6	10
10	Ledyard Bay SPEI Critical Habitat Area	1	7	5	2	29	13	6	33	6	59	2	5
11	Wrangel Island 12 nm & Offshore	8	8	7	6	3	3	8	3	6	2	4	2
14	Cape Thompson Seabird Colony Area	-	-	-	-	2	-	-	2	-	1	-	-
15	Cape Lisburne Seabird Colony Area	1	3	2	-	13	4	3	24	2	10	1	2
16	Barrow Canyon	4	7	10	7	11	18	8	8	13	14	12	30
18	Murre Rearing and Molting Area	4	13	8	4	19	9	10	24	9	11	4	5
19	Chukchi Spring Lead System	-	1	2	1	8	8	1	8	3	15	2	12
20	East Chukchi Offshore	-	-	-	1	-	1	-	-	-	-	2	2
23	Polar Bear Offshore	-	1	1	1	14	7	1	14	2	16	1	4
27	AK BFT Bowhead FM 6	-	-	-	-	-	-	-	-	-	-	1	-
28	AK BFT Bowhead FM 7	-	-	-	-	-	-	-	-	-	-	1	-
29	AK BFT Bowhead FM 8	-	-	1	1	-	1	-	-	-	-	1	1
30	Beaufort Spring Lead 1	-	-	-	-	1	2	-	-	1	1	1	4
31	Beaufort Spring Lead 2	-	-	-	-	-	1	-	-	-	1	-	2
38	SUA: Pt. Hope - Cape Lisburne	-	1	-	-	4	1	1	7	1	3	-	1
39	SUA: Pt. Lay - Kasegaluk	1	4	3	1	11	5	3	11	3	31	1	2
40	SUA: Icy Cape - Wainwright	6	14	14	7	29	34	14	23	20	46	9	62
42	SUA: Barrow - East Arch	3	3	5	7	3	7	3	3	5	4	10	10
43	SUA: Nuiqsut - Cross Island	1	1	2	2	1	3	1	1	2	1	4	4
44	SUA: Kaktovik	-	-	-	-	-	-	-	-	-	-	-	1
47	Hanna Shoal Walrus Use Area	24	20	32	75	17	46	20	12	34	17	**	55
49	Chukchi Spring Lead 1	-	-	-	-	1	-	-	3	-	1	-	-
50	Pt Lay Walrus Offshore	3	11	8	3	40	21	10	39	10	60	3	9
51	Pt Lay Walrus Nearshore	1	3	2	1	11	5	3	12	2	38	1	2
52	Russian Coast Walrus Offshore	5	14	10	5	20	10	12	24	10	13	5	6
53	Chukchi Spring Lead 2	-	1	1	-	11	5	1	12	1	17	-	1
54	Chukchi Spring Lead 3	-	2	2	1	6	9	2	4	4	10	3	16
55	Point Barrow, Plover Islands	-	-	1	1	-	1	-	-	1	1	2	2
56	Hanna Shoal Area	12	8	13	32	6	17	8	5	12	7	51	24

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
57	Skull Cliffs	2	4	4	2	6	10	3	5	6	9	4	16
58	Russian Coast Walrus Nearshore	1	4	3	1	8	3	4	11	3	5	1	2
59	Ostrov Kolyuchin	1	2	1	-	2	1	2	2	1	1	-	1
61	Pt Lay-Barrow BH GW SSF	14	23	27	22	37	53	23	30	34	58	36	86
63	North Chukchi	4	1	2	2	-	-	1	-	1	-	1	-
64	Peard Bay Area	5	8	10	8	12	21	9	9	14	16	13	34
66	Herald Island	3	3	3	3	1	1	3	1	2	1	2	1
70	North Central Chukchi	4	1	2	4	1	1	1	1	2	1	3	1
74	Offshore Herald Island	4	3	4	4	2	2	3	1	4	1	4	1
80	Beaufort Outer Shelf 1	1	1	1	1	-	1	1	-	1	1	2	3
82	N Chukotka Nrshr 2	4	9	5	2	6	4	8	8	5	4	2	2
83	N Chukotka Nrshr 3	3	8	5	2	10	4	7	13	5	6	2	2
91	Hope Sea Valley	3	5	4	3	4	3	5	4	5	3	3	2
101	Beaufort Outer Shelf 2	-	-	1	1	-	1	-	-	1	1	2	1
102	Opilio Crab EFH	-	2	1	1	6	3	1	8	2	4	1	1
103	Saffron Cod EFH	10	22	23	15	47	47	22	49	30	67	24	66
107	Pt Hope Offshore	-	1	1	-	4	2	1	6	1	3	-	1
108	Barrow Feeding Aggregation	3	2	4	6	1	5	2	1	3	2	8	9
111	AK BFT Outer Shelf&Slope 2	-	-	-	1	-	-	-	-	-	-	1	1
112	AK BFT Outer Shelf&Slope 3	-	-	-	1	-	1	-	-	1	-	1	1
113	AK BFT Outer Shelf&Slope 4	1	-	1	1	-	1	-	-	1	1	2	1
114	AK BFT Outer Shelf&Slope 5	1	-	1	1	-	1	1	-	1	-	2	1
115	AK BFT Outer Shelf&Slope 6	1	1	1	2	1	2	1	-	2	1	3	3
116	AK BFT Outer Shelf&Slope 7	2	1	2	3	1	3	1	-	2	1	4	4
117	AK BFT Outer Shelf&Slope 8	3	1	3	4	1	4	2	1	3	2	6	6
118	AK BFT Outer Shelf&Slope 9	3	2	3	5	2	5	2	2	3	3	6	8
119	AK BFT Outer Shelf&Slope 10	5	5	8	10	8	14	5	6	9	9	16	21
120	Russia CH GW Fall 1&2	2	6	4	2	9	4	5	12	5	6	2	2
121	C Lisburne - Pt Hope	-	2	1	-	8	2	1	17	1	5	1	1
122	North Chukotka Offshore	2	3	2	1	1	1	3	1	2	1	1	1
123	AK Chukchi Offshore	4	6	9	7	3	4	4	2	7	2	7	4
124	Central Chukchi Offshore	4	7	5	4	4	5	7	4	6	4	4	3

Table A.2-28. 60 Days-(Summer ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	22	36	31	22	47	40	34	49	35	56	24	43
1	Kasegaluk Lagoon Area	1	3	2	1	9	4	3	9	3	19	1	1
2	Point Barrow, Plover Islands	-	-	1	1	1	1	-	-	1	1	2	2
3	SUA: Uelen/Russia	1	4	2	1	4	2	3	5	2	2	1	1
4	SUA:Naukan/Russia	-	-	-	-	1	-	-	1	-	1	-	-
6	Hanna Shoal	9	8	11	24	5	12	8	3	11	4	37	12
7	Krill Trap	2	3	4	4	4	7	3	3	4	5	6	10
10	Ledyard Bay SPEI Critical Habitat Area	2	8	5	2	29	14	7	33	6	59	2	5
11	Wrangel Island 12 nm & Offshore	11	10	9	8	5	5	10	5	7	3	6	3
14	Cape Thompson Seabird Colony Area	-	-	-	-	2	-	-	2	-	1	-	-
15	Cape Lisburne Seabird Colony Area	1	3	2	1	13	4	3	24	2	10	1	2
16	Barrow Canyon	5	8	10	8	12	19	9	9	13	15	13	31
18	Murre Rearing and Molting Area	4	14	9	5	19	9	11	24	9	11	5	5
19	Chukchi Spring Lead System	-	1	2	1	8	8	1	8	3	15	2	12
20	East Chukchi Offshore	1	-	1	2	-	1	-	-	1	-	3	2
23	Polar Bear Offshore	-	1	1	1	14	7	1	14	2	16	1	4
27	AK BFT Bowhead FM 6	-	-	-	1	-	-	-	-	-	-	1	1
28	AK BFT Bowhead FM 7	-	-	-	1	-	-	-	-	-	-	1	1
29	AK BFT Bowhead FM 8	-	-	1	1	-	1	-	-	-	-	1	1
30	Beaufort Spring Lead 1	-	-	-	-	1	2	-	-	1	1	1	4
31	Beaufort Spring Lead 2	-	-	-	-	-	1	-	-	-	1	-	2
38	SUA: Pt. Hope - Cape Lisburne	-	1	-	-	4	1	1	7	1	3	-	1
39	SUA: Pt. Lay - Kasegaluk	1	4	3	1	11	5	3	12	3	31	1	2
40	SUA: Icy Cape - Wainwright	7	15	15	7	30	34	15	25	21	47	9	62
42	SUA: Barrow - East Arch	4	4	6	8	4	8	4	3	6	5	11	10
43	SUA: Nuiqsut - Cross Island	1	1	2	3	1	3	1	1	2	1	4	4
44	SUA: Kaktovik	-	-	-	-	-	-	-	-	-	-	1	1
46	Wrangel Island 12 nmi Buffer 2	1	-	1	1	-	1	-	-	1	-	1	1
47	Hanna Shoal Walrus Use Area	26	23	34	76	19	47	23	14	36	19	**	56
48	Chukchi Lead System 4	-	-	-	-	-	-	-	-	-	1	-	1
49	Chukchi Spring Lead 1	-	-	-	-	1	-	-	3	-	1	-	-
50	Pt Lay Walrus Offshore	3	12	9	3	41	21	11	39	11	60	3	9
51	Pt Lay Walrus Nearshore	1	4	2	1	12	5	3	12	3	38	1	2

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
52	Russian Coast Walrus Offshore	5	15	10	6	20	10	13	24	10	13	5	6
53	Chukchi Spring Lead 2	-	1	1	-	11	5	1	12	1	17	-	1
54	Chukchi Spring Lead 3	-	2	2	1	6	9	2	4	4	10	3	16
55	Point Barrow, Plover Islands	-	-	1	1	1	1	-	-	1	1	2	2
56	Hanna Shoal Area	13	10	14	33	8	19	11	6	14	8	52	25
57	Skull Cliffs	3	4	4	3	7	10	4	5	6	9	4	16
58	Russian Coast Walrus Nearshore	1	5	3	2	8	3	4	11	3	5	2	2
59	Ostrov Kolyuchin	1	2	1	1	2	1	2	3	1	1	1	1
61	Pt Lay-Barrow BH GW SSF	16	25	29	23	38	54	25	31	36	60	36	86
63	North Chukchi	5	1	2	2	-	1	1	-	2	1	2	1
64	Peard Bay Area	6	9	11	8	13	21	10	10	14	17	14	35
65	Smith Bay	-	-	-	-	-	-	-	-	-	-	1	1
66	Herald Island	4	3	3	3	2	2	3	2	3	1	3	1
70	North Central Chukchi	5	1	2	4	1	1	1	1	2	1	3	1
74	Offshore Herald Island	5	3	4	4	2	2	3	1	4	1	4	2
80	Beaufort Outer Shelf 1	1	1	1	2	1	2	1	-	2	1	3	3
82	N Chukotka Nrshr 2	4	9	5	2	7	4	8	8	5	4	2	2
83	N Chukotka Nrshr 3	3	9	6	3	10	5	8	13	5	6	2	2
91	Hope Sea Valley	3	5	4	3	4	4	5	4	5	3	3	3
101	Beaufort Outer Shelf 2	1	1	1	1	-	1	1	-	1	1	2	2
102	Opilio Crab EFH	-	2	1	1	6	3	1	8	2	4	1	1
103	Saffron Cod EFH	12	25	25	16	49	48	24	51	32	68	25	67
107	Pt Hope Offshore	-	1	1	1	4	2	1	7	1	3	1	1
108	Barrow Feeding Aggregation	4	2	4	6	1	5	3	1	4	2	8	10
109	AK BFT Shelf Edge	-	-	-	1	-	-	-	-	-	-	1	-
110	AK BFT Outer Shelf&Slope 1	1	-	1	1	-	-	-	-	-	-	1	1
111	AK BFT Outer Shelf&Slope 2	1	-	1	1	-	1	-	-	1	-	2	1
112	AK BFT Outer Shelf&Slope 3	1	-	1	1	-	1	1	-	1	1	2	1
113	AK BFT Outer Shelf&Slope 4	1	1	1	2	1	2	1	-	1	1	2	2
114	AK BFT Outer Shelf&Slope 5	1	1	2	2	1	2	1	-	2	1	3	2
115	AK BFT Outer Shelf&Slope 6	2	1	2	3	1	3	2	1	2	1	4	4
116	AK BFT Outer Shelf&Slope 7	3	2	3	4	1	4	2	1	3	2	5	6
117	AK BFT Outer Shelf&Slope 8	4	2	4	5	2	5	3	2	4	3	8	8
118	AK BFT Outer Shelf&Slope 9	4	3	5	6	4	7	3	3	5	4	8	10
119	AK BFT Outer Shelf&Slope 10	7	7	10	12	10	15	8	8	11	11	17	22
120	Russia CH GW Fall 1&2	2	7	5	2	9	4	6	12	5	6	2	2
121	C Lisburne - Pt Hope	-	2	1	1	8	2	2	17	1	5	1	1
122	North Chukotka Offshore	2	3	2	2	1	1	3	1	2	1	2	1
123	AK Chukchi Offshore	5	6	9	8	3	5	4	3	8	3	8	4
124	Central Chukchi Offshore	4	7	5	4	4	5	7	4	6	4	5	3

Table A.2-29. 180 Days-(Summer ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	25	39	35	26	49	43	38	50	38	58	28	45
1	Kasegaluk Lagoon Area	1	3	3	1	9	4	3	9	3	19	1	1
2	Point Barrow, Plover Islands	1	-	1	1	1	1	-	-	1	1	2	2
3	SUA: Uelen/Russia	2	4	3	2	4	2	4	5	3	2	1	1
4	SUA:Naukan/Russia	-	-	-	-	1	-	-	1	-	1	-	-
6	Hanna Shoal	10	9	12	25	5	13	9	4	12	5	38	13
7	Krill Trap	3	3	4	4	4	7	3	3	5	5	6	10
10	Ledyard Bay SPEI Critical Habitat Area	2	8	6	2	29	14	7	33	6	59	2	5
11	Wrangel Island 12 nm & Offshore	12	11	10	9	5	6	12	5	8	4	7	5
14	Cape Thompson Seabird Colony Area	-	-	-	-	2	-	-	2	-	1	-	-
15	Cape Lisburne Seabird Colony Area	1	3	2	1	13	4	3	24	2	10	1	2
16	Barrow Canyon	5	9	11	8	12	19	9	9	14	15	13	31
18	Murre Rearing and Molting Area	5	14	10	6	20	10	11	25	10	12	5	5
19	Chukchi Spring Lead System	-	1	2	1	8	8	1	8	3	15	2	12
20	East Chukchi Offshore	1	1	1	2	1	2	1	1	1	1	3	4
23	Polar Bear Offshore	-	1	1	1	14	7	1	14	2	16	2	4
26	AK BFT Bowhead FM 5	-	-	-	-	-	-	-	-	-	-	1	1
27	AK BFT Bowhead FM 6	-	-	-	1	-	-	-	-	-	-	1	1
28	AK BFT Bowhead FM 7	-	-	-	1	-	-	-	-	-	-	1	1
29	AK BFT Bowhead FM 8	-	-	1	1	-	1	-	-	-	-	1	1
30	Beaufort Spring Lead 1	-	-	-	-	1	2	-	-	1	1	1	4
31	Beaufort Spring Lead 2	-	-	-	-	-	1	-	-	-	1	-	2
32	Beaufort Spring Lead 3	-	-	-	-	-	-	-	-	-	-	-	1
38	SUA: Pt. Hope - Cape Lisburne	-	1	-	-	4	1	1	7	1	3	-	1
39	SUA: Pt. Lay - Kasegaluk	1	4	3	1	11	5	3	12	3	31	1	2

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
40	SUA: Icy Cape - Wainwright	7	16	16	8	30	35	16	25	21	47	10	62
42	SUA: Barrow - East Arch	5	5	6	8	5	8	5	4	6	5	11	11
43	SUA: Nuiqsut - Cross Island	2	2	3	3	2	3	2	1	3	2	5	4
44	SUA: Kaktovik	1	-	1	1	-	1	-	-	1	-	1	1
46	Wrangel Island 12 nmi Buffer 2	1	1	2	2	1	1	1	-	2	1	2	1
47	Hanna Shoal Walrus Use Area	27	23	35	76	20	48	24	14	36	20	**	57
48	Chukchi Lead System 4	-	-	-	-	-	1	-	-	-	1	1	1
49	Chukchi Spring Lead 1	-	-	-	-	1	-	-	3	-	1	-	-
50	Pt Lay Walrus Offshore	4	12	9	3	41	21	11	39	11	60	3	9
51	Pt Lay Walrus Nearshore	1	4	2	1	12	5	3	12	3	38	1	2
52	Russian Coast Walrus Offshore	6	16	11	6	20	11	14	25	12	13	6	6
53	Chukchi Spring Lead 2	-	1	1	-	11	5	1	12	1	17	-	1
54	Chukchi Spring Lead 3	-	2	2	1	6	9	2	4	4	10	3	16
55	Point Barrow, Plover Islands	1	-	1	1	1	1	-	-	1	1	2	2
56	Hanna Shoal Area	15	12	16	35	9	20	13	6	16	9	54	26
57	Skull Cliffs	3	4	5	3	7	10	4	6	7	10	4	16
58	Russian Coast Walrus Nearshore	2	5	4	2	8	4	4	11	4	5	2	2
59	Ostrov Kolyuchin	1	2	1	1	2	1	2	3	1	1	1	1
61	Pt Lay-Barrow BH GW SSF	17	26	29	24	38	55	26	32	36	60	37	86
63	North Chukchi	5	1	3	3	1	1	2	-	2	1	2	1
64	Peard Bay Area	6	9	11	8	13	21	10	10	15	17	14	35
65	Smith Bay	-	-	-	-	-	-	-	-	-	-	1	1
66	Herald Island	4	3	3	3	2	2	3	2	3	1	3	2
70	North Central Chukchi	5	1	3	5	1	2	1	1	3	1	4	2
74	Offshore Herald Island	5	3	4	5	2	3	4	2	4	1	5	2
80	Beaufort Outer Shelf 1	1	1	2	2	1	2	1	-	2	1	3	3
82	N Chukotka Nrshr 2	4	9	5	2	7	4	8	8	5	4	2	2
83	N Chukotka Nrshr 3	4	9	7	4	10	5	8	13	6	6	3	3
91	Hope Sea Valley	4	6	4	3	4	4	5	4	5	3	3	3
101	Beaufort Outer Shelf 2	1	1	1	2	1	2	1	-	1	1	2	2
102	Opilio Crab EFH	-	2	1	1	6	3	1	8	2	4	1	1
103	Saffron Cod EFH	13	25	25	17	49	49	25	51	32	68	26	67
107	Pt Hope Offshore	-	1	1	1	4	2	1	7	1	3	1	1
108	Barrow Feeding Aggregation	4	3	4	6	2	6	3	1	4	3	9	10
109	AK BFT Shelf Edge	1	1	1	1	-	1	1	-	1	-	1	1
110	AK BFT Outer Shelf&Slope 1	1	1	1	1	-	1	1	-	1	-	1	1
111	AK BFT Outer Shelf&Slope 2	1	1	1	1	1	1	1	-	1	1	2	2
112	AK BFT Outer Shelf&Slope 3	1	1	1	1	1	2	1	-	2	1	2	2
113	AK BFT Outer Shelf&Slope 4	1	2	2	2	1	2	2	1	2	1	3	3
114	AK BFT Outer Shelf&Slope 5	2	2	2	2	1	2	2	1	2	1	3	3
115	AK BFT Outer Shelf&Slope 6	2	2	3	3	1	3	2	1	3	1	4	4
116	AK BFT Outer Shelf&Slope 7	3	3	3	4	2	5	3	1	4	2	6	6
117	AK BFT Outer Shelf&Slope 8	4	3	5	6	3	6	4	2	5	3	8	8
118	AK BFT Outer Shelf&Slope 9	4	4	5	6	4	8	4	4	6	5	9	11
119	AK BFT Outer Shelf&Slope 10	7	8	10	12	10	16	8	8	11	11	18	23
120	Russia CH GW Fall 1&2	3	7	5	3	10	5	6	12	6	6	3	2
121	C Lisburne - Pt Hope	-	2	1	1	8	2	2	17	1	5	1	1
122	North Chukotka Offshore	2	3	3	2	1	2	3	1	3	1	2	1
123	AK Chukchi Offshore	5	6	9	8	4	5	4	3	8	3	8	5
124	Central Chukchi Offshore	4	7	6	4	4	5	7	4	6	4	5	3

Table A.2-30. 360 Days-(Summer ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	25	40	35	26	49	43	38	50	38	58	28	45
1	Kasegaluk Lagoon Area	1	3	3	1	9	4	3	9	3	19	1	1
2	Point Barrow, Plover Islands	1	-	1	1	1	1	-	-	1	1	2	2
3	SUA: Uelen/Russia	2	4	3	2	4	2	4	5	3	2	1	1
4	SUA:Naukan/Russia	-	-	-	-	1	-	-	1	-	1	-	-
6	Hanna Shoal	10	9	12	25	5	13	9	4	12	5	38	14
7	Krill Trap	3	3	4	4	4	7	3	3	5	5	6	10
10	Ledyard Bay SPEI Critical Habitat Area	2	8	6	2	29	14	7	33	6	59	2	5
11	Wrangel Island 12 nm & Offshore	12	11	10	9	5	6	12	5	8	4	7	5
14	Cape Thompson Seabird Colony Area	-	-	-	-	2	-	-	2	-	1	-	-
15	Cape Lisburne Seabird Colony Area	1	3	2	1	13	4	3	24	2	10	1	2
16	Barrow Canyon	5	9	11	8	12	19	9	9	14	15	13	31
18	Murre Rearing and Molting Area	5	14	10	6	20	10	11	25	10	12	5	5
19	Chukchi Spring Lead System	-	1	2	1	8	8	1	8	3	15	2	12
20	East Chukchi Offshore	1	1	1	2	1	2	1	1	1	1	3	4

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
23	Polar Bear Offshore	-	1	1	1	14	7	1	14	2	16	2	4
26	AK BFT Bowhead FM 5	-	-	-	-	-	-	-	-	-	-	1	1
27	AK BFT Bowhead FM 6	-	-	-	1	-	-	-	-	-	-	1	1
28	AK BFT Bowhead FM 7	-	-	-	1	-	-	-	-	-	-	1	1
29	AK BFT Bowhead FM 8	-	-	1	1	-	1	-	-	-	-	1	1
30	Beaufort Spring Lead 1	-	-	-	-	1	2	-	-	1	1	1	4
31	Beaufort Spring Lead 2	-	-	-	-	-	1	-	-	-	1	-	2
32	Beaufort Spring Lead 3	-	-	-	-	-	-	-	-	-	-	-	1
38	SUA: Pt. Hope - Cape Lisburne	-	1	-	-	4	1	1	7	1	3	-	1
39	SUA: Pt. Lay - Kasegaluk	1	4	3	1	11	5	3	12	3	31	1	2
40	SUA: Icy Cape - Wainwright	7	16	16	8	30	35	16	25	21	47	10	62
42	SUA: Barrow - East Arch	5	5	6	8	5	8	5	4	6	5	11	11
43	SUA: Nuiqsut - Cross Island	2	2	3	3	2	3	2	1	3	2	5	4
44	SUA: Kaktovik	1	-	1	1	-	1	-	-	1	-	1	1
46	Wrangel Island 12 nmi Buffer 2	1	1	2	2	1	2	1	-	2	1	2	1
47	Hanna Shoal Walrus Use Area	27	23	35	76	20	48	24	14	36	20	**	57
48	Chukchi Lead System 4	-	-	-	-	-	1	-	-	-	1	1	1
49	Chukchi Spring Lead 1	-	-	-	-	1	-	-	3	-	1	-	-
50	Pt Lay Walrus Offshore	4	12	9	3	41	21	11	39	11	60	3	9
51	Pt Lay Walrus Nearshore	1	4	2	1	12	5	3	12	3	38	1	2
52	Russian Coast Walrus Offshore	6	16	11	6	20	11	14	25	12	13	6	6
53	Chukchi Spring Lead 2	-	1	1	-	11	5	1	12	1	17	-	1
54	Chukchi Spring Lead 3	-	2	2	1	6	9	2	4	4	10	3	16
55	Point Barrow, Plover Islands	1	-	1	1	1	1	-	-	1	1	2	2
56	Hanna Shoal Area	15	12	16	35	9	20	13	6	16	9	54	26
57	Skull Cliffs	3	4	5	3	7	10	4	6	7	10	4	16
58	Russian Coast Walrus Nearshore	2	5	4	2	8	4	4	11	4	5	2	2
59	Ostrov Kolyuchin	1	2	1	1	2	1	2	3	1	1	1	1
61	Pt Lay-Barrow BH GW SSF	17	26	29	24	38	55	26	32	36	60	37	86
63	North Chukchi	5	1	3	3	1	1	2	-	2	1	2	1
64	Peard Bay Area	6	9	11	8	13	21	10	10	15	17	14	35
65	Smith Bay	-	-	-	-	-	-	-	-	-	-	1	1
66	Herald Island	4	3	3	3	2	2	3	2	3	1	3	2
70	North Central Chukchi	5	1	3	5	1	2	1	1	3	1	4	2
74	Offshore Herald Island	5	3	4	5	2	3	4	2	4	1	5	2
80	Beaufort Outer Shelf 1	1	1	2	2	1	2	1	-	2	1	3	3
82	N Chukotka Nrshr 2	4	9	5	2	7	4	8	8	5	4	2	2
83	N Chukotka Nrshr 3	4	9	7	4	10	5	8	13	6	6	3	3
91	Hope Sea Valley	4	6	4	3	4	4	5	4	5	3	3	3
101	Beaufort Outer Shelf 2	1	1	1	2	1	2	1	-	1	1	2	2
102	Opilio Crab EFH	-	2	1	1	6	3	1	8	2	4	1	1
103	Saffron Cod EFH	13	25	25	17	49	49	25	51	32	68	26	67
107	Pt Hope Offshore	-	1	1	1	4	2	1	7	1	3	1	1
108	Barrow Feeding Aggregation	4	3	4	6	2	6	3	1	4	3	9	10
109	AK BFT Shelf Edge	1	1	1	1	-	1	1	-	1	-	1	1
110	AK BFT Outer Shelf&Slope 1	1	1	1	1	-	1	1	-	1	-	1	1
111	AK BFT Outer Shelf&Slope 2	1	1	1	1	1	1	1	-	1	1	2	2
112	AK BFT Outer Shelf&Slope 3	1	1	1	1	1	2	1	-	2	1	2	2
113	AK BFT Outer Shelf&Slope 4	1	2	2	2	1	2	2	1	2	1	3	3
114	AK BFT Outer Shelf&Slope 5	2	2	2	2	1	2	2	1	2	1	3	3
115	AK BFT Outer Shelf&Slope 6	2	2	3	3	1	3	2	1	3	1	4	4
116	AK BFT Outer Shelf&Slope 7	3	3	3	4	2	5	3	1	4	2	6	6
117	AK BFT Outer Shelf&Slope 8	4	3	5	6	3	6	4	2	5	3	8	8
118	AK BFT Outer Shelf&Slope 9	4	4	5	6	4	8	4	4	6	5	9	11
119	AK BFT Outer Shelf&Slope 10	7	8	10	12	10	16	8	8	11	11	18	23
120	Russia CH GW Fall 1&2	3	7	5	3	10	5	6	12	6	6	3	2
121	C Lisburne - Pt Hope	-	2	1	1	8	2	2	17	1	5	1	1
122	North Chukotka Offshore	2	3	3	2	1	2	3	1	3	1	2	1
123	AK Chukchi Offshore	5	6	9	8	4	5	4	3	8	3	8	5
124	Central Chukchi Offshore	4	7	6	4	4	5	7	4	6	4	5	3

Tables A.2-31 through A.2-36 represent summer conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain land segment within:

Table A.2-31. 3 Days-(Summer LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
65	Buckland, Cape Lisburne	-	-	-	-	-	-	-	1	-	-	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	-	-	-	-	-	3	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
73	Tungaich Point, Tungak Creek	-	-	-	-	-	-	-	-	-	3	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	-	-	-	-	-	2	-	-
75	Akeonik, Icy Cape	-	-	-	-	-	-	-	-	-	1	-	-
78	Point Collie, Sigeakruk Point	-	-	-	-	-	-	-	-	-	1	-	-
79	Point Belcher, Wainwright	-	-	-	-	-	1	-	-	-	1	-	2
80	Eluksingiak Point, Kugrua Bay	-	-	-	-	-	-	-	-	-	-	-	3
84	Will Rogers & Wiley Post Mem.	-	-	-	-	-	-	-	-	-	-	-	2
85	Barrow, Browerville, Elson Lag.	-	-	-	-	-	-	-	-	-	-	-	3

Table A.2-32. 10 Days-(Summer LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
64	Kukpuk River, Point Hope	-	-	-	-	-	-	-	1	-	-	-	-
65	Buckland, Cape Lisburne	-	-	-	-	1	-	-	2	-	1	-	-
66	Ayugatak Lagoon	-	-	-	-	-	-	-	1	-	1	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	1	-	-	-	-
71	Kukpowruk River, Sitkok Point	-	-	-	-	1	-	-	1	-	-	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	1	-	-	1	-	3	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	1	-	-	1	-	3	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	1	-	-	1	-	3	-	-
75	Akeonik, Icy Cape	-	-	-	-	1	1	-	1	-	3	-	-
76	Avak Inlet, Tunalik River	-	-	-	-	-	-	-	-	-	1	-	-
77	Nivat Point, Nokotlek Point	-	-	-	-	-	-	-	-	-	1	-	-
78	Point Collie, Sigeakruk Point	-	-	-	-	1	1	1	1	1	2	-	1
79	Point Belcher, Wainwright	-	1	1	-	2	2	1	1	1	4	-	3
80	Eluksingiak Point, Kugrua Bay	-	-	1	-	1	2	-	-	1	2	-	4
81	Peard Bay, Point Franklin	-	-	-	-	-	-	-	-	-	-	-	1
82	Skull Cliff	-	-	-	-	-	-	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	-	1	-	-	-	-	-	1
84	Will Rogers & Wiley Post Mem.	-	-	1	-	1	2	-	-	1	1	1	4
85	Barrow, Browerville, Elson Lag.	-	-	1	1	1	4	-	-	2	2	2	7

Table A.2-33. 30 Days-(Summer LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
5	Mys Evans	1	-	-	-	-	-	1	-	-	-	-	-
6	Ostrov Mushtakova	1	1	1	1	-	-	1	-	1	-	-	-
7	Kosa Bruch	1	1	1	1	-	-	1	-	1	-	-	-
8	E. Wrangel Island, Skeletov	1	1	1	1	-	-	1	-	1	-	1	-
21	Laguna Pil'khikay, Pil'khikay	-	1	-	-	-	-	-	-	-	-	-	-
22	Rypkarpyy, Mys Shmidta	-	1	-	-	1	-	1	1	1	1	-	-
23	Emuem, Tenkergin	-	1	-	-	1	-	1	1	-	-	-	-
24	LS 24	-	1	-	-	1	-	1	1	-	-	-	-
25	Laguna Amguema, Yulinu	1	1	1	-	1	1	1	1	-	1	-	-
26	Ekugvaam, Kepin, Pil'khin	-	1	1	-	1	1	1	1	-	1	-	-
27	Laguna Nut, Rigol'	-	1	1	-	1	1	1	1	1	1	1	1
28	Vankarem,Vankarem Laguna	-	1	1	-	1	1	1	1	1	1	1	1
29	Mys Onman, Vel'may	-	1	1	-	1	1	1	1	1	1	-	1
30	Nutepynmin, Pyngopil'gyn	-	1	1	-	1	1	1	2	1	1	-	-
31	Alyatki, Zaliv Tasytkhin	-	1	1	-	1	1	1	1	1	1	-	-
32	Mys Dzhenretlen, Eynenekvyk	-	1	1	-	1	-	1	1	1	1	-	-
33	Neskan, Laguna Neskan	-	1	1	-	1	-	1	1	1	1	-	-
34	Tepken, Memino	-	1	-	-	1	-	1	1	1	1	-	-
35	Enurmino, Mys Neten	-	1	-	-	1	-	1	1	-	1	-	-
36	Mys Serdtse-Kamen	-	-	-	-	1	-	-	1	-	-	-	-
37	Chegitun, Utkan	-	-	-	-	-	-	-	1	-	-	-	-
64	Kukpuk River, Point Hope	-	-	-	-	1	-	-	1	-	1	-	-
65	Buckland, Cape Lisburne	-	-	-	-	2	1	-	3	-	1	-	-
66	Ayugatak Lagoon	-	-	-	-	1	-	-	1	-	1	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	1	-	-	1	-	-	-	-
69	Cape Beaufort, Omalik Lagoon	-	-	-	-	-	-	-	1	-	-	-	-
70	Kuchaurak and Kuchiak Creek	-	-	-	-	-	-	-	1	-	-	-	-
71	Kukpowruk River, Sitkok Point	-	-	-	-	1	-	-	1	-	1	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	1	-	-	2	-	4	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	1	1	-	1	-	4	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	1	-	-	2	1	1	1	-	3	-	-
75	Akeonik, Icy Cape	-	1	1	-	2	1	1	1	1	3	-	-
76	Avak Inlet, Tunalik River	-	-	-	-	1	1	-	1	-	2	-	-
77	Nivat Point, Nokotlek Point	-	-	-	-	1	1	-	1	-	1	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
78	Point Collie, Sigeakruk Point	-	1	1	-	2	2	1	1	1	3	-	1
79	Point Belcher, Wainwright	1	2	2	1	4	3	2	2	2	6	1	4
80	Eluksingiak Point, Kugrua Bay	1	1	1	1	2	3	1	2	2	3	-	4
81	Peard Bay, Point Franklin	-	-	-	-	-	1	-	-	1	1	-	1
82	Skull Cliff	-	-	-	-	-	1	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	-	1	-	-	1	1	1	1
84	Will Rogers & Wiley Post Mem.	1	1	1	1	2	3	1	1	2	3	2	6
85	Barrow, Browerville, Elson Lag.	1	2	4	3	4	6	2	3	5	4	5	10
88	Cape Simpson, Piasuk River	-	-	-	-	-	-	-	-	-	-	1	-

Table A.2-34. 60 Days-(Summer LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
5	Mys Evans	1	1	1	1	-	-	1	-	-	-	-	-
6	Ostrov Mushtakova	1	1	1	1	-	-	1	-	1	-	-	-
7	Kosa Bruch	1	1	1	1	-	1	1	-	1	-	1	1
8	E. Wrangel Island, Skeletov	1	1	1	1	1	1	1	-	1	-	1	1
21	Laguna Pil'khikay, Pil'khikay	-	1	-	-	-	-	-	-	-	-	-	-
22	Rypkarpyy, Mys Shmidta	-	1	1	-	1	1	1	1	1	1	-	-
23	Emuem, Tenkergin	-	1	-	-	1	1	1	1	-	1	-	-
24	LS 24	1	1	-	-	1	1	1	1	1	1	-	-
25	Laguna Amguema, Yulinu	1	1	1	-	1	1	1	1	1	1	1	1
26	Ekugvaam, Kepin, Pil'khin	1	1	1	-	1	1	1	1	1	1	-	-
27	Laguna Nut, Rigol'	-	1	1	1	1	1	1	1	1	1	1	1
28	Vankarem,Vankarem Laguna	-	1	1	1	1	1	1	1	1	1	1	1
29	Mys Onman, Vel'may	-	1	1	-	1	1	1	1	1	1	-	1
30	Nutepynmin, Pyngopil'gyn	1	1	1	1	1	1	1	2	1	1	1	-
31	Alyatki, Zaliv Tasytkhin	1	1	1	-	1	1	1	2	1	1	1	1
32	Mys Dzhenretlen, Eynenekvyk	1	1	1	-	1	1	1	1	1	1	-	1
33	Neskan, Laguna Neskan	-	1	1	-	1	1	1	1	1	1	-	-
34	Tepken, Memino	-	1	1	-	1	-	1	1	1	1	-	-
35	Enurmino, Mys Neten	-	1	-	-	1	-	1	1	-	1	-	-
36	Mys Serdtse-Kamen	-	-	-	-	1	-	-	1	-	-	-	-
37	Chegitun, Utkan	-	-	-	-	-	-	-	1	-	-	-	-
64	Kukpuk River, Point Hope	-	-	-	-	1	-	-	1	-	1	-	-
65	Buckland, Cape Lisburne	-	-	-	-	2	1	-	4	-	1	-	-
66	Ayugatak Lagoon	-	-	-	-	1	-	-	1	-	1	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	1	-	-	-	-
69	Cape Beaufort, Omalik Lagoon	-	-	-	-	-	-	-	1	-	-	-	-
70	Kuchaurak and Kuchiak Creek	-	-	-	-	-	-	-	1	-	-	-	-
71	Kukpowruk River, Sitkok Point	-	-	-	-	1	-	-	1	-	1	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	1	-	-	2	-	4	-	-
73	Tungaich Point, Tungak Creek	-	1	-	-	1	1	1	1	-	4	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	1	-	-	2	1	1	1	-	3	-	-
75	Akeonik, Icy Cape	-	1	1	-	2	1	1	1	1	3	-	-
76	Avak Inlet, Tunalik River	-	-	-	-	1	1	-	1	-	2	-	-
77	Nivat Point, Nokotlek Point	-	-	-	-	1	1	-	1	-	1	-	-
78	Point Collie, Sigeakruk Point	-	1	1	-	2	2	1	1	1	3	-	1
79	Point Belcher, Wainwright	1	2	2	1	4	4	2	3	3	6	1	4
80	Eluksingiak Point, Kugrua Bay	1	1	1	1	2	3	1	2	2	3	-	4
81	Peard Bay, Point Franklin	-	-	-	-	-	1	-	-	1	1	-	1
82	Skull Cliff	-	-	-	-	-	1	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	1	1	-	-	1	1	1	1
84	Will Rogers & Wiley Post Mem.	1	1	2	1	2	3	1	1	2	3	2	6
85	Barrow, Browerville, Elson Lag.	2	3	4	3	4	6	3	3	5	5	5	10
88	Cape Simpson, Piasuk River	-	-	-	-	-	-	-	-	-	-	1	-

Table A.2-35. 180 Days-(Summer LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
3	Mys Florens, Gusinaya	1	-	-	-	-	-	-	-	-	-	-	-
4	Mys Ushakova, Laguna Drem-Khed	1	-	-	1	-	-	1	-	1	-	-	-
5	Mys Evans	1	1	1	1	-	1	1	-	1	-	1	-
6	Ostrov Mushtakova	2	1	1	1	-	1	1	-	1	-	1	1
7	Kosa Bruch	2	1	1	1	1	1	2	1	1	-	1	1
8	E. Wrangel Island, Skeletov	1	1	1	1	1	1	1	-	1	-	1	1
21	Laguna Pil'khikay, Pil'khikay	-	1	-	-	-	-	1	-	-	-	-	-
22	Rypkarpyy, Mys Shmidta	-	1	1	1	1	1	1	1	1	1	1	-
23	Emuem, Tenkergin	-	1	-	-	1	1	1	1	1	1	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
24	LS 24	1	1	1	-	1	1	1	1	1	1	1	-
25	Laguna Amguema, Yulinu	1	1	1	1	1	1	1	1	1	1	1	1
26	Ekugvaam, Kepin, Pil'khin	1	1	1	1	1	1	1	1	1	1	-	-
27	Laguna Nut, Rigol'	1	1	1	1	1	1	1	1	1	1	1	1
28	Vankarem,Vankarem Laguna	1	1	1	1	1	1	1	1	1	1	1	1
29	Mys Onman, Vel'may	-	1	1	1	1	1	1	1	1	1	-	1
30	Nutepynmin, Pyngopil'gyn	1	1	1	1	1	1	1	2	1	1	1	1
31	Alyatki, Zaliv Tasytkhin	1	1	1	1	1	1	1	2	1	1	1	1
32	Mys Dzhenretlen, Eynenekvyk	1	1	1	1	1	1	1	1	1	1	-	1
33	Neskan, Laguna Neskan	1	1	1	-	1	1	1	1	1	1	-	-
34	Tepken, Memino	-	1	1	-	1	1	1	1	1	1	-	-
35	Enurmino, Mys Neten	-	1	1	-	1	1	1	1	1	1	-	-
36	Mys Serdtse-Kamen	-	-	-	-	1	-	-	1	-	-	-	-
37	Chegitun, Utkan	-	-	-	-	-	-	-	1	-	-	-	-
64	Kukpuk River, Point Hope	-	-	-	-	1	-	-	1	-	1	-	-
65	Buckland, Cape Lisburne	-	-	-	-	2	1	-	4	-	1	-	-
66	Ayugatak Lagoon	-	-	-	-	1	-	-	1	-	1	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	1	-	-	-	-
69	Cape Beaufort, Omalik Lagoon	-	-	-	-	-	-	-	1	-	-	-	-
70	Kuchaurak and Kuchiak Creek	-	-	-	-	-	-	-	1	-	-	-	-
71	Kukpowruk River, Sitkok Point	-	-	-	-	1	-	-	1	-	1	-	-
72	Point Lay, Siksrikpak Point	-	1	-	-	1	-	-	2	-	4	-	-
73	Tungaich Point, Tungak Creek	-	1	-	-	1	1	1	1	-	4	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	1	-	-	2	1	1	1	-	3	-	-
75	Akeonik, Icy Cape	-	1	1	-	2	1	1	1	1	3	-	-
76	Avak Inlet, Tunalik River	-	-	-	-	1	1	-	1	-	2	-	-
77	Nivat Point, Nokotlek Point	-	-	-	-	1	1	-	1	-	1	-	-
78	Point Collie, Sigeakruk Point	-	1	1	-	2	2	1	1	1	3	-	1
79	Point Belcher, Wainwright	1	2	2	1	4	4	2	3	3	6	1	4
80	Eluksingiak Point, Kugrua Bay	1	1	1	1	2	3	1	2	2	3	-	4
81	Peard Bay, Point Franklin	-	-	-	-	-	1	-	-	1	1	-	1
82	Skull Cliff	-	-	-	-	-	1	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	1	1	-	-	1	1	1	1
84	Will Rogers & Wiley Post Mem.	1	1	2	1	2	4	1	2	2	3	2	6
85	Barrow, Browerville, Elson Lag.	2	3	4	3	4	7	3	3	5	5	5	10
88	Cape Simpson, Piasuk River	-	-	-	-	-	-	-	-	-	-	1	-

Table A.2-36. 360 Days-(Summer LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
3	Mys Florens, Gusinaya	1	-	-	1	-	-	-	-	-	-	-	-
4	Mys Ushakova, Laguna Drem-Khed	1	-	1	1	-	-	1	-	1	-	-	-
5	Mys Evans	1	1	1	1	-	1	1	-	1	-	1	-
6	Ostrov Mushtakova	2	1	1	1	-	1	1	-	1	-	1	1
7	Kosa Bruch	2	1	1	1	1	1	2	1	1	-	1	1
8	E. Wrangel Island, Skeletov	1	1	1	1	1	1	1	-	1	-	1	1
21	Laguna Pil'khikay, Pil'khikay	-	1	-	-	-	-	1	-	-	-	-	-
22	Rypkarpyy, Mys Shmidta	-	1	1	1	1	1	1	1	1	1	1	-
23	Emuem, Tenkergin	-	1	-	-	1	1	1	1	1	1	-	-
24	LS 24	1	1	1	-	1	1	1	1	1	1	1	-
25	Laguna Amguema, Yulinu	1	1	1	1	1	1	1	1	1	1	1	1
26	Ekugvaam, Kepin, Pil'khin	1	1	1	1	1	1	1	1	1	1	-	-
27	Laguna Nut, Rigol'	1	1	1	1	1	1	1	1	1	1	1	1
28	Vankarem,Vankarem Laguna	1	1	1	1	1	1	1	1	1	1	1	1
29	Mys Onman, Vel'may	-	1	1	1	1	1	1	1	1	1	-	1
30	Nutepynmin, Pyngopil'gyn	1	1	1	1	1	1	1	2	1	1	1	1
31	Alyatki, Zaliv Tasytkhin	1	1	1	1	1	1	1	2	1	1	1	1
32	Mys Dzhenretlen, Eynenekvyk	1	1	1	1	1	1	1	1	1	1	-	1
33	Neskan, Laguna Neskan	1	1	1	-	1	1	1	1	1	1	-	-
34	Tepken, Memino	-	1	1	-	1	1	1	1	1	1	-	-
35	Enurmino, Mys Neten	-	1	1	-	1	1	1	1	1	1	-	-
36	Mys Serdtse-Kamen	-	-	-	-	1	-	-	1	-	-	-	-
37	Chegitun, Utkan	-	-	-	-	-	-	-	1	-	-	-	-
64	Kukpuk River, Point Hope	-	-	-	-	1	-	-	1	-	1	-	-
65	Buckland, Cape Lisburne	-	-	-	-	2	1	-	4	-	1	-	-
66	Ayugatak Lagoon	-	-	-	-	1	-	-	1	-	1	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	1	-	-	-	-
69	Cape Beaufort, Omalik Lagoon	-	-	-	-	-	-	-	1	-	-	-	-
70	Kuchaurak and Kuchiak Creek	-	-	-	-	-	-	-	1	-	-	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
71	Kukpowruk River, Sitkok Point	-	-	-	-	1	-	-	1	-	1	-	-
72	Point Lay, Siksrikpak Point	-	1	-	-	1	-	-	2	-	4	-	-
73	Tungaich Point, Tungak Creek	-	1	-	-	1	1	1	1	-	4	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	1	-	-	2	1	1	1	-	3	-	-
75	Akeonik, Icy Cape	-	1	1	-	2	1	1	1	1	3	-	-
76	Avak Inlet, Tunalik River	-	-	-	-	1	1	-	1	-	2	-	-
77	Nivat Point, Nokotlek Point	-	-	-	-	1	1	-	1	-	1	-	-
78	Point Collie, Sigeakruk Point	-	1	1	-	2	2	1	1	1	3	-	1
79	Point Belcher, Wainwright	1	2	2	1	4	4	2	3	3	6	1	4
80	Eluksingiak Point, Kugrua Bay	1	1	1	1	2	3	1	2	2	3	-	4
81	Peard Bay, Point Franklin	-	-	-	-	-	1	-	-	1	1	-	1
82	Skull Cliff	-	-	-	-	-	1	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	1	1	-	-	1	1	1	1
84	Will Rogers & Wiley Post Mem.	1	1	2	1	2	4	1	2	2	3	2	6
85	Barrow, Browerville, Elson Lag.	2	3	4	3	4	7	3	3	5	5	5	10
88	Cape Simpson, Piasuk River	-	-	-	-	-	-	-	-	-	-	1	-

Tables A.2-37 through A.2-42 represent summer conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain group of land segments:

Table A.2-37. 3 Days-(Summer GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
143	WAH Insect Relief	-	-	-	-	-	-	-	1	-	-	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	-	-	-	1	-	-	-	-
145	Cape Lisburne	-	-	-	-	-	-	-	2	-	-	-	-
146	Ledyard Bay	-	-	-	-	-	-	-	2	-	-	-	-
147	Point Lay Haulout	-	-	-	-	-	-	-	-	-	8	-	-
148	Kasegaluk Brown Bears	-	-	-	-	-	1	-	-	-	6	-	-
149	National Petroleum Reserve Alaska	-	-	-	-	-	1	-	-	-	-	-	4
151	Kuk River	-	-	-	-	-	1	-	-	-	1	-	2
152	TCH Insect Relief/Calving	-	-	-	-	-	-	-	-	-	-	-	2
176	United States Chukchi Coast	-	-	-	-	1	2	-	2	-	11	-	9
177	United States Beaufort Coast	-	-	-	-	-	-	-	-	-	-	-	3

Table A.2-38. 10 Days-(Summer GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	1	-	-	-	-	-	-	-	-	-	-	-
135	Kolyuchin Bay	-	-	-	-	-	-	-	1	-	-	-	-
143	WAH Insect Relief	-	-	-	-	1	-	-	2	-	-	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	1	-	-	2	-	1	-	-
145	Cape Lisburne	-	-	-	-	1	-	-	3	-	2	-	-
146	Ledyard Bay	-	-	-	-	2	-	-	5	-	2	-	-
147	Point Lay Haulout	-	1	-	-	3	1	-	3	-	10	-	-
148	Kasegaluk Brown Bears	-	1	1	-	4	2	1	3	1	11	-	1
149	National Petroleum Reserve Alaska	-	1	1	-	2	4	1	1	2	5	1	7
150	Kasegaluk Lagoon Special Use Area	-	-	-	-	1	1	-	-	-	2	-	1
151	Kuk River	-	1	1	-	3	3	1	2	2	6	-	4
152	TCH Insect Relief/Calving	-	-	1	-	1	2	-	-	1	1	1	4
174	Russia Chukchi Coast Marine Mammals	1	2	-	-	1	-	1	2	-	-	-	-
175	Russia Chukchi Coast	1	2	-	-	1	-	1	2	-	-	-	-
176	United States Chukchi Coast	1	3	3	1	12	11	3	13	5	28	2	16
177	United States Beaufort Coast	-	-	1	1	1	4	-	-	2	2	3	7

Table A.2-39. 30 Days-(Summer GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	5	4	4	3	1	1	5	1	3	1	2	1
135	Kolyuchin Bay	1	4	2	1	4	2	4	5	2	3	1	1
136	Ostrov Idlidlya	1	2	1	-	2	1	2	2	1	1	-	-
137	Mys Serditse Kamen	-	1	1	-	2	1	1	2	1	1	-	-
138	Chukota Coast Haulout	-	1	1	-	3	1	1	3	1	2	-	1
143	WAH Insect Relief	-	-	-	-	2	-	-	3	-	1	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	2	1	-	4	-	1	-	-
145	Cape Lisburne	-	1	-	-	3	1	1	4	-	3	-	1
146	Ledyard Bay	-	1	-	-	4	1	1	7	1	4	-	-
147	Point Lay Haulout	-	2	1	-	5	2	2	5	1	12	-	1
148	Kasegaluk Brown Bears	1	2	2	1	6	4	2	5	2	13	1	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
149	National Petroleum Reserve Alaska	1	3	3	3	5	7	2	4	5	8	4	10
150	Kasegaluk Lagoon Special Use Area	-	1	1	-	2	1	1	1	1	3	-	1
151	Kuk River	1	3	3	1	5	5	3	4	4	8	1	5
152	TCH Insect Relief/Calving	1	1	2	1	3	4	1	2	3	3	2	7
153	Smith Bay Spotted Seal Haulout	-	-	-	-	-	-	-	-	-	-	1	-
154	Teshekpuk Lake Special Use Area	-	-	-	-	-	-	-	-	-	-	1	1
174	Russia Chukchi Coast Marine Mammals	11	19	13	8	16	10	18	19	12	11	7	6
175	Russia Chukchi Coast	12	19	13	8	16	10	18	20	12	12	7	7
176	United States Chukchi Coast	4	10	9	4	23	19	9	24	12	38	5	21
177	United States Beaufort Coast	2	3	4	4	4	7	3	3	6	5	7	12

Table A.2-40. 60 Days-(Summer GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	7	5	5	5	2	2	6	2	4	1	4	2
135	Kolyuchin Bay	2	4	3	1	4	2	4	5	3	3	1	1
136	Ostrov Idlidlya	1	2	1	1	2	1	2	2	1	1	-	-
137	Mys Serditse Kamen	-	1	1	-	2	1	1	2	1	1	-	-
138	Chukota Coast Haulout	1	1	1	1	3	1	1	4	1	2	-	1
143	WAH Insect Relief	-	-	-	-	2	-	-	3	-	1	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	2	1	-	4	-	1	-	-
145	Cape Lisburne	-	1	-	-	3	1	1	4	-	3	-	1
146	Ledyard Bay	-	1	1	-	4	1	1	7	1	4	-	-
147	Point Lay Haulout	-	2	1	-	5	2	2	6	1	12	1	1
148	Kasegaluk Brown Bears	1	3	2	1	6	4	2	5	2	13	1	1
149	National Petroleum Reserve Alaska	2	3	4	3	5	7	3	4	5	8	4	10
150	Kasegaluk Lagoon Special Use Area	-	1	1	-	2	1	1	1	1	3	-	1
151	Kuk River	1	3	3	1	6	5	3	4	4	8	1	5
152	TCH Insect Relief/Calving	1	2	2	1	3	4	2	2	3	4	3	7
153	Smith Bay Spotted Seal Haulout	-	-	-	-	-	-	-	-	-	-	1	-
154	Teshekpuk Lake Special Use Area	-	-	-	-	-	1	-	-	-	-	1	1
174	Russia Chukchi Coast Marine Mammals	14	21	15	11	17	12	20	20	15	12	10	8
175	Russia Chukchi Coast	16	22	17	13	18	13	22	21	16	13	12	10
176	United States Chukchi Coast	5	11	10	5	24	20	10	25	13	38	6	21
177	United States Beaufort Coast	2	3	5	4	5	8	3	3	6	5	7	12

Table A.2-41. 180 Days-(Summer GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	8	6	6	5	2	3	7	2	5	2	5	3
135	Kolyuchin Bay	2	5	3	2	5	2	4	5	3	3	2	1
136	Ostrov Idlidlya	1	2	2	1	2	1	2	2	2	1	1	-
137	Mys Serditse Kamen	-	1	1	-	2	1	1	2	1	1	-	-
138	Chukota Coast Haulout	1	1	1	1	3	1	1	4	1	2	1	1
143	WAH Insect Relief	-	-	-	-	2	-	-	3	-	1	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	2	1	-	4	-	1	-	-
145	Cape Lisburne	-	1	-	-	3	1	1	4	-	3	-	1
146	Ledyard Bay	-	1	1	-	4	1	1	7	1	4	-	-
147	Point Lay Haulout	-	2	1	1	5	2	2	6	1	12	1	1
148	Kasegaluk Brown Bears	1	3	2	1	6	4	3	5	2	13	1	1
149	National Petroleum Reserve Alaska	2	3	4	3	5	8	3	4	5	8	4	10
150	Kasegaluk Lagoon Special Use Area	-	1	1	-	2	1	1	1	1	3	-	1
151	Kuk River	1	3	3	1	6	5	3	4	4	8	1	5
152	TCH Insect Relief/Calving	1	2	2	1	3	4	2	2	3	4	3	7
153	Smith Bay Spotted Seal Haulout	-	-	-	-	-	-	-	-	-	-	1	-
154	Teshekpuk Lake Special Use Area	-	-	-	-	-	1	-	-	-	-	1	1
174	Russia Chukchi Coast Marine Mammals	16	23	18	13	19	14	23	21	17	13	12	10
175	Russia Chukchi Coast	19	25	21	16	20	16	25	22	19	14	15	12
176	United States Chukchi Coast	5	11	10	5	24	20	11	25	13	38	6	21
177	United States Beaufort Coast	2	3	5	4	5	8	3	3	6	5	7	12

Table A.2-42. 360 Days-(Summer GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	8	6	6	5	2	3	7	2	5	2	5	3
135	Kolyuchin Bay	2	5	3	2	5	2	4	5	3	3	2	1
136	Ostrov Idlidlya	1	2	2	1	2	1	2	2	2	1	1	-
137	Mys Serditse Kamen	-	1	1	-	2	1	1	2	1	1	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
138	Chukota Coast Haulout	1	1	1	1	3	1	1	4	1	2	1	1
143	WAH Insect Relief	-	-	-	-	2	-	-	3	-	1	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	2	1	-	4	-	1	-	-
145	Cape Lisburne	-	1	-	-	3	1	1	4	-	3	-	1
146	Ledyard Bay	-	1	1	-	4	1	1	7	1	4	-	-
147	Point Lay Haulout	-	2	1	1	5	2	2	6	1	12	1	1
148	Kasegaluk Brown Bears	1	3	2	1	6	4	3	5	2	13	1	1
149	National Petroleum Reserve Alaska	2	3	4	3	5	8	3	4	5	8	4	10
150	Kasegaluk Lagoon Special Use Area	-	1	1	-	2	1	1	1	1	3	-	1
151	Kuk River	1	3	3	1	6	5	3	4	4	8	1	5
152	TCH Insect Relief/Calving	1	2	2	1	3	4	2	2	3	4	3	7
153	Smith Bay Spotted Seal Haulout	-	-	-	-	-	-	-	-	-	-	1	-
154	Teshekpuk Lake Special Use Area	-	-	-	-	-	1	-	-	-	-	1	1
174	Russia Chukchi Coast Marine Mammals	16	23	19	13	19	14	23	21	18	13	12	10
175	Russia Chukchi Coast	19	25	21	16	20	16	25	22	19	14	15	12
176	United States Chukchi Coast	5	11	10	5	24	20	11	25	13	38	6	21
177	United States Beaufort Coast	2	3	5	4	5	8	3	4	6	5	7	12

Tables A.2-43 through A.2-48 represent summer conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain boundary segment within:

Table A.2-43. 3 Days-(Summer BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9

Note: All rows have all values less than 0.5 percent and are not shown

Table A.2-44. 10 Days-(Summer BS

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9

Note: All rows have all values less than 0.5 percent and are not shown

Table A.2-45. 30 Days-(Summer BS)

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
5	Chukchi Sea	-	1	-	-	-	-	1	-	-	-	-	-
6	Chukchi Sea	1	1	1	1	-	-	1	-	1	-	1	-
7	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
8	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
13	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
14	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
17	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	-
18	Chukchi Sea	2	-	-	2	-	-	-	-	-	-	1	1
19	Chukchi Sea	1	-	-	2	-	-	-	-	-	-	1	1
20	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	-	-

Table A.2-46. 60 Days-(Summer BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
3	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
4	Chukchi Sea	1	-	-	-	-	-	-	1	-	-	-	-
5	Chukchi Sea	1	1	1	1	1	1	1	1	1	-	-	-
6	Chukchi Sea	2	2	2	2	-	1	2	-	1	-	1	1
7	Chukchi Sea	3	1	1	1	-	-	1	-	1	-	-	-
8	Chukchi Sea	2	-	-	1	-	-	-	-	-	-	1	-
9	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
10	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
11	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
12	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
13	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	-	-
14	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	-
15	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	-
16	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	-
17	Chukchi Sea	3	-	1	2	-	1	-	-	-	-	2	1
18	Chukchi Sea	4	1	2	4	-	2	1	-	1	-	3	3
19	Chukchi Sea	3	1	1	3	-	1	1	-	1	-	3	2
20	Chukchi Sea	1	-	1	1	-	-	-	-	-	-	1	1
21	Chukchi Sea	1	-	-	1	-	-	1	-	-	-	1	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
22	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	-
25	Beaufort Sea	-	-	-	1	-	-	-	-	-	-	-	-

Table A.2-47. 180 Days-(Summer BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
3	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
4	Chukchi Sea	1	-	-	1	1	-	-	1	-	-	-	-
5	Chukchi Sea	2	1	1	1	1	1	1	1	1	1	1	1
6	Chukchi Sea	3	2	2	2	1	1	2	-	2	1	2	1
7	Chukchi Sea	4	2	2	3	-	1	2	-	2	-	3	1
8	Chukchi Sea	3	1	1	1	-	-	1	-	1	-	1	-
9	Chukchi Sea	2	1	1	1	-	-	1	-	1	-	-	-
10	Chukchi Sea	2	-	-	1	-	-	1	-	-	-	-	-
11	Chukchi Sea	2	-	1	1	-	-	1	-	-	-	1	-
12	Chukchi Sea	1	-	1	1	-	-	-	-	-	-	-	-
13	Chukchi Sea	1	-	1	1	-	-	1	-	-	-	-	-
14	Chukchi Sea	1	1	1	1	-	-	1	-	1	-	1	-
15	Chukchi Sea	1	1	1	1	-	-	1	-	1	-	1	1
16	Chukchi Sea	1	-	1	1	-	1	-	-	1	-	1	1
17	Chukchi Sea	3	1	1	3	-	1	1	-	1	1	3	2
18	Chukchi Sea	5	2	3	5	1	3	2	1	3	1	4	4
19	Chukchi Sea	4	1	2	4	1	2	1	1	2	1	3	3
20	Chukchi Sea	1	1	1	2	-	1	1	-	1	-	1	1
21	Chukchi Sea	1	-	1	1	-	-	1	-	-	-	1	-
22	Chukchi Sea	1	-	1	1	-	-	-	-	-	-	1	-
23	Beaufort Sea	-	-	-	-	-	-	-	-	-	-	-	1
24	Beaufort Sea	-	-	1	1	-	-	-	-	1	-	1	1
25	Beaufort Sea	-	-	-	1	-	-	-	-	-	-	1	-
26	Beaufort Sea	-	-	-	1	-	-	-	-	-	-	1	-

Table A.2-48. 360 Days-(Summer BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
3	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	1	-
4	Chukchi Sea	1	-	-	1	1	-	-	1	-	-	-	-
5	Chukchi Sea	2	1	1	1	1	1	1	1	1	1	1	1
6	Chukchi Sea	3	2	2	2	1	2	2	-	2	1	2	2
7	Chukchi Sea	4	2	2	3	-	1	2	-	2	-	3	1
8	Chukchi Sea	3	1	1	1	-	1	1	-	1	-	1	-
9	Chukchi Sea	2	1	1	1	-	-	1	-	1	-	-	-
10	Chukchi Sea	2	-	-	1	-	-	1	-	-	-	-	-
11	Chukchi Sea	2	-	1	1	-	-	1	-	-	-	1	-
12	Chukchi Sea	1	-	1	1	-	-	-	-	-	-	-	-
13	Chukchi Sea	1	-	1	1	-	-	1	-	-	-	-	-
14	Chukchi Sea	1	1	1	1	-	-	1	-	1	-	1	1
15	Chukchi Sea	1	1	1	1	-	1	1	-	1	-	1	1
16	Chukchi Sea	1	-	1	1	-	1	-	-	1	-	1	1
17	Chukchi Sea	3	1	1	3	1	1	1	-	1	1	3	2
18	Chukchi Sea	5	2	3	5	1	3	2	1	3	1	4	4
19	Chukchi Sea	4	1	2	4	1	2	1	1	2	1	4	3
20	Chukchi Sea	1	1	1	2	-	1	1	-	1	-	1	1
21	Chukchi Sea	1	1	1	1	-	-	1	-	-	-	1	-
22	Chukchi Sea	1	-	1	1	-	-	-	-	-	-	1	-
23	Beaufort Sea	-	-	-	-	-	-	-	-	-	-	-	1
24	Beaufort Sea	-	-	1	1	-	-	-	-	1	-	1	1
25	Beaufort Sea	-	-	-	1	-	-	-	-	-	-	1	-
26	Beaufort Sea	-	-	-	1	-	-	-	-	-	-	1	-

Tables A.2-49 through A.2-54 represent winter conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain environmental resource area within:

Table A.2-49. 3 Days-(Winter ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	-	-	-	-	-	-	-	2	-	5	-	4
1	Kasegaluk Lagoon Area	-	-	-	-	-	-	-	-	-	1	-	-
6	Hanna Shoal	-	-	-	9	-	1	-	-	-	-	17	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
10	Ledyard Bay SPEI Critical Habitat Area	-	-	-	-	1	1	-	2	-	8	-	-
15	Cape Lisburne Seabird Colony Area	-	-	-	-	1	-	-	2	-	-	-	-
16	Barrow Canyon	-	-	-	-	-	-	-	-	-	-	-	3
19	Chukchi Spring Lead System	-	-	-	-	3	4	-	4	-	16	-	11
23	Polar Bear Offshore	-	1	1	-	59	24	1	58	2	65	-	5
38	SUA: Pt. Hope - Cape Lisburne	-	-	-	-	-	-	-	3	-	-	-	-
39	SUA: Pt. Lay - Kasegaluk	-	-	-	-	-	-	-	-	-	22	-	1
40	SUA: Icy Cape - Wainwright	-	-	-	-	-	7	-	-	1	7	-	57
41	SUA: Barrow - Chukchi	-	-	-	-	-	-	-	-	-	-	-	1
47	Hanna Shoal Walrus Use Area	-	-	-	8	-	4	-	-	-	-	15	6
48	Chukchi Lead System 4	-	-	-	-	10	15	-	12	1	50	1	37
49	Chukchi Spring Lead 1	-	-	-	-	1	-	-	4	-	-	-	-
50	Pt Lay Walrus Offshore	-	-	-	-	3	1	-	2	-	6	-	1
51	Pt Lay Walrus Nearshore	-	-	-	-	-	-	-	-	-	5	-	-
53	Chukchi Spring Lead 2	-	-	-	-	11	7	-	13	-	22	-	2
54	Chukchi Spring Lead 3	-	-	-	-	-	4	-	-	-	2	-	18
57	Skull Cliffs	-	-	-	-	-	-	-	-	-	-	-	5
62	Herald Shoal Polynya 2	-	4	1	-	-	-	4	-	-	-	-	-
64	Peard Bay Area	-	-	-	-	-	-	-	-	-	-	-	1
70	North Central Chukchi	1	-	-	-	-	-	-	-	-	-	-	-
102	Opilio Crab EFH	-	-	-	-	1	-	-	3	-	-	-	-
103	Saffron Cod EFH	-	-	-	-	3	5	-	13	-	25	1	41
123	AK Chukchi Offshore	3	4	6	2	-	-	2	-	3	-	1	-
124	Central Chukchi Offshore	-	2	1	-	-	-	2	-	-	-	-	-

Table A.2-50. 10 Days-(Winter ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	2	3	2	1	5	6	2	8	2	15	2	14
1	Kasegaluk Lagoon Area	-	-	-	-	-	-	-	-	-	1	-	-
6	Hanna Shoal	1	-	2	14	1	4	-	-	2	1	22	3
10	Ledyard Bay SPEI Critical Habitat Area	-	-	-	-	2	1	-	3	-	9	-	1
11	Wrangel Island 12 nm & Offshore	1	-	-	-	-	-	-	-	-	-	-	-
15	Cape Lisburne Seabird Colony Area	-	-	-	-	1	-	-	3	-	1	-	-
16	Barrow Canyon	-	-	1	1	1	4	-	-	1	2	3	10
18	Murre Rearing and Molting Area	-	-	-	-	1	-	-	2	-	-	-	-
19	Chukchi Spring Lead System	-	-	-	-	6	7	-	6	1	19	1	14
20	East Chukchi Offshore	-	-	-	-	-	-	-	-	-	-	1	-
23	Polar Bear Offshore	-	7	5	1	67	35	5	67	11	76	4	19
30	Beaufort Spring Lead 1	-	-	-	-	-	-	-	-	-	-	-	2
31	Beaufort Spring Lead 2	-	-	-	-	-	-	-	-	-	-	-	1
38	SUA: Pt. Hope - Cape Lisburne	-	-	-	-	2	-	-	5	-	3	-	-
39	SUA: Pt. Lay - Kasegaluk	-	-	-	-	2	3	-	1	1	26	-	3
40	SUA: Icy Cape - Wainwright	-	1	2	2	5	16	1	3	5	17	6	62
41	SUA: Barrow - Chukchi	-	-	-	-	-	1	-	-	-	1	1	3
46	Wrangel Island 12 nmi Buffer 2	2	-	-	-	-	-	-	-	-	-	-	-
47	Hanna Shoal Walrus Use Area	1	1	2	9	1	5	1	-	2	1	16	9
48	Chukchi Lead System 4	-	2	3	3	19	27	1	18	6	58	8	49
49	Chukchi Spring Lead 1	-	-	-	-	4	1	-	6	-	3	-	-
50	Pt Lay Walrus Offshore	-	-	-	-	4	2	-	3	-	7	-	1
51	Pt Lay Walrus Nearshore	-	-	-	-	-	-	-	-	-	5	-	-
52	Russian Coast Walrus Offshore	-	2	1	-	3	1	1	5	1	2	-	1
53	Chukchi Spring Lead 2	-	-	-	-	14	9	-	15	1	24	-	6
54	Chukchi Spring Lead 3	-	-	1	1	2	7	-	1	2	5	3	21
57	Skull Cliffs	-	-	-	-	1	2	-	-	-	2	1	10
58	Russian Coast Walrus Nearshore	-	-	-	-	1	-	-	1	-	1	-	-
62	Herald Shoal Polynya 2	3	13	7	2	2	3	12	2	6	1	2	1
63	North Chukchi	1	-	-	-	-	-	-	-	-	-	-	-
64	Peard Bay Area	-	-	-	-	-	1	-	-	-	1	-	2
70	North Central Chukchi	2	-	-	-	-	-	-	-	-	-	-	-
74	Offshore Herald Island	3	1	1	1	-	-	1	-	1	-	1	-
91	Hope Sea Valley	1	2	1	1	1	-	2	1	1	-	-	-
102	Opilio Crab EFH	-	-	-	-	6	1	-	9	-	4	-	1
103	Saffron Cod EFH	-	2	3	3	18	19	2	25	6	41	8	51
122	North Chukotka Offshore	-	-	-	-	-	-	1	-	-	-	-	-
123	AK Chukchi Offshore	4	5	8	6	1	2	2	1	5	-	4	1
124	Central Chukchi Offshore	2	6	3	2	1	1	6	1	3	1	1	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Table A.2-51. 30 Days-(Winter ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	18	29	23	17	34	29	27	38	24	41	19	35
1	Kasegaluk Lagoon Area	-	-	-	-	-	-	-	-	-	1	-	-
4	SUA:Naukan/Russia	-	1	-	-	3	1	-	4	-	2	-	1
6	Hanna Shoal	2	2	5	17	2	7	2	1	5	2	25	8
7	Krill Trap	-	-	-	-	-	-	-	-	-	-	-	1
10	Ledyard Bay SPEI Critical Habitat Area	-	-	-	-	3	2	-	4	-	9	-	1
11	Wrangel Island 12 nm & Offshore	2	1	1	1	-	-	1	-	1	-	-	-
15	Cape Lisburne Seabird Colony Area	-	-	-	-	1	1	-	3	-	2	-	1
16	Barrow Canyon	1	1	2	4	4	7	1	2	3	4	6	14
18	Murre Rearing and Molting Area	-	2	1	-	6	2	1	7	1	4	-	2
19	Chukchi Spring Lead System	-	1	1	1	8	10	1	8	3	22	3	18
20	East Chukchi Offshore	-	-	-	1	-	-	-	-	-	-	1	1
23	Polar Bear Offshore	3	12	11	7	70	43	10	70	18	78	12	28
30	Beaufort Spring Lead 1	-	-	-	1	1	2	-	1	1	2	1	3
31	Beaufort Spring Lead 2	-	-	-	-	1	1	-	-	-	1	-	2
38	SUA: Pt. Hope - Cape Lisburne	-	1	1	-	4	2	1	6	1	6	-	1
39	SUA: Pt. Lay - Kasegaluk	-	1	1	1	4	5	1	3	2	27	1	5
40	SUA: Icy Cape - Wainwright	2	4	6	5	10	21	3	7	9	23	10	65
41	SUA: Barrow - Chukchi	-	-	-	1	1	2	-	1	1	1	1	5
46	Wrangel Island 12 nmi Buffer 2	9	4	4	4	1	2	5	1	3	-	3	1
47	Hanna Shoal Walrus Use Area	2	3	4	11	3	8	3	2	5	3	18	11
48	Chukchi Lead System 4	3	6	8	9	24	34	5	22	12	62	17	55
49	Chukchi Spring Lead 1	-	-	-	-	6	3	-	8	-	6	-	2
50	Pt Lay Walrus Offshore	-	-	-	-	5	2	-	5	-	8	-	2
51	Pt Lay Walrus Nearshore	-	-	-	-	1	-	-	1	-	6	-	-
52	Russian Coast Walrus Offshore	1	5	2	1	9	3	4	11	2	6	1	2
53	Chukchi Spring Lead 2	-	1	1	-	16	11	1	17	2	26	2	8
54	Chukchi Spring Lead 3	-	1	2	2	5	10	1	4	4	9	5	24
55	Point Barrow, Plover Islands	-	-	-	-	-	-	-	-	-	-	-	1
57	Skull Cliffs	1	-	1	1	2	4	-	1	2	4	3	13
58	Russian Coast Walrus Nearshore	-	1	-	-	3	1	1	4	-	2	-	1
59	Ostrov Kolyuchin	-	-	-	-	-	-	-	1	-	-	-	-
62	Herald Shoal Polynya 2	8	19	13	8	8	8	19	6	12	6	7	6
63	North Chukchi	1	-	-	1	-	-	-	-	-	-	-	-
64	Peard Bay Area	-	-	-	-	1	1	-	1	-	2	-	3
66	Herald Island	1	-	-	-	-	-	-	-	-	-	-	-
70	North Central Chukchi	2	-	-	1	-	-	-	-	-	-	-	-
74	Offshore Herald Island	5	2	2	3	1	1	2	-	2	1	2	1
80	Beaufort Outer Shelf 1	-	-	-	-	-	-	-	-	-	-	-	1
91	Hope Sea Valley	3	3	3	2	2	2	3	2	3	1	2	1
102	Opilio Crab EFH	1	3	2	1	11	5	3	15	3	10	1	4
103	Saffron Cod EFH	3	8	10	9	30	31	8	35	14	52	16	59
121	C Lisburne - Pt Hope	-	-	-	-	-	-	-	1	-	-	-	-
122	North Chukotka Offshore	2	2	2	1	1	-	2	-	1	-	1	-
123	AK Chukchi Offshore	5	5	9	7	1	2	3	1	6	1	6	2
124	Central Chukchi Offshore	4	7	5	4	2	3	7	2	5	2	3	2

Table A.2-52. 60 Days-(Winter ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	33	52	44	35	55	49	49	58	46	60	38	51
1	Kasegaluk Lagoon Area	-	-	-	-	-	-	-	-	-	2	-	-
4	SUA:Naukan/Russia	-	2	1	1	4	2	2	6	1	4	1	2
6	Hanna Shoal	3	3	6	19	4	9	3	3	6	4	27	9
7	Krill Trap	-	-	-	-	1	1	-	-	-	1	-	1
10	Ledyard Bay SPEI Critical Habitat Area	-	-	-	-	3	2	-	4	-	10	-	2
11	Wrangel Island 12 nm & Offshore	2	1	1	1	-	-	1	-	1	-	-	-
15	Cape Lisburne Seabird Colony Area	-	-	-	-	2	1	-	3	-	2	-	1
16	Barrow Canyon	1	2	3	4	5	9	2	4	5	6	7	15
18	Murre Rearing and Molting Area	1	3	2	1	7	4	2	9	2	6	1	3
19	Chukchi Spring Lead System	-	1	2	2	10	12	1	10	4	23	4	19
20	East Chukchi Offshore	-	-	-	1	-	-	-	-	-	-	1	1
23	Polar Bear Offshore	5	14	13	8	71	44	12	71	20	79	14	30
30	Beaufort Spring Lead 1	-	-	1	1	2	2	-	1	1	2	1	4
31	Beaufort Spring Lead 2	-	-	-	-	1	1	-	1	-	1	1	2
32	Beaufort Spring Lead 3	-	-	-	-	-	-	-	-	-	-	-	1
38	SUA: Pt. Hope - Cape Lisburne	-	1	1	1	4	2	1	7	2	7	-	1
39	SUA: Pt. Lay - Kasegaluk	1	1	1	1	4	5	1	3	2	28	2	5

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
40	SUA: Icy Cape - Wainwright	3	5	7	7	13	23	5	9	11	25	12	66
41	SUA: Barrow - Chukchi	-	-	-	1	2	2	-	1	1	2	2	5
46	Wrangel Island 12 nmi Buffer 2	13	8	8	8	3	4	9	3	7	3	6	3
47	Hanna Shoal Walrus Use Area	3	6	7	13	7	11	6	6	8	7	19	14
48	Chukchi Lead System 4	4	7	10	11	25	35	7	24	14	62	18	56
49	Chukchi Spring Lead 1	-	1	1	1	7	4	1	9	1	7	1	3
50	Pt Lay Walrus Offshore	-	-	-	-	5	3	-	5	1	9	-	3
51	Pt Lay Walrus Nearshore	-	-	-	-	1	-	-	1	-	6	-	-
52	Russian Coast Walrus Offshore	1	6	3	1	10	5	4	13	3	8	2	4
53	Chukchi Spring Lead 2	-	2	2	1	17	12	1	17	3	27	3	9
54	Chukchi Spring Lead 3	-	3	3	3	7	12	2	6	5	11	6	25
55	Point Barrow, Plover Islands	-	-	-	-	-	1	-	-	-	-	1	1
57	Skull Cliffs	1	1	2	2	2	4	1	2	2	4	3	13
58	Russian Coast Walrus Nearshore	-	1	1	-	3	1	1	5	1	2	1	1
59	Ostrov Kolyuchin	-	-	-	-	-	-	-	1	-	-	-	-
61	Pt Lay-Barrow BH GW SSF	-	1	1	-	1	1	1	1	1	1	-	1
62	Herald Shoal Polynya 2	9	20	16	11	9	11	21	8	15	8	10	9
63	North Chukchi	1	-	-	1	-	-	-	-	-	-	-	-
64	Peard Bay Area	-	-	-	-	2	2	-	1	1	2	-	3
66	Herald Island	1	-	-	-	-	-	-	-	-	-	-	-
70	North Central Chukchi	2	-	-	1	-	-	-	-	-	-	-	-
74	Offshore Herald Island	5	2	2	3	1	1	2	-	2	1	2	1
80	Beaufort Outer Shelf 1	-	-	-	-	-	-	-	-	-	-	-	1
91	Hope Sea Valley	3	4	3	2	2	2	3	2	3	1	2	2
102	Opilio Crab EFH	2	4	3	1	13	6	4	16	4	12	2	5
103	Saffron Cod EFH	5	11	13	12	33	34	11	38	18	55	19	60
107	Pt Hope Offshore	-	-	-	-	-	-	-	1	-	-	-	-
119	AK BFT Outer Shelf&Slope 10	-	-	-	-	1	-	-	1	-	1	-	-
121	C Lisburne - Pt Hope	-	-	-	-	1	-	-	1	-	1	-	-
122	North Chukotka Offshore	2	2	2	2	1	1	2	1	1	-	1	-
123	AK Chukchi Offshore	5	5	9	7	1	3	3	1	6	1	6	2
124	Central Chukchi Offshore	4	7	5	4	2	3	7	2	5	2	3	3

Table A.2-53. 180 Days-(Winter ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	41	61	54	45	64	58	59	66	56	67	48	60
1	Kasegaluk Lagoon Area	-	-	-	-	-	-	-	-	-	2	-	-
4	SUA:Naukan/Russia	1	2	1	1	4	2	2	6	1	4	1	2
6	Hanna Shoal	4	6	8	20	6	11	5	5	8	6	29	11
7	Krill Trap	-	1	1	-	1	1	1	1	1	1	-	1
10	Ledyard Bay SPEI Critical Habitat Area	-	-	-	-	3	2	-	4	-	10	-	2
11	Wrangel Island 12 nm & Offshore	3	3	3	2	3	2	3	3	3	2	1	2
15	Cape Lisburne Seabird Colony Area	-	-	-	-	2	1	-	3	-	2	-	1
16	Barrow Canyon	2	3	4	5	6	9	3	5	6	7	7	16
18	Murre Rearing and Molting Area	1	4	3	1	8	5	3	10	3	7	2	4
19	Chukchi Spring Lead System	-	2	2	2	11	12	1	11	4	23	5	19
20	East Chukchi Offshore	-	-	-	1	-	1	-	-	-	-	1	1
23	Polar Bear Offshore	6	14	13	9	71	44	13	71	20	79	14	31
30	Beaufort Spring Lead 1	-	-	1	1	2	3	-	2	1	3	2	4
31	Beaufort Spring Lead 2	-	-	-	-	1	1	-	1	-	2	1	3
32	Beaufort Spring Lead 3	-	-	-	-	-	-	-	-	-	-	-	1
38	SUA: Pt. Hope - Cape Lisburne	-	1	1	1	4	2	1	7	2	7	1	2
39	SUA: Pt. Lay - Kasegaluk	1	1	1	1	4	5	1	3	2	28	2	5
40	SUA: Icy Cape - Wainwright	3	6	8	8	14	24	6	10	11	26	13	66
41	SUA: Barrow - Chukchi	-	-	-	1	2	3	-	1	1	2	2	5
42	SUA: Barrow - East Arch	1	1	1	-	1	1	1	1	1	1	1	1
43	SUA: Nuiqsut - Cross Island	-	1	-	-	1	-	1	1	1	1	-	-
46	Wrangel Island 12 nmi Buffer 2	15	9	10	10	4	6	11	4	8	3	8	5
47	Hanna Shoal Walrus Use Area	4	10	10	15	10	14	9	9	11	10	22	17
48	Chukchi Lead System 4	5	7	11	12	26	36	7	24	15	62	19	56
49	Chukchi Spring Lead 1	-	1	1	1	7	4	1	9	1	7	1	3
50	Pt Lay Walrus Offshore	-	-	-	-	5	3	-	5	1	9	1	3
51	Pt Lay Walrus Nearshore	-	-	-	-	1	-	-	1	-	6	-	1
52	Russian Coast Walrus Offshore	2	7	4	2	11	6	5	14	4	8	2	5
53	Chukchi Spring Lead 2	-	2	2	1	17	12	2	18	3	27	3	9
54	Chukchi Spring Lead 3	-	3	4	3	8	13	3	7	6	12	7	26
55	Point Barrow, Plover Islands	-	-	-	1	-	1	-	-	-	-	1	1
56	Hanna Shoal Area	1	2	1	1	2	2	1	2	2	2	2	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
57	Skull Cliffs	1	1	2	2	2	5	1	2	3	4	4	14
58	Russian Coast Walrus Nearshore	1	2	1	1	4	2	1	5	1	3	1	1
59	Ostrov Kolyuchin	-	-	-	-	-	-	-	1	-	-	-	-
61	Pt Lay-Barrow BH GW SSF	1	3	2	1	3	2	2	3	2	3	1	2
62	Herald Shoal Polynya 2	10	21	16	12	10	11	21	8	16	8	11	9
63	North Chukchi	1	-	-	1	-	-	-	-	-	-	-	-
64	Peard Bay Area	-	1	1	-	3	2	1	2	1	3	1	3
66	Herald Island	1	1	1	1	1	1	1	1	1	1	1	-
70	North Central Chukchi	2	-	-	1	-	-	-	-	-	-	-	-
74	Offshore Herald Island	5	2	2	3	1	1	2	-	2	1	2	1
80	Beaufort Outer Shelf 1	-	1	-	-	1	1	-	1	1	1	1	1
82	N Chukotka Nrshr 2	-	-	-	-	-	-	-	1	-	-	-	-
91	Hope Sea Valley	3	4	3	2	2	2	3	2	3	1	2	2
101	Beaufort Outer Shelf 2	-	1	-	-	1	1	-	1	1	1	-	1
102	Opilio Crab EFH	2	4	3	2	13	6	4	16	4	12	2	5
103	Saffron Cod EFH	6	13	14	13	35	35	12	39	19	55	20	61
107	Pt Hope Offshore	-	-	-	-	-	-	-	1	-	-	-	-
109	AK BFT Shelf Edge	-	-	-	-	-	-	-	-	-	1	-	-
110	AK BFT Outer Shelf&Slope 1	-	-	-	-	1	-	-	1	-	1	-	-
111	AK BFT Outer Shelf&Slope 2	-	-	-	-	1	-	-	1	-	1	-	-
112	AK BFT Outer Shelf&Slope 3	-	-	-	-	1	-	-	1	-	1	-	-
113	AK BFT Outer Shelf&Slope 4	-	-	-	-	1	-	-	1	-	1	-	-
114	AK BFT Outer Shelf&Slope 5	-	1	-	-	1	1	-	1	1	1	-	-
115	AK BFT Outer Shelf&Slope 6	-	1	-	-	1	1	1	1	1	1	-	-
116	AK BFT Outer Shelf&Slope 7	-	1	1	-	1	1	1	1	1	1	1	1
117	AK BFT Outer Shelf&Slope 8	-	1	1	-	1	1	1	1	1	1	1	1
118	AK BFT Outer Shelf&Slope 9	-	1	1	-	1	1	1	1	1	1	1	1
119	AK BFT Outer Shelf&Slope 10	1	2	2	1	3	2	2	3	2	2	1	1
121	C Lisburne - Pt Hope	-	-	-	-	1	-	-	1	-	1	-	-
122	North Chukotka Offshore	2	2	2	2	1	1	2	1	1	-	1	-
123	AK Chukchi Offshore	5	5	9	7	1	3	3	1	6	1	6	2
124	Central Chukchi Offshore	4	7	5	4	2	3	7	2	5	2	3	3

Table A.2-54. 360 Days-(Winter ERA).

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
0	Land	42	61	54	45	64	59	59	66	56	68	48	60
1	Kasegaluk Lagoon Area	-	-	-	-	-	-	-	-	-	2	-	-
4	SUA:Naukan/Russia	1	2	1	1	4	2	2	6	1	4	1	2
6	Hanna Shoal	4	6	8	20	6	11	5	5	8	6	29	11
7	Krill Trap	-	1	1	-	1	1	1	1	1	1	-	1
10	Ledyard Bay SPEI Critical Habitat Area	-	-	-	-	3	2	-	4	-	10	-	2
11	Wrangel Island 12 nm & Offshore	3	3	3	2	3	2	3	3	3	2	2	2
15	Cape Lisburne Seabird Colony Area	-	-	-	-	2	1	-	3	-	2	-	1
16	Barrow Canyon	2	3	4	5	6	9	3	5	6	7	7	16
18	Murre Rearing and Molting Area	1	4	3	1	8	5	3	10	3	7	2	4
19	Chukchi Spring Lead System	-	2	2	2	11	12	1	11	4	23	5	19
20	East Chukchi Offshore	-	-	-	1	-	1	-	-	-	-	1	1
23	Polar Bear Offshore	6	14	13	9	71	44	13	71	20	79	14	31
30	Beaufort Spring Lead 1	-	-	1	1	2	3	-	2	1	3	2	4
31	Beaufort Spring Lead 2	-	-	-	-	1	1	-	1	-	2	1	3
32	Beaufort Spring Lead 3	-	-	-	-	-	-	-	-	-	-	-	1
38	SUA: Pt. Hope - Cape Lisburne	-	1	1	1	4	2	1	7	2	7	1	2
39	SUA: Pt. Lay - Kasegaluk	1	1	1	1	4	5	1	3	2	28	2	5
40	SUA: Icy Cape - Wainwright	3	6	8	8	14	24	6	10	11	26	13	66
41	SUA: Barrow - Chukchi	-	-	-	1	2	3	-	1	1	2	2	5
42	SUA: Barrow - East Arch	1	1	1	-	1	1	1	1	1	1	1	1
43	SUA: Nuiqsut - Cross Island	-	1	-	-	1	-	1	1	1	1	-	-
46	Wrangel Island 12 nmi Buffer 2	15	9	10	10	4	6	11	4	8	3	8	5
47	Hanna Shoal Walrus Use Area	4	10	10	15	10	15	9	9	11	10	22	17
48	Chukchi Lead System 4	5	7	11	12	26	36	7	24	15	62	19	56
49	Chukchi Spring Lead 1	-	1	1	1	7	4	1	9	1	7	1	3
50	Pt Lay Walrus Offshore	-	-	-	-	5	3	-	5	1	9	1	3
51	Pt Lay Walrus Nearshore	-	-	-	-	1	-	-	1	-	6	-	1
52	Russian Coast Walrus Offshore	2	7	4	2	11	6	5	14	4	8	2	5
53	Chukchi Spring Lead 2	-	2	2	1	17	12	2	18	3	27	3	9
54	Chukchi Spring Lead 3	-	3	4	3	8	13	3	7	6	12	7	26
55	Point Barrow, Plover Islands	-	-	-	1	-	1	-	-	-	-	1	1
56	Hanna Shoal Area	1	2	1	1	2	2	1	2	2	2	2	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Environmental Resource Area Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
57	Skull Cliffs	1	1	2	2	2	5	1	2	3	4	4	14
58	Russian Coast Walrus Nearshore	1	2	1	1	4	2	1	5	1	3	1	1
59	Ostrov Kolyuchin	-	-	-	-	-	-	-	1	-	-	-	-
61	Pt Lay-Barrow BH GW SSF	1	3	2	1	3	2	2	4	2	3	1	2
62	Herald Shoal Polynya 2	10	21	16	12	10	11	21	8	16	8	11	9
63	North Chukchi	1	-	-	1	-	-	-	-	-	-	-	-
64	Peard Bay Area	-	1	1	-	3	2	1	2	1	3	1	3
66	Herald Island	1	1	1	1	1	1	1	1	1	1	1	-
70	North Central Chukchi	2	-	-	1	-	1	-	-	-	1	-	-
74	Offshore Herald Island	5	2	2	3	1	1	2	1	2	1	2	1
80	Beaufort Outer Shelf 1	-	1	-	-	1	1	-	1	1	1	1	1
82	N Chukotka Nrshr 2	-	-	-	-	-	-	-	1	-	-	-	-
91	Hope Sea Valley	3	4	3	2	2	2	4	2	3	1	2	2
101	Beaufort Outer Shelf 2	-	1	-	-	1	1	-	1	1	1	-	1
102	Opilio Crab EFH	2	4	3	2	13	6	4	16	4	12	2	5
103	Saffron Cod EFH	6	13	14	13	35	35	12	39	19	55	20	61
107	Pt Hope Offshore	-	-	-	-	-	-	-	1	-	-	-	-
109	AK BFT Shelf Edge	-	-	-	-	-	-	-	-	-	1	-	-
110	AK BFT Outer Shelf&Slope 1	-	-	-	-	1	-	-	1	-	1	-	-
111	AK BFT Outer Shelf&Slope 2	-	-	-	-	1	-	-	1	-	1	-	-
112	AK BFT Outer Shelf&Slope 3	-	-	-	-	1	-	-	1	-	1	-	-
113	AK BFT Outer Shelf&Slope 4	-	-	-	-	1	-	-	1	-	1	-	-
114	AK BFT Outer Shelf&Slope 5	-	1	-	-	1	1	-	1	1	1	-	-
115	AK BFT Outer Shelf&Slope 6	-	1	1	-	1	1	1	1	1	1	-	-
116	AK BFT Outer Shelf&Slope 7	-	1	1	-	1	1	1	1	1	1	1	1
117	AK BFT Outer Shelf&Slope 8	-	1	1	1	1	1	1	1	1	1	1	1
118	AK BFT Outer Shelf&Slope 9	-	1	1	1	1	1	1	1	1	1	1	1
119	AK BFT Outer Shelf&Slope 10	1	2	2	1	3	2	2	3	2	2	1	1
121	C Lisburne - Pt Hope	-	-	-	-	1	-	-	1	-	1	-	-
122	North Chukotka Offshore	2	2	2	2	1	1	2	1	1	-	1	-
123	AK Chukchi Offshore	5	5	9	7	1	3	3	1	6	1	6	2
124	Central Chukchi Offshore	4	7	5	4	2	3	7	2	5	2	3	3

Tables A.2-55 through A.2-60 represent winter conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain land segment within:

Table A.2-55. 3 Days-(Winter LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
65	Buckland, Cape Lisburne	-	-	-	-	-	-	-	1	-	-	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	-	-	-	-	-	2	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	-	-	-	-	-	1	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	-	-	-	-	-	1	-	-
79	Point Belcher, Wainwright	-	-	-	-	-	-	-	-	-	-	-	1
80	Eluksingiak Point, Kugrua Bay	-	-	-	-	-	-	-	-	-	-	-	1

Table A.2-56. 10 Days-(Winter LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
64	Kukpuk River, Point Hope	-	-	-	-	-	-	-	1	-	-	-	-
65	Buckland, Cape Lisburne	-	-	-	-	1	-	-	2	-	2	-	-
66	Ayugatak Lagoon	-	-	-	-	-	-	-	1	-	1	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	-	-	1	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	-	-	-	-	-	2	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	-	-	-	-	-	2	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	-	-	-	-	-	2	-	-
75	Akeonik, Icy Cape	-	-	-	-	-	-	-	-	-	1	-	-
76	Avak Inlet, Tunalik River	-	-	-	-	-	-	-	-	-	-	-	1
78	Point Collie, Sigeakruk Point	-	-	-	-	-	-	-	-	-	-	-	1
79	Point Belcher, Wainwright	-	-	-	-	-	1	-	-	-	1	-	3
80	Eluksingiak Point, Kugrua Bay	-	-	-	-	-	1	-	-	-	-	-	3
81	Peard Bay, Point Franklin	-	-	-	-	-	-	-	-	-	-	-	1
82	Skull Cliff	-	-	-	-	-	-	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	-	-	-	-	-	-	-	1
84	Will Rogers & Wiley Post Mem.	-	-	-	-	-	1	-	-	-	-	1	2
85	Barrow, Browerville, Elson Lag.	-	-	-	-	-	1	-	-	-	-	1	2

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Table A.2-57. 30 Days-(Winter LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
5	Mys Evans	1	-	-	-	-	-	-	-	-	-	-	-
6	Ostrov Mushtakova	1	-	-	-	-	-	1	-	-	-	-	-
7	Kosa Bruch	2	1	1	1	-	-	1	-	1	-	1	-
8	E. Wrangel Island, Skeletov	2	1	1	1	-	-	1	-	1	-	-	-
20	Polyarnyy, Pil'gyn	-	1	1	-	-	-	1	-	-	-	-	-
21	Laguna Pil'khikay, Pil'khikay	-	1	1	-	-	-	1	-	1	-	-	-
22	Rypkarpyy, Mys Shmidta	1	1	1	1	-	-	1	-	1	-	1	-
23	Emuem, Tenkergin	1	1	1	1	-	-	1	-	1	-	-	-
24	LS 24	1	1	1	-	-	-	1	-	1	-	-	-
25	Laguna Amguema, Yulinu	1	1	1	1	1	1	1	1	1	-	1	-
26	Ekugvaam, Kepin, Pil'khin	1	1	1	1	1	1	1	1	1	1	1	-
27	Laguna Nut, Rigol'	1	2	1	1	1	1	1	1	1	1	1	1
28	Vankarem,Vankarem Laguna	1	2	1	1	1	1	2	1	1	1	1	1
29	Mys Onman, Vel'may	1	2	1	1	1	1	1	2	1	1	1	1
30	Nutepynmin, Pyngopil'gyn	1	2	1	1	2	2	2	3	2	1	1	1
31	Alyatki, Zaliv Tasytkhin	1	2	1	1	3	2	2	3	1	2	1	1
32	Mys Dzhenretlen, Eynenekvyk	-	1	1	1	2	1	1	2	1	1	1	1
33	Neskan, Laguna Neskan	-	1	1	-	2	1	1	2	1	1	-	1
34	Tepken, Memino	-	1	1	-	2	1	1	2	1	1	-	1
35	Enurmino, Mys Neten	-	1	1	-	2	1	1	2	1	1	-	1
36	Mys Serdtse-Kamen	-	1	-	-	2	1	1	2	1	2	-	1
37	Chegitun, Utkan	-	-	-	-	1	1	-	2	-	1	-	-
38	Enmytagyn, Inchoun, Mitkulen	-	-	-	-	1	-	-	1	-	1	-	-
39	Cape Dezhnev, Naukan, Uelen	-	-	-	-	1	-	-	1	-	1	-	-
64	Kukpuk River, Point Hope	-	-	-	-	1	-	-	1	-	1	-	-
65	Buckland, Cape Lisburne	-	-	-	-	1	1	-	3	-	3	-	-
66	Ayugatak Lagoon	-	-	-	-	1	-	-	1	-	2	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	-	-	1	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	-	-	-	-	-	3	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	-	-	-	-	-	2	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	-	1	-	-	-	2	-	-
75	Akeonik, Icy Cape	-	-	-	-	-	1	-	-	-	2	-	1
76	Avak Inlet, Tunalik River	-	-	-	-	-	1	-	-	-	1	-	1
78	Point Collie, Sigeakruk Point	-	-	-	-	-	1	-	-	-	1	-	1
79	Point Belcher, Wainwright	-	-	-	-	1	2	-	-	1	2	1	4
80	Eluksingiak Point, Kugrua Bay	-	-	-	-	-	1	-	-	-	1	-	3
81	Peard Bay, Point Franklin	-	-	-	-	-	-	-	-	-	-	-	1
82	Skull Cliff	-	-	-	-	-	-	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	-	-	-	-	-	-	-	1
84	Will Rogers & Wiley Post Mem.	-	-	-	1	-	1	-	-	-	1	1	3
85	Barrow, Browerville, Elson Lag.	-	-	-	1	1	2	-	-	1	1	2	4

Table A.2-58. 60 Days-(Winter LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
5	Mys Evans	1	-	-	-	-	-	-	-	-	-	-	-
6	Ostrov Mushtakova	2	1	1	1	-	-	1	-	1	-	1	-
7	Kosa Bruch	2	1	1	1	-	1	1	-	1	-	1	1
8	E. Wrangel Island, Skeletov	2	2	2	1	1	1	2	-	1	1	1	1
9	Mys Proletarskiy	1	1	1	1	-	-	1	-	1	-	-	1
10	Bukhta Davidova	1	1	-	-	-	-	1	-	-	-	-	-
17	Mys Yakan	-	-	1	-	-	-	-	-	-	-	-	-
18	Pil'khikay, Laguna Rypil'khin	-	-	1	-	-	-	1	-	1	-	-	-
19	Laguna Kuepil'khin, Leningradskiy	1	1	1	1	-	-	1	-	1	-	1	-
20	Polyarnyy, Pil'gyn	1	1	1	1	-	-	1	-	1	-	1	-
21	Laguna Pil'khikay, Pil'khikay	1	1	1	1	1	1	1	1	1	-	1	-
22	Rypkarpyy, Mys Shmidta	2	2	2	1	1	1	2	1	1	1	1	1
23	Emuem, Tenkergin	1	2	1	1	1	1	2	1	1	1	1	-
24	LS 24	1	2	2	1	1	1	2	1	2	1	1	1
25	Laguna Amguema, Yulinu	1	2	2	1	1	1	2	1	2	1	1	1
26	Ekugvaam, Kepin, Pil'khin	1	2	2	1	2	1	2	2	2	1	1	1
27	Laguna Nut, Rigol'	1	3	2	2	2	2	2	2	2	2	1	1
28	Vankarem,Vankarem Laguna	1	3	2	2	2	2	3	2	2	2	2	2
29	Mys Onman, Vel'may	1	3	2	1	2	2	2	3	2	2	2	1
30	Nutepynmin, Pyngopil'gyn	1	3	2	2	4	3	3	4	3	3	2	2
31	Alyatki, Zaliv Tasytkhin	1	3	2	2	4	3	3	5	2	4	3	2
32	Mys Dzhenretlen, Eynenekvyk	1	2	2	1	3	2	2	3	2	2	1	2
33	Neskan, Laguna Neskan	1	2	2	1	3	2	2	3	2	2	1	2

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
34	Tepken, Memino	1	2	1	1	3	2	2	3	2	2	1	2
35	Enurmino, Mys Neten	1	2	1	1	3	2	2	3	1	2	1	1
36	Mys Serdtse-Kamen	-	2	1	-	3	2	1	4	1	3	1	1
37	Chegitun, Utkan	-	1	1	-	2	1	1	3	1	2	-	1
38	Enmytagyn, Inchoun, Mitkulen	-	1	-	-	2	1	1	2	-	1	-	1
39	Cape Dezhnev, Naukan, Uelen	-	1	-	-	2	1	1	2	-	2	-	1
64	Kukpuk River, Point Hope	-	-	-	-	1	-	-	1	-	1	-	-
65	Buckland, Cape Lisburne	-	-	-	-	1	1	-	3	1	3	-	-
66	Ayugatak Lagoon	-	-	-	-	1	-	-	1	-	2	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	-	-	1	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	-	-	-	-	-	3	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	-	-	-	-	-	2	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	1	1	-	-	-	2	-	-
75	Akeonik, Icy Cape	-	-	-	-	1	1	-	-	-	2	-	1
76	Avak Inlet, Tunalik River	-	-	-	-	-	1	-	-	-	1	-	1
77	Nivat Point, Nokotlek Point	-	-	-	-	-	-	-	-	-	-	-	1
78	Point Collie, Sigeakruk Point	-	-	-	-	-	1	-	-	-	1	-	1
79	Point Belcher, Wainwright	-	-	1	-	1	2	-	1	1	2	1	4
80	Eluksingiak Point, Kugrua Bay	-	-	-	-	-	1	-	-	-	1	-	3
81	Peard Bay, Point Franklin	-	-	-	-	-	-	-	-	-	-	-	1
82	Skull Cliff	-	-	-	-	-	-	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	-	-	-	-	-	-	1	2
84	Will Rogers & Wiley Post Mem.	-	-	-	1	1	1	-	-	1	1	1	3
85	Barrow, Browerville, Elson Lag.	-	-	1	1	1	2	-	1	1	1	2	4

Table A.2-59. 180 Days-(Winter LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
1	Mys Blossom, Laguna Vaygach	-	1	-	-	-	-	1	-	-	-	-	-
3	Mys Florens, Gusinaya	1	-	-	-	-	-	-	-	-	-	-	-
4	Mys Ushakova, Laguna Drem-Khed	1	-	-	-	-	-	-	-	-	-	-	-
5	Mys Evans	1	1	1	1	-	-	1	-	1	-	1	-
6	Ostrov Mushtakova	2	1	1	1	-	1	1	-	1	1	1	1
7	Kosa Bruch	2	1	2	2	1	1	2	1	1	1	1	1
8	E. Wrangel Island, Skeletov	2	2	2	2	1	1	2	1	2	1	2	1
9	Mys Proletarskiy	1	1	1	1	1	1	1	1	1	1	1	1
10	Bukhta Davidova	1	1	1	1	1	1	1	1	1	1	-	-
12	Bukhta Predatel'skaya	-	1	1	-	1	-	1	1	1	-	-	-
15	Billings, Laguna Adtaynung	1	-	-	-	-	-	1	-	-	-	-	-
16	Mys Enmytagyn	-	-	-	-	-	-	1	-	-	-	-	-
17	Mys Yakan	1	1	1	1	-	-	1	-	-	-	-	-
18	Pil'khikay, Laguna Rypil'khin	1	1	1	1	-	-	1	-	1	-	-	-
19	Laguna Kuepil'khin, Leningradskiy	1	1	1	1	-	-	1	-	1	-	1	-
20	Polyarnyy, Pil'gyn	1	1	1	1	1	1	1	-	1	-	1	1
21	Laguna Pil'khikay, Pil'khikay	1	1	1	1	1	1	1	1	1	-	1	1
22	Rypkarpyy, Mys Shmidta	2	2	2	2	1	1	2	1	2	1	1	1
23	Emuem, Tenkergin	2	2	2	2	1	1	2	1	2	1	1	1
24	LS 24	1	2	2	1	1	1	2	1	2	1	2	1
25	Laguna Amguema, Yulinu	1	2	2	2	1	2	2	1	2	1	2	1
26	Ekugvaam, Kepin, Pil'khin	1	3	2	2	2	2	3	2	2	1	1	2
27	Laguna Nut, Rigol'	1	3	2	2	2	2	2	2	3	2	2	2
28	Vankarem,Vankarem Laguna	1	3	2	2	2	2	3	2	3	2	2	2
29	Mys Onman, Vel'may	1	3	2	2	3	2	2	3	3	2	2	2
30	Nutepynmin, Pyngopil'gyn	2	3	3	2	4	3	3	4	3	3	3	2
31	Alyatki, Zaliv Tasytkhin	2	4	3	2	5	4	4	5	3	4	3	3
32	Mys Dzhenretlen, Eynenekvyk	1	3	2	1	3	2	3	3	2	3	2	2
33	Neskan, Laguna Neskan	1	3	2	1	3	2	2	3	2	2	1	2
34	Tepken, Memino	1	3	2	1	3	2	2	3	2	2	1	2
35	Enurmino, Mys Neten	1	2	1	1	3	2	2	3	2	3	1	2
36	Mys Serdtse-Kamen	1	2	1	1	3	2	2	4	1	3	1	2
37	Chegitun, Utkan	-	1	1	-	2	1	1	3	1	2	1	1
38	Enmytagyn, Inchoun, Mitkulen	-	1	-	-	2	1	1	2	1	1	-	1
39	Cape Dezhnev, Naukan, Uelen	-	1	-	-	2	1	1	2	-	2	-	1
64	Kukpuk River, Point Hope	-	-	-	-	1	-	-	1	-	1	-	-
65	Buckland, Cape Lisburne	-	-	-	-	1	1	-	3	1	3	-	-
66	Ayugatak Lagoon	-	-	-	-	1	-	-	1	-	2	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	-	-	1	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	-	-	-	-	-	3	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	-	-	-	-	-	2	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	1	1	-	-	-	2	-	-
75	Akeonik, Icy Cape	-	-	-	-	1	1	-	-	-	2	-	1
76	Avak Inlet, Tunalik River	-	-	-	-	-	1	-	-	-	1	-	1
77	Nivat Point, Nokotlek Point	-	-	-	-	-	-	-	-	-	-	-	1
78	Point Collie, Sigeakruk Point	-	-	-	-	-	1	-	-	-	1	-	1
79	Point Belcher, Wainwright	-	-	1	1	1	2	-	1	1	2	1	4
80	Eluksingiak Point, Kugrua Bay	-	-	-	-	-	1	-	-	-	1	1	3
81	Peard Bay, Point Franklin	-	-	-	-	-	-	-	-	-	-	-	1
82	Skull Cliff	-	-	-	-	-	-	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	-	1	-	-	-	-	1	2
84	Will Rogers & Wiley Post Mem.	-	-	1	1	1	1	-	-	1	1	2	3
85	Barrow, Browerville, Elson Lag.	-	1	1	2	1	2	1	1	1	2	2	4
86	Dease Inlet, Plover Islands	-	-	-	-	-	-	-	-	-	-	1	1

Table A.2-60. 360 Days-(Winter LS).

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
1	Mys Blossom, Laguna Vaygach	-	1	-	-	-	-	1	-	-	-	-	-
3	Mys Florens, Gusinaya	1	-	-	-	-	-	-	-	-	-	-	-
4	Mys Ushakova, Laguna Drem-Khed	1	-	-	-	-	-	-	-	-	-	-	-
5	Mys Evans	1	1	1	1	-	-	1	-	1	-	1	-
6	Ostrov Mushtakova	2	1	1	1	-	1	1	-	1	1	1	1
7	Kosa Bruch	2	1	2	2	1	1	2	1	1	1	1	1
8	E. Wrangel Island, Skeletov	2	2	2	2	1	1	2	1	2	1	2	1
9	Mys Proletarskiy	1	1	1	1	1	1	1	1	1	1	1	1
10	Bukhta Davidova	1	1	1	1	1	1	1	1	1	1	-	-
12	Bukhta Predatel'skaya	-	1	1	-	1	-	1	1	1	-	-	-
15	Billings, Laguna Adtaynung	1	-	-	-	-	-	1	-	-	-	-	-
16	Mys Enmytagyn	-	-	-	-	-	-	1	-	-	-	-	-
17	Mys Yakan	1	1	1	1	-	-	1	-	-	-	-	-
18	Pil'khikay, Laguna Rypil'khin	1	1	1	1	-	-	1	-	1	-	-	-
19	Laguna Kuepil'khin, Leningradskiy	1	1	1	1	-	-	1	-	1	-	1	-
20	Polyarnyy, Pil'gyn	1	1	1	1	1	1	1	-	1	-	1	1
21	Laguna Pil'khikay, Pil'khikay	1	1	1	1	1	1	1	1	1	-	1	1
22	Rypkarpyy, Mys Shmidta	2	2	2	2	1	1	2	1	2	1	1	1
23	Emuem, Tenkergin	2	2	2	2	1	1	2	1	2	1	1	1
24	LS 24	1	2	2	2	1	1	2	1	2	1	2	1
25	Laguna Amguema, Yulinu	1	2	2	2	1	2	2	1	2	1	2	1
26	Ekugvaam, Kepin, Pil'khin	1	3	2	2	2	2	3	2	2	1	1	2
27	Laguna Nut, Rigol'	1	3	2	2	2	2	2	2	3	2	2	2
28	Vankarem,Vankarem Laguna	1	3	2	2	2	2	3	2	3	2	2	2
29	Mys Onman, Vel'may	1	3	2	2	3	2	2	3	3	2	2	2
30	Nutepynmin, Pyngopil'gyn	2	3	3	2	4	3	3	4	3	3	3	2
31	Alyatki, Zaliv Tasytkhin	2	4	3	2	5	4	4	5	3	4	3	3
32	Mys Dzhenretlen, Eynenekvyk	1	3	2	1	3	2	3	3	2	3	2	2
33	Neskan, Laguna Neskan	1	3	2	1	3	2	2	3	2	2	1	2
34	Tepken, Memino	1	3	2	1	3	2	2	3	2	2	1	2
35	Enurmino, Mys Neten	1	2	1	1	3	2	2	3	2	3	1	2
36	Mys Serdtse-Kamen	1	2	1	1	3	2	2	4	1	3	1	2
37	Chegitun, Utkan	-	1	1	-	2	1	1	3	1	2	1	1
38	Enmytagyn, Inchoun, Mitkulen	-	1	-	-	2	1	1	2	1	1	-	1
39	Cape Dezhnev, Naukan, Uelen	-	1	-	-	2	1	1	2	-	2	-	1
64	Kukpuk River, Point Hope	-	-	-	-	1	-	-	1	-	1	-	-
65	Buckland, Cape Lisburne	-	-	-	-	1	1	-	3	1	3	-	-
66	Ayugatak Lagoon	-	-	-	-	1	-	-	1	-	2	-	-
67	Cape Sabine, Pitmegea River	-	-	-	-	-	-	-	-	-	1	-	-
72	Point Lay, Siksrikpak Point	-	-	-	-	-	-	-	-	-	3	-	-
73	Tungaich Point, Tungak Creek	-	-	-	-	-	-	-	-	-	2	-	-
74	Kasegaluk Lagoon, Solivik Isl.	-	-	-	-	1	1	-	-	-	2	-	-
75	Akeonik, Icy Cape	-	-	-	-	1	1	-	-	-	2	-	1
76	Avak Inlet, Tunalik River	-	-	-	-	-	1	-	-	-	1	-	1
77	Nivat Point, Nokotlek Point	-	-	-	-	-	-	-	-	-	-	-	1
78	Point Collie, Sigeakruk Point	-	-	-	-	-	1	-	-	-	1	-	1
79	Point Belcher, Wainwright	-	-	1	1	1	2	-	1	1	2	1	4
80	Eluksingiak Point, Kugrua Bay	-	-	-	-	-	1	-	-	-	1	1	3
81	Peard Bay, Point Franklin	-	-	-	-	-	-	-	-	-	-	-	1
82	Skull Cliff	-	-	-	-	-	-	-	-	-	-	-	1
83	Nulavik, Loran Radio Station	-	-	-	-	-	1	-	-	-	-	1	2
84	Will Rogers & Wiley Post Mem.	-	-	1	1	1	1	-	-	1	1	2	3

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Land Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
85	Barrow, Browerville, Elson Lag.	-	1	1	2	1	2	1	1	1	2	2	4
86	Dease Inlet, Plover Islands	-	-	-	-	-	-	-	-	-	-	1	1

Tables A.2-61 through A.2-66 represent winter conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain group of land segments within:

Table A.2-61. 3 Days-(Winter GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
144	Alaska Maritime Wildlife Refuge	-	-	-	-	-	-	-	1	-	-	-	-
147	Point Lay Haulout	-	-	-	-	-	-	-	-	-	4	-	-
149	National Petroleum Reserve Alaska	-	-	-	-	-	-	-	-	-	-	-	2
151	Kuk River	-	-	-	-	-	-	-	-	-	-	-	1
176	United States Chukchi Coast	-	-	-	-	-	-	-	2	-	5	-	4

Table A.2-62. 10 Days-(Winter GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
144	Alaska Maritime Wildlife Refuge	-	-	-	-	1	-	-	2	-	2	-	-
147	Point Lay Haulout	-	-	-	-	1	-	-	-	-	6	-	-
149	National Petroleum Reserve Alaska	-	-	-	-	-	1	-	-	-	1	-	6
150	Kasegaluk Lagoon Special Use Area	-	-	-	-	-	-	-	-	-	1	-	1
151	Kuk River	-	-	-	-	-	1	-	-	-	1	-	3
174	Russia Chukchi Coast Marine Mammals	1	1	-	-	1	-	1	1	-	1	-	-
175	Russia Chukchi Coast	2	2	1	-	2	-	2	3	1	1	-	-
176	United States Chukchi Coast	-	-	1	-	3	4	-	5	1	14	1	12
177	United States Beaufort Coast	-	-	-	-	-	1	-	-	-	-	1	2

Table A.2-63. 30 Days-(Winter GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	1	-	-	-	-	-	-	-	-	-	-	-
135	Kolyuchin Bay	-	-	-	-	1	-	-	1	-	-	-	-
138	Chukota Coast Haulout	-	1	-	-	2	1	-	2	1	2	1	1
143	WAH Insect Relief	-	-	-	-	1	-	-	1	-	1	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	1	1	-	2	-	3	-	-
146	Ledyard Bay	-	-	-	-	-	-	-	1	-	1	-	-
147	Point Lay Haulout	-	-	-	-	1	1	-	1	-	7	-	1
148	Kasegaluk Brown Bears	-	-	-	-	-	-	-	-	-	1	-	-
149	National Petroleum Reserve Alaska	-	1	1	1	1	3	1	-	1	2	2	9
150	Kasegaluk Lagoon Special Use Area	-	-	-	-	-	1	-	-	-	1	-	2
151	Kuk River	-	-	-	-	1	2	-	1	1	2	1	4
174	Russia Chukchi Coast Marine Mammals	5	6	5	5	6	5	6	7	5	5	5	4
175	Russia Chukchi Coast	17	27	19	13	26	17	25	30	19	19	13	13
176	United States Chukchi Coast	1	2	3	3	7	10	2	8	4	22	4	18
177	United States Beaufort Coast	-	-	-	1	1	2	-	-	1	1	2	4

Table A.2-64. 60 Days-(Winter GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	1	1	1	-	-	-	1	-	-	-	-	-
135	Kolyuchin Bay	-	-	-	-	1	-	-	1	-	-	-	-
138	Chukota Coast Haulout	1	2	1	1	3	2	1	3	2	3	1	2
143	WAH Insect Relief	-	-	-	-	1	1	-	1	1	1	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	1	1	-	2	-	3	-	-
146	Ledyard Bay	-	-	-	-	1	-	-	1	-	1	-	-
147	Point Lay Haulout	-	-	-	-	1	1	-	1	-	7	1	1
148	Kasegaluk Brown Bears	-	-	-	-	-	1	-	-	-	1	-	-
149	National Petroleum Reserve Alaska	1	1	1	2	1	3	1	1	2	3	3	9
150	Kasegaluk Lagoon Special Use Area	-	-	-	-	-	1	-	-	-	1	-	2
151	Kuk River	-	-	1	-	1	2	-	1	1	2	1	4
174	Russia Chukchi Coast Marine Mammals	10	12	11	9	11	9	11	11	10	9	8	7
175	Russia Chukchi Coast	31	49	39	30	46	35	47	48	39	36	29	27
176	United States Chukchi Coast	2	3	4	4	9	11	3	9	6	23	6	20
177	United States Beaufort Coast	-	-	1	2	1	2	-	1	1	1	3	4

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Table A.2-65. 180 Days-(Winter GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	2	3	2	2	3	2	3	3	3	2	2	2
135	Kolyuchin Bay	-	-	-	-	1	-	-	1	-	-	-	-
138	Chukota Coast Haulout	1	2	2	1	3	3	2	3	2	3	2	2
143	WAH Insect Relief	-	-	-	-	1	1	-	1	1	1	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	1	1	-	2	-	3	-	-
146	Ledyard Bay	-	-	-	-	1	-	-	1	-	1	-	-
147	Point Lay Haulout	-	-	-	-	1	1	-	1	-	7	1	1
148	Kasegaluk Brown Bears	-	-	1	1	-	1	-	-	1	1	1	-
149	National Petroleum Reserve Alaska	1	1	2	2	2	4	1	1	2	3	3	10
150	Kasegaluk Lagoon Special Use Area	-	-	-	-	-	1	-	-	-	1	1	2
151	Kuk River	-	-	1	1	1	2	-	1	1	2	1	4
152	TCH Insect Relief/Calving	-	-	-	-	1	-	-	1	-	1	-	1
174	Russia Chukchi Coast Marine Mammals	14	17	16	14	15	14	16	15	15	13	13	12
175	Russia Chukchi Coast	40	58	50	40	54	45	56	56	50	43	39	36
176	United States Chukchi Coast	2	3	5	5	10	12	3	10	6	23	7	20
177	United States Beaufort Coast	1	1	1	2	2	3	1	1	2	2	3	5

Table A.2-66. 360 Days-(Winter GLS).

ID	Grouped Land Segments Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
133	Mys Blossom	2	3	3	2	3	2	3	3	3	2	2	2
135	Kolyuchin Bay	-	-	-	-	1	-	-	1	-	-	-	-
138	Chukota Coast Haulout	1	2	2	1	3	3	2	3	2	3	2	2
143	WAH Insect Relief	-	-	-	-	1	1	-	1	1	1	-	-
144	Alaska Maritime Wildlife Refuge	-	-	-	-	1	1	-	2	-	3	-	-
146	Ledyard Bay	-	-	-	-	1	-	-	1	-	1	-	-
147	Point Lay Haulout	-	-	-	-	1	1	-	1	-	7	1	1
148	Kasegaluk Brown Bears	-	-	1	1	-	1	-	-	1	1	1	-
149	National Petroleum Reserve Alaska	1	1	2	2	2	4	1	1	2	3	3	10
150	Kasegaluk Lagoon Special Use Area	-	-	-	-	-	1	-	-	-	1	1	2
151	Kuk River	-	-	1	1	1	2	-	1	1	2	1	4
152	TCH Insect Relief/Calving	-	-	-	-	1	-	-	1	-	1	-	1
174	Russia Chukchi Coast Marine Mammals	14	17	16	14	15	14	16	15	16	13	13	12
175	Russia Chukchi Coast	40	58	50	40	54	45	57	56	50	43	39	36
176	United States Chukchi Coast	2	3	5	5	10	12	3	10	6	23	7	20
177	United States Beaufort Coast	1	1	1	2	2	3	1	1	2	2	3	5

Tables A.2-67 through A.2-72 represent winter conditional probabilities (expressed as percent chance) that a large oil spill starting at a particular location will contact a certain boundary segment within:

Table A.2-67. 3 Days-(Winter BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9

Note: All rows have all values less than 0.5 percent and are not shown

Table A.2-68. 10 Days-(Winter BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9

Note: All rows have all values less than 0.5 percent and are not shown

Table A.2-69. 30 Days-(Winter BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
1	Bering Strait	-	-	-	-	-	-	-	1	-	-	-	-
2	Bering Strait	-	-	-	-	1	-	-	1	-	-	-	-
3	Chukchi Sea	1	1	-	-	-	-	1	-	-	-	-	-
4	Chukchi Sea	2	-	1	-	-	-	1	-	-	-	-	-
5	Chukchi Sea	2	-	-	1	-	-	-	-	-	-	-	-
6	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
7	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
11	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
12	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
19	Chukchi Sea	-	-	-	1	-	-	-	-	-	-	-	-

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

Table A.2-70. 60 Days-(Winter BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
1	Bering Strait	-	-	-	-	1	-	-	1	-	-	-	-
2	Bering Strait	-	-	-	-	1	1	-	2	-	1	-	-
3	Chukchi Sea	1	1	1	1	-	1	1	-	1	-	1	-
4	Chukchi Sea	3	1	1	2	-	-	1	-	1	-	2	-
5	Chukchi Sea	4	1	1	2	-	-	1	-	1	-	1	-
6	Chukchi Sea	4	1	1	2	-	-	2	-	1	-	1	-
7	Chukchi Sea	3	1	2	2	-	-	2	-	1	-	1	-
8	Chukchi Sea	2	1	1	1	-	-	1	-	1	-	1	-
9	Chukchi Sea	2	1	1	1	-	-	1	-	1	-	1	-
10	Chukchi Sea	2	-	1	1	-	-	-	-	1	-	1	-
11	Chukchi Sea	2	-	1	1	-	-	-	-	1	-	1	-
12	Chukchi Sea	2	-	-	1	-	-	-	-	-	-	1	-
13	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	-	-
14	Chukchi Sea	1	-	-	-	-	-	-	-	-	-	-	-
15	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	-	-
16	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	-	-
17	Chukchi Sea	1	-	1	1	-	-	1	-	-	-	1	-
18	Chukchi Sea	1	-	1	2	-	1	-	-	1	-	1	1
19	Chukchi Sea	1	-	1	2	-	1	-	-	1	-	1	1
20	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	1

Table A.2-71. 180 Days-(Winter BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
1	Bering Strait	-	-	-	-	1	-	-	1	-	1	-	-
2	Bering Strait	-	-	-	-	1	1	-	2	-	1	-	-
3	Chukchi Sea	2	1	1	1	-	1	2	-	1	-	1	1
4	Chukchi Sea	4	2	2	2	1	1	2	1	1	1	3	1
5	Chukchi Sea	6	2	2	3	1	1	3	2	2	1	3	1
6	Chukchi Sea	6	3	4	4	2	2	4	2	3	1	3	2
7	Chukchi Sea	5	3	4	4	2	3	3	2	3	2	4	3
8	Chukchi Sea	3	2	2	3	1	1	2	1	2	1	2	1
9	Chukchi Sea	3	1	2	2	1	1	1	1	1	-	1	1
10	Chukchi Sea	3	1	2	3	1	1	1	1	2	1	2	1
11	Chukchi Sea	3	2	2	3	1	1	2	1	2	1	2	1
12	Chukchi Sea	3	1	2	2	1	1	1	1	2	1	2	1
13	Chukchi Sea	2	1	2	2	1	1	1	1	1	1	1	1
14	Chukchi Sea	2	1	2	2	1	1	1	1	1	1	2	1
15	Chukchi Sea	2	1	1	2	1	1	1	1	1	1	2	1
16	Chukchi Sea	2	1	1	2	1	1	1	1	1	1	1	1
17	Chukchi Sea	2	2	2	3	2	2	2	2	2	1	3	2
18	Chukchi Sea	2	2	3	4	4	4	2	3	4	3	4	3
19	Chukchi Sea	3	2	2	3	2	3	2	1	2	2	3	3
20	Chukchi Sea	1	1	2	2	1	1	1	1	2	1	1	1
21	Chukchi Sea	1	-	1	1	-	1	1	-	1	-	1	1
22	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	-
23	Beaufort Sea	-	-	-	1	-	1	-	-	-	-	1	-
24	Beaufort Sea	-	-	-	1	-	-	-	-	-	-	1	1
25	Beaufort Sea	-	-	-	-	-	-	-	-	-	-	1	1
38	Beaufort Sea	-	1	1	1	1	1	1	1	1	1	-	-

Table A.2-72. 360 Days-(Winter BS).

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
1	Bering Strait	-	-	-	-	1	-	-	1	-	1	-	-
2	Bering Strait	-	-	-	-	1	1	-	2	-	1	-	-
3	Chukchi Sea	2	1	1	1	-	1	2	-	1	-	1	1
4	Chukchi Sea	4	2	2	2	1	1	2	1	1	1	3	1
5	Chukchi Sea	6	2	2	3	1	1	3	2	2	1	3	1
6	Chukchi Sea	6	4	4	5	2	2	4	2	3	1	3	2
7	Chukchi Sea	5	3	4	4	2	3	3	2	4	2	4	3
8	Chukchi Sea	3	2	2	3	1	1	2	1	2	1	2	1
9	Chukchi Sea	3	1	2	2	1	1	1	1	1	-	2	1
10	Chukchi Sea	3	1	2	3	1	1	1	1	2	1	2	1
11	Chukchi Sea	3	2	2	3	1	2	2	1	2	1	2	1
12	Chukchi Sea	3	1	2	2	1	1	1	1	2	1	2	1
13	Chukchi Sea	2	1	2	2	1	1	1	1	1	1	1	1
14	Chukchi Sea	2	1	2	2	1	1	1	1	2	1	2	1

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ID	Boundary Segment Name	LA 1	LA 4	LA 5	LA 6	LA 10	LA 11	PL 2	PL 3	PL 5	PL 6	PL 8	PL 9
15	Chukchi Sea	2	1	1	2	1	1	1	1	1	1	2	1
16	Chukchi Sea	2	1	1	2	1	1	1	1	1	1	1	1
17	Chukchi Sea	2	2	2	3	2	2	2	2	2	2	3	3
18	Chukchi Sea	2	2	3	4	4	4	2	3	4	3	4	3
19	Chukchi Sea	3	2	2	3	2	3	3	1	2	2	3	3
20	Chukchi Sea	1	1	2	2	1	1	1	1	2	1	2	1
21	Chukchi Sea	1	-	1	1	1	1	1	-	1	-	1	1
22	Chukchi Sea	1	-	-	1	-	-	-	-	-	-	1	-
23	Beaufort Sea	-	-	-	1	-	1	-	-	-	-	1	-
24	Beaufort Sea	-	-	-	1	-	1	1	-	-	-	1	1
25	Beaufort Sea	-	-	-	1	-	1	-	-	-	-	1	1
38	Beaufort Sea	-	1	1	1	1	1	1	1	1	1	-	-

Tables A.2-73 Through A.2-75 Represent Combined Probabilities (Expressed as Percent Chance), Over The Assumed Life Of The Leased Area, Alternatives 1, 3, Or 4, of One Or More Spills ≥1,000 Bbl, And The Estimated Number Of Spills (Mean), Occurring And Contacting A Certain:

Table A.2-73. Environmental Resource Area.

ERA ID	Environmental Resource Area Name	3 days		10 days		30 days		60 days		180 days		360 days	
		%	mean	%	mean	%	mean	%	mean	%	mean	%	mean
0	Land	3	0.04	13	0.14	37	0.45	47	0.64	51	0.72	52	0.73
1	Kasegaluk Lagoon Area	2	0.02	3	0.03	4	0.05	5	0.05	5	0.05	5	0.05
2	Point Barrow, Plover Islands	-	-	-	-	-	-	1	0.01	1	0.01	1	0.01
3	SUA: Uelen/Russia	-	-	-	-	1	0.01	1	0.01	2	0.02	2	0.02
4	SUA:Naukan/Russia	-	-	-	-	1	0.01	2	0.02	2	0.02	2	0.02
6	Hanna Shoal	2	0.02	5	0.05	9	0.10	11	0.12	13	0.14	13	0.14
7	Krill Trap	0	0	1	0.01	3	0.03	3	0.03	3	0.03	3	0.03
10	Ledyard Bay SPEI Crit.Hab. Area	11	0.11	13	0.14	14	0.15	15	0.16	15	0.16	15	0.16
11	Wrangel Island 12 nmi & Offshore	-	-	-	-	3	0.03	4	0.04	6	0.06	6	0.06
15	Cape Lisburne Seabird Col. Area	1	0.01	3	0.03	4	0.05	5	0.05	5	0.05	5	0.05
16	Barrow Canyon	1	0.01	5	0.05	10	0.10	11	0.12	12	0.13	12	0.13
18	Murre Rearing and Molting Area	-	-	3	0.03	8	0.08	9	0.09	10	0.11	10	0.11
19	Chukchi Spring Lead System	6	0.07	9	0.09	11	0.11	11	0.12	12	0.12	12	0.12
20	East Chukchi Offshore	-	-	-	-	-	-	1	0.01	1	0.01	1	0.01
23	Polar Bear Offshore	21	0.24	27	0.31	30	0.36	31	0.37	31	0.37	31	0.37
30	Beaufort Spring Lead 1	-	-	-	-	1	0.01	2	0.02	2	0.02	2	0.02
31	Beaufort Spring Lead 2	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
38	SUA: Pt. Hope - Cape Lisburne	0	0	2	0.02	3	0.03	4	0.04	4	0.04	4	0.04
39	SUA: Pt. Lay - Kasegaluk	8	0.08	10	0.11	12	0.13	13	0.13	13	0.13	13	0.13
40	SUA: Icy Cape - Wainwright	9	0.09	18	0.20	24	0.27	25	0.29	26	0.30	26	0.30
41	SUA: Barrow - Chukchi	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
42	SUA: Barrow - East Arch	-	-	1	0.01	3	0.03	3	0.03	4	0.04	4	0.04
43	SUA: Nuiqsut - Cross Island	-	-	-	-	1	0.01	1	0.01	2	0.02	2	0.02
46	Wrangel Island 12 nmi Buffer 2	-	-	-	-	2	0.02	5	0.05	6	0.06	6	0.06
47	Hanna Shoal Walrus Use Area	9	0.09	14	0.16	21	0.23	23	0.26	25	0.29	25	0.29
48	Chukchi Lead System 4	13	0.14	17	0.19	20	0.23	21	0.24	22	0.24	22	0.25
49	Chukchi Spring Lead 1	0	0	1	0.01	2	0.03	3	0.03	3	0.03	3	0.03
50	Pt Lay Walrus Offshore	11	0.11	14	0.15	16	0.17	16	0.18	17	0.18	17	0.18
51	Pt Lay Walrus Nearshore	6	0.06	7	0.08	8	0.09	8	0.09	8	0.09	8	0.09
52	Russian Coast Walrus Offshore	-	-	3	0.03	10	0.10	11	0.11	12	0.12	12	0.12
53	Chukchi Spring Lead 2	9	0.09	10	0.11	11	0.12	12	0.13	12	0.13	12	0.13
54	Chukchi Spring Lead 3	2	0.02	5	0.05	8	0.08	9	0.09	9	0.09	9	0.09
55	Point Barrow, Plover Islands	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
56	Hanna Shoal Area	3	0.03	5	0.05	7	0.08	8	0.09	10	0.11	10	0.11
57	Skull Cliffs	1	0.01	3	0.03	6	0.06	6	0.06	7	0.07	7	0.07
58	Russian Coast Walrus Nearshore	-	-	1	0.01	3	0.03	4	0.04	4	0.04	4	0.04
59	Ostrov Kolyuchin	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
61	Pt Lay-Barrow BH GW SSF	9	0.10	16	0.17	21	0.23	22	0.25	23	0.26	23	0.26
62	Herald Shoal Polynya 2	-	-	3	0.03	7	0.07	9	0.09	9	0.10	9	0.10
63	North Chukchi	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
64	Peard Bay Area	1	0.01	4	0.05	8	0.09	9	0.09	9	0.10	9	0.10

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

ERA ID	Environmental Resource Area Name	3 days		10 days		30 days		60 days		180 days		360 days	
		%	mean	%	mean	%	mean	%	mean	%	mean	%	mean
66	Herald Island	-	-	-	-	1	0.01	1	0.01	2	0.02	2	0.02
70	North Central Chukchi	-	-	-	-	1	0.01	1	0.01	1	0.02	2	0.02
74	Offshore Herald Island	-	-	1	0.01	3	0.03	3	0.03	3	0.03	3	0.03
80	Beaufort Outer Shelf 1	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
82	N Chukotka Nrshr 2	-	-	-	-	3	0.03	3	0.03	3	0.03	3	0.03
83	N Chukotka Nrshr 3	-	-	-	-	3	0.03	3	0.03	4	0.04	4	0.04
91	Hope Sea Valley	-	-	1	0.01	4	0.04	4	0.04	4	0.04	4	0.04
101	Beaufort Outer Shelf 2	-	-	-	-	-	-	1	0.01	1	0.01	1	0.01
102	Opilio Crab EFH	-	-	2	0.03	6	0.06	7	0.08	7	0.08	7	0.08
103	Saffron Cod EFH	15	0.16	27	0.32	37	0.46	39	0.49	40	0.51	40	0.51
107	Pt Hope Offshore	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
108	Barrow Feeding Aggregation	-	-	1	0.01	2	0.02	2	0.02	2	0.02	2	0.03
109	AK BFT Shelf Edge	-	-	-	-	-	-	-	-	1	0.01	1	0.01
110	AK BFT Outer Shelf&Slope 1	-	-	-	-	-	-	-	-	1	0.01	1	0.01
111	AK BFT Outer Shelf&Slope 2	-	-	-	-	-	-	-	-	1	0.01	1	0.01
112	AK BFT Outer Shelf&Slope 3	-	-	-	-	-	-	-	-	1	0.01	1	0.01
113	AK BFT Outer Shelf&Slope 4	-	-	-	-	-	-	1	0.01	1	0.01	1	0.01
114	AK BFT Outer Shelf&Slope 5	-	-	-	-	-	-	1	0.01	1	0.01	1	0.01
115	AK BFT Outer Shelf&Slope 6	-	-	-	-	1	0.01	1	0.01	2	0.02	2	0.02
116	AK BFT Outer Shelf&Slope 7	-	-	-	-	1	0.01	2	0.02	2	0.03	3	0.03
117	AK BFT Outer Shelf&Slope 8	-	-	-	-	2	0.02	2	0.02	3	0.03	3	0.03
118	AK BFT Outer Shelf&Slope 9	-	-	-	-	2	0.02	3	0.03	4	0.04	4	0.04
119	AK BFT Outer Shelf&Slope 10	-	-	2	0.02	5	0.05	7	0.07	8	0.08	8	0.08
120	Russia CH GW Fall 1&2	-	-	1	0.01	3	0.03	3	0.03	3	0.03	3	0.03
121	C Lisburne - Pt Hope	1	0.01	2	0.02	2	0.02	3	0.03	3	0.03	3	0.03
122	North Chukotka Offshore	-	-	-	-	2	0.02	2	0.02	2	0.02	2	0.02
123	AK Chukchi Offshore	2	0.02	4	0.04	6	0.06	6	0.06	6	0.06	6	0.06
124	Central Chukchi Offshore	-	-	2	0.03	5	0.05	5	0.06	5	0.06	5	0.06

Table A.2-74. Land Segment.

LS ID	Land Segment Name	3 days		10 days		30 days		60 days		180 days		360 days	
		%	mean	%	mean	%	mean	%	mean	%	mean	%	mean
5	Mys Evans	-	-	-	-	-	-	-	-	1	0.01	1	0.01
6	Ostrov Mushtakova	-	-	-	-	-	-	1	0.01	1	0.01	1	0.01
7	Kosa Bruch	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
8	E. Wrangel Island, Skeletov	-	-	-	-	1	0.01	1	0.01	2	0.02	2	0.02
9	Mys Proletarskiy	-	-	-	-	-	-	1	0.01	1	0.01	1	0.01
10	Bukhta Davidova	-	-	-	-	-	-	-	-	1	0.01	1	0.01
19	Laguna Kuepil'khin, Leningradskiy	-	-	-	-	-	-	-	-	1	0.01	1	0.01
20	Polyarnyy, Pil'gyn	-	-	-	-	-	-	1	0.01	1	0.01	1	0.01
21	Laguna Pil'khikay, Pil'khikay	-	-	-	-	-	-	1	0.01	1	0.01	1	0.01
22	Rypkarpyy, Mys Shmidta	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
23	Emuem, Tenkergin	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
24	LS 24	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
25	Laguna Amguema, Yulinu	-	-	-	-	1	0.01	2	0.02	2	0.02	2	0.02
26	Ekugvaam, Kepin, Pil'khin	-	-	-	-	1	0.01	2	0.02	2	0.02	2	0.02
27	Laguna Nut, Rigol'	-	-	-	-	1	0.01	2	0.02	2	0.02	2	0.02
28	Vankarem,Vankarem Laguna	-	-	-	-	1	0.01	2	0.02	2	0.02	2	0.02
29	Mys Onman, Vel'may	-	-	-	-	1	0.01	2	0.02	2	0.02	2	0.02
30	Nutepynmin, Pyngopil'gyn	-	-	-	-	2	0.02	3	0.03	3	0.03	3	0.03
31	Alyatki, Zaliv Tasytkhin	-	-	-	-	2	0.02	3	0.03	3	0.03	3	0.03
32	Mys Dzhenretlen, Eynenekvyk	-	-	-	-	1	0.01	2	0.02	2	0.02	2	0.02
33	Neskan, Laguna Neskan	-	-	-	-	1	0.01	2	0.02	2	0.02	2	0.02
34	Tepken, Memino	-	-	-	-	1	0.01	2	0.02	2	0.02	2	0.02
35	Enurmino, Mys Neten	-	-	-	-	1	0.01	2	0.02	2	0.02	2	0.02
36	Mys Serdtse-Kamen	-	-	-	-	1	0.01	2	0.02	2	0.02	2	0.02
37	Chegitun, Utkan	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
38	Enmytagyn, Inchoun, Mitkulen	-	-	-	-	-	-	1	0.01	1	0.01	1	0.01

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

39	Cape Dezhnev, Naukan, Uelen	-	-	-	-	-	-	1	0.01	1	0.01	1	0.01
64	Kukpuk River, Point Hope	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
65	Buckland, Cape Lisburne	-	-	1	0.01	1	0.01	2	0.02	2	0.02	2	0.02
66	Ayugatak Lagoon	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
72	Point Lay, Siksrikpak Point	1	0.01	1	0.01	1	0.01	1	0.01	1	0.01	1	0.01
73	Tungaich Point, Tungak Creek	1	0.01	1	0.01	1	0.01	1	0.01	1	0.01	1	0.01
74	Kasegaluk Lagoon, Solivik Isl.	-	-	1	0.01	1	0.01	1	0.01	1	0.01	1	0.01
75	Akeonik, Icy Cape	-	-	1	0.01	1	0.01	1	0.01	1	0.01	1	0.01
76	Avak Inlet, Tunalik River	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
77	Nivat Point, Nokotlek Point	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
78	Point Collie, Sigeakruk Point	-	-	1	0.01	1	0.01	1	0.01	1	0.01	1	0.01
79	Point Belcher, Wainwright	-	-	1	0.01	3	0.03	3	0.03	3	0.03	3	0.03
80	Eluksingiak Point, Kugrua Bay	-	-	1	0.01	2	0.02	2	0.02	2	0.02	2	0.02
81	Peard Bay, Point Franklin	-	-	-	-	-	-	-	-	1	0.01	1	0.01
83	Nulavik, Loran Radio Station	-	-	-	-	-	-	1	0.01	1	0.01	1	0.01
84	Will Rogers & Wiley Post Mem.	-	-	1	0.01	2	0.02	2	0.02	2	0.02	2	0.02
85	Barrow, Browerville, Elson Lag.	-	-	1	0.01	3	0.03	3	0.04	4	0.04	4	0.04

Table A.2-75. Grouped Land Segment.

GLS ID	Grouped Land Segment Name	3 days		10 days		30 days		60 days		180 days		360 days	
		%	mean	%	mean	%	mean	%	mean	%	mean	%	mean
133	Mys Blossom	-	-	-	-	1	0.01	2	0.02	4	0.04	4	0.04
135	Kolyuchin Bay	-	-	-	-	2	0.02	2	0.02	2	0.02	2	0.02
136	Ostrov Idlidlya	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
137	Mys Serditse Kamen	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
138	Chukotka Coast Haulout	-	-	-	-	2	0.02	2	0.02	3	0.03	3	0.03
143	WAH Insect Relief	-	-	-	-	1	0.01	1	0.01	1	0.01	1	0.01
144	Alaska Maritime National Wildlife Refuge	-	-	1	0.01	1	0.01	1	0.01	1	0.01	1	0.01
145	Cape Lisburne	-	-	1	0.01	1	0.01	1	0.01	1	0.01	1	0.01
146	Ledyard Brown Bears	-	-	1	0.01	1	0.01	2	0.02	2	0.02	2	0.02
147	Point Lay Haulout	2	0.02	3	0.03	4	0.04	4	0.04	4	0.04	4	0.04
148	Kasegaluk Brown Bears	1	0.01	2	0.02	3	0.03	3	0.03	3	0.04	3	0.04
149	National Petroleum Reserve Alaska	-	-	2	0.02	4	0.04	5	0.05	5	0.05	5	0.05
150	Kasegaluk Lagoon Special Area (NPR-A)	-	-	1	0.01	1	0.01	1	0.01	1	0.01	1	0.01
151	Kuk River	-	-	2	0.02	3	0.04	4	0.04	4	0.04	4	0.04
152	TCH Insect Relief/Calving	-	-	1	0.01	2	0.02	2	0.02	2	0.02	2	0.02
174	Russia Chukchi Coast Marine Mammals	-	-	1	0.01	11	0.11	15	0.16	19	0.21	19	0.21
175	Russia Chukchi Coast	-	-	1	0.01	21	0.23	33	0.39	38	0.48	38	0.48
176	United States Chukchi Coast	3	0.03	10	0.11	17	0.19	18	0.20	19	0.21	19	0.21
177	United States Beaufort Coast	-	-	1	0.01	4	0.04	4	0.04	5	0.05	5	0.05

Note: For all tables in Section A.2, OSRA Conditional and Combined Probability Tables: ** = Greater than 99.5 percent; - = less than 0.5 percent; LA = Launch Area, PL = Pipeline. Rows with all values less than 0.5 percent are not shown.

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APPENDIX B

Resource Assessment and Methodology

Resource Assessment for the Lease Sale 193 Scenario

Scenario Support Table

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Appendix B. Resource Assessment and Methodology

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B-1 Resource Assessment for the Lease Sale 193 Scenario

1. Purpose

This document explains the methods used by BOEM to: (1) estimate the conditional amount of oil that could reasonably be produced from Lease Sale 193 and reasonably foreseeable future lease sales; and (2) determine a plausible distribution of that production among the geologic prospects on which the oil resources potentially reside.

2. Resource Assessment

The methodology undertaken in this exercise differs from a typical presale resource assessment. Typically, the actual leases to be acquired in a sale are not known when the resource assessment for the EIS analyses is being generated. As a result, there is a wide range of uncertainty about industry targets and interest in acquiring geologic prospects, and therefore little basis to predict which leases will be acquired and which of the associated geologic prospects potentially will be drilled and produced. One way of addressing that uncertainty is to conduct the forecast under different assumptions regarding bidder perceptions about future oil prices. Among other things, this approach provides a range of outcomes reflecting both price uncertainty and bidder perceptions about those prices.

The methodology employed by BOEM for the Lease Sale 193 resource assessment utilized for this Second SEIS differs in that the resource assessment is based on data from leases that received bids and that were subsequently evaluated for fair market value by BOEM regional staff. These leasing data and their underlying resource implications capture actual results from the sale; they are the most timely and accurate real world information set that can be used to assess the resources attributable to Lease Sale 193 leases.

In a typical, presale resource assessment, applied to a proven area of hydrocarbon production such as the Gulf of Mexico, BOEM usually finds a strong relationship between oil prices and forecasted production. In contrast, when focusing on resources underlying leases issued through Lease Sale 193, BOEM finds the sensitivity of oil production to alternative specifications of oil prices to be weak.

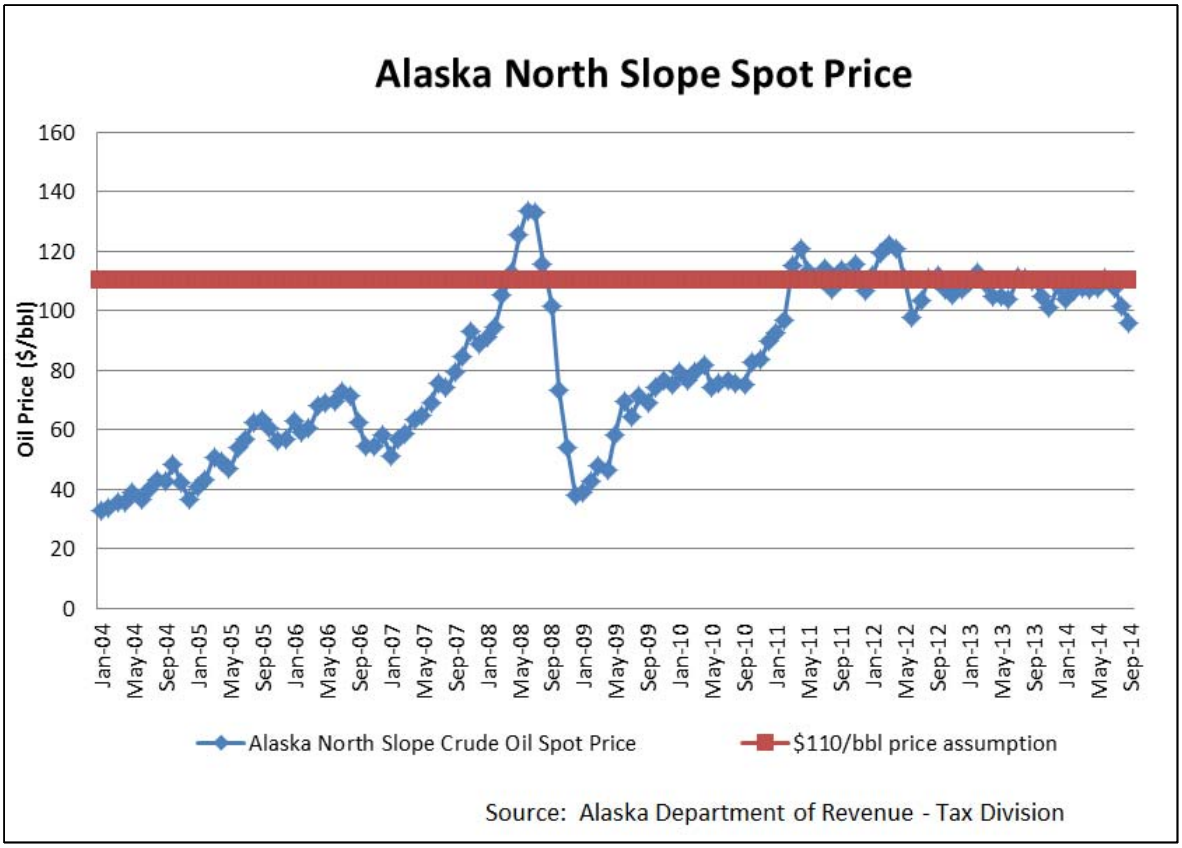
This production-price relationship is further weakened when considering unproven areas of Alaska because the analysis of environmental effects itself requires there to be at least some production occurring in each model run. When a Monte Carlo simulation is performed, the computer selects parameters from a range of possible values and performs calculations using those values to determine, among other things, the total oil production. These calculations are run repeatedly and the results are averaged to find mean values. Because there are no environmental consequences to analyze for an iteration where there is no production, those zero production cases were eliminated. For a run with a lower starting oil price, there are more zero production cases, but the low oil price cases with production must have a high resource volume in order to be economic. Because the zero-production cases are not included in the average, the effect is that the lower oil price runs actually had higher average resource volumes.

For these reasons, the forecasted amount of oil production on leases already sold in an unproven area of Alaska was not anticipated to be very sensitive to changes in oil prices. And indeed, this was found to be the case in modeling the leases sold in Lease Sale 193 using three different oil prices and subjecting them to a simulation analysis in which only the conditional results were counted, i.e., at least one field having a lease sold in Lease Sale 193 which actually produces. Accordingly, it would not be meaningful to generate a range of forecasted production for use in the Lease Sale 193 EIS based on variation in oil prices, given the methodology used to calculate the resources.

3. Real World Data from Sale 193

The identification of bids and evaluation of tracts offered in Sale 193 give a substantial amount of information that is normally not available prior to a sale. BOEM evaluated all 487 tracts receiving bids in the sale and identified twenty-eight specific geologic prospects underlying these tracts. Thirteen of these prospects were screened out as uneconomic, based upon their geologic and reservoir properties. BOEM then subjected the remaining fifteen prospects to extensive statistical analysis, and the relevant outputs of this analysis were captured and their sensitivities tested by re-running the original analysis at two other oil price levels. Variation in oil prices was confirmed to have little effect on the conditional production estimates.

The oil price of $110/bbl (in today's dollars) was selected as the most likely oil price for the analysis for two reasons. The starting oil price is adjusted for inflation during the course of the simulation run. First, $110/bbl is the most likely oil price in BOEM's 2011 Resource Assessment of the Undiscovered Economically Recoverable Resources. Second, $110/bbl is consistent with the current information in the Energy Information Agency's *Short Term Energy Outlook,* the publication used by BOEM's Economics Division to set oil prices to be used in fair market value determinations following lease sales. The current period of oil price stability accounts for the value being unchanged from 2011 to the present. This stability in oil prices is demonstrated by the chart below, which shows the North Slope Crude Spot Prices from January 2004 until September 2014. The red line indicates the $110/barrel price line. As of October 2014, crude oil prices are continuing to decline.

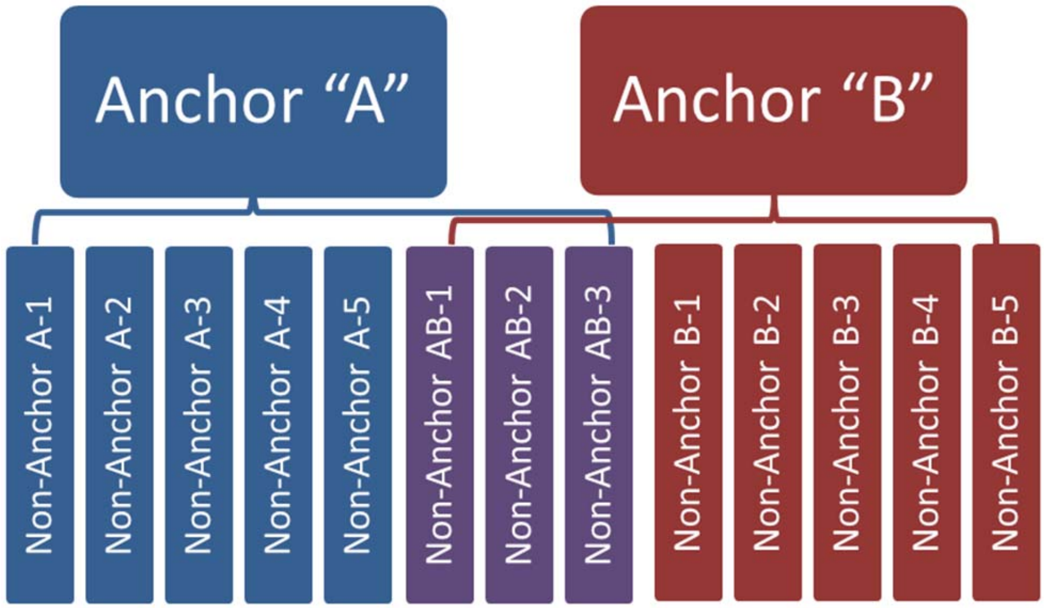


4. Lease Sale 193 Drilling Scenarios

Several different sequential drilling scenarios involving various degrees of assumed geologic dependence between the fifteen prospects were postulated. The fifteen prospects were separated into one of two categories, termed anchor and satellite (non-anchor) fields, based on their geologic and economic potential. (A prospect becomes a field upon discovery of commercial hydrocarbons.) An anchor is judged by BOEM to be capable of being developed under the given set of price assumptions, regardless of whether any of the other prospects is drilled successfully, and capable of supporting offshore infrastructure that may or may not currently exist. A satellite is judged by BOEM not to be economically profitable under the given set of price assumptions, but may become profitable to drill if an anchor is successfully drilled and its infrastructure can be shared by the satellite. The estimates of these prospects' geologic and economic characteristics derive originally from geologic play evaluations conducted for the National Assessment and were later refined by BOEM regional staff evaluations conducted following Lease Sale 193.

Two of the fifteen prospects were judged by BOEM to be potential anchor fields. The remaining thirteen prospects were categorized as potential satellite fields, dependent on one or both of the anchors based on their geologic and geographic characteristics.

Figure 1 - Chukchi Anchor and Non-Anchor (Satellite) Prospects



Satellite AB is dependent on either Anchor "A" or Anchor "B"

As Figure 1 above shows, there are two prospective anchor fields, and thirteen possible satellite fields. Five of the satellites are dependent on Anchor "A," five other satellites are dependent on Anchor "B," and the remaining three satellites are dependent on either Anchor "A" or Anchor "B." These prospects and their geologic dependencies were modeled according to following six cases. In all cases, BOEM assumes that both anchors are drilled, and that none of the satellites is drilled if drilling on both anchors is unsuccessful.

Case #1: Regardless of the success or failure of drilling the anchors, none of the satellites is drilled. This case was rejected because successful production of an anchor has historically encouraged exploration of additional prospects which might take advantage of existing infrastructure.

Case #2: If one or both anchors are drilled successfully, all satellites are drilled subject to their original probability of drilling success. This case was rejected because if a satellite is geologically similar to a successful anchor, its chance of success would likely be revised upward following success at the anchor.

Case #3: If one or both anchors are drilled successfully, all satellites are drilled, the geologically dependent satellites associated with an anchor field drilled successfully are also drilled successfully (i.e., revised probability of drilling success is 100%), and, all other satellites associated with an unsuccessful anchor are drilled at their original probability of drilling success. This case was rejected because a successful anchor cannot guarantee a successful satellite, even though they are geologically related. Even though the successful anchor and the satellite are in the same rock formation, the satellite may not have a trapping mechanism to keep the oil contained. Also, it is unlikely that a satellite which is geologically related to an unsuccessful anchor would even be drilled.

Case #4: If one or both anchor fields are drilled successfully, all geologically dependent satellites associated with a successful anchor are also drilled successfully (i.e., revised probability of success is

100%), and all other satellites associated with an anchor not drilled successfully are not drilled (i.e., effective probability of drilling success is 0%). This case was rejected because it incorporates same flawed logic as Case #3.

Case #5: If one or both anchors are drilled successfully, all satellites are drilled. The chance of successful drilling on all geologically dependent satellites associated with a successful anchor is revised to reflect successful drilling on the related anchor field. The revised chance of success is assumed equal to the midpoint of the satellite's original probability of success and 100%. All other satellites associated with an unsuccessful anchor are drilled subject to their original probability of success. This case was rejected because it unreasonably assumes that all geologically-related satellites associated with a failed anchor would still get drilled.

Case #6: If one or both anchors are drilled successfully, all geologically dependent satellites associated with a successful anchor are drilled at a revised chance of success equal to the midpoint of the satellite's original probability of success and 100%. All other satellites are not drilled (i.e., effective probability of drilling success is 0%). This case represents the most reasonable progression of activities in light of the circumstances influencing development on the Chukchi Sea OCS.

Each of the six drilling scenarios was evaluated through a Monte Carlo simulation based on the underlying resource and economic characteristics of each geologic prospect. In order to ensure that the scenario resulted in some level of oil production, only those simulations in which drilling resulted in oil being discovered in commercial quantities on at least one field were considered successful trials. *Only these successful trials were included in the calculation of the conditional production results.* Selected points on the cumulative probability of production for each of the cases are shown in Table 1, and the production results are calculated at a starting oil price of $110 per barrel.

Table 1 – Conditional Production Results for All Cases at $110 Starting Price of Oil

	Oil Production (Bbbl)					
$110 Price Level	Average	Minimum	5th Percentile	Median	95th Percentile	Maximum
Case #1	2.6	1.8	1.8	2.9	2.9	4.7
Case #2	3.1	1.8	1.8	2.9	5.1	7.7
Case #3	8.7	6.1	6.1	9.6	11.4	15.3
Case #4	8.5	6.1	6.1	9.6	9.7	15.3
Case #5	5.9	1.9	2.9	5.7	9.4	13.7
Case #6	5.7	1.9	2.8	5.5	9.2	13.6

Out of the six cases, Case #6 was selected as the most plausible set of relationships and activities for depicting the drilling scenario for leases sold in Sale 193.

5. Monte Carlo Simulation Results

The table of results below for Case #6 shows the results of approximately one million successful trials in the simulation for each price case. A successful trial involves a drilling scenario in which at least one anchor field is drilled successfully and encounters an amount of oil large enough to be produced profitably. Simulation trials in which anchors are drilled but fail to encounter economically recoverable amounts of hydrocarbons were counted as failures. A majority of simulation trials were categorized as failures; only between 13% and 17% of trials are successes, depending on the assumed price level. To generate approximately one million successful trials, about seven million simulation trials were run at each price level.

As shown in Table 2 below, the median amount of production at the $110 price case is 5.5 billion barrels of oil. While the median represents the 50th percentile of the successful trials, in reality this figure represents about the 93rd percentile of *all* trials.

Table 2 - Case #6 Monte Carlo Simulation Results

	Oil Resources (Bbbl)					
Starting Oil Price Case	Average	Minimum	5th Percentile	Median	95th Percentile	Maximum
$76.86	6.2	2.0	3.0	6.0	10.1	14.9
$110.00	5.7	1.9	2.8	5.5	9.2	13.6
$160.00	5.5	1.9	2.7	5.3	8.9	13.3

	Gas Resources (TCF)					
Starting Oil Price Case	Average	Minimum	5th Percentile	Median	95th Percentile	Maximum
$76.86	15.9	1.4	3.9	17.8	26.0	30.3
$110.00	15.8	1.4	3.9	17.6	25.5	30.0
$160.00	15.4	1.4	3.9	17.2	24.5	29.3

Next, Table 3 shows the percent of successful trials for each price case.

Table 3 - Successful Trials per Price Case

Starting Oil Price Case	Successful Trials
$76.86	13%
$110.00	15%
$160.00	17%

Table 4 shows the cumulative distribution of conditional resources from the Monte Carlo Simulation at the $110 price case.

Table 4 - Case #6 Distribution of Oil, $110 Starting Price

Percentile	Oil (Bbbl)
0.00	1.9
0.05	2.8

Percentile	Oil (Bbbl)
0.10	3.2
0.15	3.5
0.20	3.9
0.25	4.2
0.30	4.5
0.35	4.8
0.40	5.0
0.45	5.2
0.50	5.5
0.55	5.7
0.60	6.0
0.65	6.3
0.70	6.7
0.75	7.1
0.80	7.4
0.85	7.9
0.90	8.3
0.95	9.2
1.00	13.6

6. Representative Case

An assortment of combinations of anchors and satellites were tested by the BOEM Economics Division for statistical outcomes for aggregate resources. BOEM selected from the distribution of Case #6 results a point which (1) represents a Chukchi Sea OCS resource volume that is high enough to ensure that cumulative environmental impacts would not be underestimated; and (2) corresponds to the total of mean resource estimates associated with a combination of modeled prospects that could be linked via a realistic development scenario. *Anchor A*, with 2.9 billion barrels (Bbbls) in potential resources, was selected as the most likely candidate for an oil field of sufficient size to justify commercial development because it is the most promising and physically largest oil prospect in the Chukchi Sea. The sizable *Satellite A-2* (1.4 Bbbls) is located 30 statute miles from the center of *Anchor A,* shares some of the geological attractions of *Anchor A*, and would likely be drilled first in the event of a significant discovery at the latter because it offers a greater geological chance of success (10%) than other more remote and sizeable satellites (6%-8%).

As shown in Table 5, the potential oil reserves in the Sale 193 scenario are 4.3 Bbbls. This represents a substantial reserve base; the largest known oil field in the entire GOMR (Mars-Ursa) has estimated reserves of 1.3 Bbbls.

Table 5 - Resource Assessment for Sale 193 Leases

Hypothetical Oil Pool	Recoverable Oil (Billions of Barrels)	Recoverable Solution Gas (Trillions of Cubic Feet)
Anchor A	2.9	1.224
Satellite A-2	1.4	1.113
Aggregate	4.3	2.337

The time required for Anchor *A* to be explored, delineated, and developed will be impacted by the short Arctic open-water seasons, the absence of existing infrastructure, and limited availability of suitable equipment and materials. The massive capital and personnel requirements to develop projects of this size and complexity will require even major operators to focus solely on one field at a time. Operators would be reluctant to commit additional resources to exploring, delineating and developing satellites (i.e. smaller prospects) until an anchor is proven. Available capital, drilling equipment inventories, and personnel will inevitably be largely committed to the massive effort to develop *Anchor A*, once proven. It is anticipated that concurrently exploring, delineating and developing *Satellite A-2* – if in fact feasible – would require the use of any remaining drilling equipment inventories.

Leases are issued for finite terms and cannot be extended without a demonstration of diligence on the part of the operator. Were development of *Anchor A* and *Satellite A-2* to proceed, it is unreasonable to assume that sufficient capital, equipment, personnel and other resources would exist to also enable the exploration, delineation and diligent development of any additional fields prior to the expiration of leases issued as a result of Lease Sale 193. It is also unreasonable to presume that satellites *A-1* and *A-3* would be unitized with *Anchor A* and/or *Satellite A-2*. Even in the case where an exploration well (or two) discovers petroleum in each of satellites *A-1* and *A-3*, it is unlikely that the well results would be sufficient to justify agency approval for incorporation of all of the several associated leases into a unit. This means that lease terms would likely expire on undeveloped satellite prospects, which would be re-leased in subsequent lease sales.

Satellites *A-1* and *A-3* are therefore identified as potential candidates for development via future Chukchi Sea OCS lease sales. Table 6 below summarizes a scenario for future lease sales. The potential oil reserves assumed to be produced from reasonably foreseeable future lease sales represent an additional 1.9 Bbbls, for a project total of 6.2 Bbbls. The resources associated with this scenario represent approximately the 95th percentile of all modeled results.

Table 6 - Resource Assessment for Future Chukchi Sea OCS Lease Sales

Hypothetical Oil Pool	Recoverable Oil (Billions of Barrels)	Recoverable Solution Gas (Trillions of Cubic Feet)
Satellite A-1	1.5	1.858
Satellite A-3	0.4	0.178
Aggregate	1.9	2.036

B-2. Lease Sale 193 Draft Second SEIS Scenario Support Table

Table B-1. Scenario Support Table.

Year	Marine Seismic Survey	Geohazard Survey	Geotechnical Survey	Exploration/ Delineation Wells	Offshore Exploration Platform		Offshore Production Platform		On-Platform Production and Service Wells	Sub-Sea Wells	Offshore Pipelines (Export Lines)		Onshore Pipelines		Exploration Base	Production Base	Supply Boat Terminal	Air Support Base	Search & Rescue Base	Gas Production (BCF)			Oil and Condensate Production (MMbbl)		
											Oil	Gas	Oil	Gas						Anchor A	A-2	TOTAL	Anchor A	A-2	TOTAL
				# of wells	***#***	***Type***	***#***	***Type***	***# of wells***	***# of wells***	***mi***	***mi***	***mi***	***mi***						***BCF/yr***			***MMbbl***		
1	1	1	1	-	-		-		-	-	-	-	-	-	1	-	-	1	1	-		**-**	-		**-**
2	-	1	1	-	-		-		-	-	-	-	-	-		-	-			-		**-**	-		**-**
3	-	-	-	4	2	Rig	-		-	-	-	-	-	-	-	-	-	-	-	-		**-**	-		**-**
4	-	-	-	4	2	Rig	-		-	-	-	-	-	-	-	-	-	-	-	-		**-**	-		**-**
5	-	1	1	4	2	Rig	-		-	-	-	-	-	-	-	1	1	-	-	-		**-**	-		**-**
6	-	1	1	4	2	Rig	-		-	-	40	-	75	-	-			-	-	-		**-**	-		**-**
7	-	1	1	4	2	Rig	-		-	-	40	-	75	-	-	-	-	-	-	-		**-**	-		**-**
8	1	-	-	4	2	Rig	-		-	-	40	-	75	-	-	-	-	-	-	-		**-**	-		**-**
9	-		-	4	2	Rig	-		-	-	40	-	75	-	-	-	-	-	-	-		**-**	-		**-**
10	-	-	-	-	-		1	GBS	3	-	-	-	-	-	-	-	-	-	-	-		**-**	1		**1.475**
11	1	1	1	-	-		-		16	-	-	-	-	-	-	-	-	-	-	-		**-**	21		**20.646**
12	-	-	-	-	2	Rig	-		16	6	-	-	-	-	-	-	-	-	-	-		**-**	47		**47.060**
13	-	-	-	-	2	Rig	1	GBS	19	6	5	-	-	-	-	-	-	-	-	-		**-**	75		**74.560**
14	-	1	1	-	2	Rig	-		25	6	-	-	-	-	-	-	-	-	-	-		**-**	106		**106.482**
15	1	-	-	-	3	Rig	-		16	9	-	-	-	-	-	-	-	-	-	-		**-**	125		**124.856**
16	-	-	-	-	3	Rig	1	GBS	19	9	5	-	-	-	-	-	-	-	-	-		**-**	143		**142.809**
17	-	1	1	-	3	Rig	-		25	9	-	-	-	-	-	-	-	-	-	-		**-**	165		**165.459**
18	-	-	-	-	3	Rig	-		16	9	-	-	-	-	-	-	-	-	-	-		**-**	174		**173.831**
19	1	1	1	-	3	**Rig**	1	**GBS**	19	9	5	-	-	-	-	-	-	-	-	-	-	**-**	182	-	**181.871**
20	-	2	2	4	4	**Rig**	-		25	6	-	-	-	-	-	-	-	-	-	-	-	**-**	193	-	**193.134**
21	1	-	-	4	4	**Rig**	-		16	6	-	-	-	-	-	-	-	-	-	-	-	**-**	190	-	**190.310**
22	-	-	-	4	4	**Rig**	1	**GBS**	19	6	5	-	-	-	-	-	-	-	-	-	-	**-**	192	-	**191.860**
23	-	1	1	-	3	**Rig**	-		25	9	20	-	-	-	-	-	-	-	-	-	-	**-**	204	-	**204.420**
24	-	-	-	-	-		1	**GBS**	19	-	-	-	-	-	-	-	-	-	-	-	-	**-**	193	2	**194.160**
25	1	-	-	-	-		-		32	-	-	-	-	-	-	-	-	-	-	-	-	**-**	181	23	**203.926**
26	-	-	-	-	-		-		19	-	-	-	-	-	-	-	-	-	-	-	-	**-**	151	45	**195.478**
27	-	-	-	-	-		1	GBS	19	-	5	40	-	75	-	-	-	-	-	-	-	**-**	121	69	**189.812**
28	-	1	1	-	-		-		21	-	-	40	-	75	-	-	-	-	-	-	-	**-**	95	92	**186.852**
29	1	-	-	-	-		-		16	-	-	40	-	75	-	-	-	-	-	-	-	**-**	74	105	**178.893**
30	-	-	-	-	-		1	**GBS**	19	-	5	40	-	75	-	-	-	-	-	-	-	**-**	57	118	**174.988**
31	-	-	-	-	-		-		21	-	-	-	-	-	-	-	-	-	-	1	-	**0.605**	45	130	**175.106**
32	-	-	-	-	-		-		16	-	-	-	-	-	-	-	-	-	-	8	-	**8.465**	35	135	**169.592**
33	-	-	-	-	-		-		16	-	-	-	-	-	-	-	-	-	-	19	-	**19.295**	27	137	**164.220**
34	-	-	-	-	-		-		2	-	-	5	-	-	-	-	-	-	-	31	-	**30.569**	21	115	**135.932**
35	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	44	-	**43.658**	16	93	**108.688**
36	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	51	-	**51.191**	12	72	**84.452**
37	-	-	-	-	-		-		-	-	-	5	-	-	-	-	-	-	-	59	-	**58.552**	9	56	**65.503**
38	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	68	-	**67.838**	7	44	**50.676**
39	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	71	-	**71.271**	5	34	**39.222**

Year	Marine Seismic Survey	Geohazard Survey	Geotechnical Survey	Exploration/ Delineation Wells	Offshore Exploration Platform		Offshore Production Platform		On-Platform Production and Service Wells	Sub-Sea Wells	Offshore Pipelines (Export Lines)		Onshore Pipelines		Exploration Base	Production Base	Supply Boat Terminal	Air Support Base	Search & Rescue Base	Gas Production (BCF)			Oil and Co ndensate Production (MMbl)		
											Oil	Gas	Oil	Gas						Anchor A	A-2	TOTAL	Anchor A	A-2	TOTAL
				# of wells	*#*	*Type*	*#*	*Type*	*# of wells*	*# of wells*	*mi*	*mi*	*mi*	*mi*						*BCF/yr*			*MMbbl*		
40	-	-	-	-	-		-		-	-	-	5	-	-	-	-	-	-	-	75	-	**74.567**	4	27	**30.278**
41	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	79	-	**79.185**	3	21	**23.266**
42	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	78	-	**78.027**	2	16	**17.910**
43	-	-	-	-	-		-		-	-	-	25	-	-	-	-	-	-	-	79	-	**78.663**	1	13	**13.692**
44	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	84	-	**83.812**	1	10	**10.314**
45	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	79	1	**80.152**	0	8	**7.868**
46	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	74	17	**91.267**	0	6	**5.794**
47	-	-	-	-	-		-		-	-	-	5	-	-	-	-	-	-	-	62	33	**94.865**	-	4	**4.318**
48	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	50	51	**100.557**	-	3	**3.154**
49	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	39	68	**107.054**	-	2	**2.220**
50	-	-	-	-	-		-		-	-	-	5	-	-	-	-	-	-	-	30	78	**108.068**	-	2	**1.545**
51	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	24	87	**110.556**	-	1	**0.994**
52	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	18	97	**114.835**	-	1	**0.538**
53	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	14	100	**114.066**	-	0	**0.236**
54	-	-	-	-	2	Rig	-		-	-	-	-	-	-	-	-	-	-	-	11	102	**112.689**	-	-	**-**
55	-	-	-	-	2	Rig	-		-	-	-	-	-	-	-	-	-	-	-	8	85	**93.787**	-	-	**-**
56	-	-	-	-	2	Rig	-		-	-	-	-	-	-	-	-	-	-	-	6	69	**75.231**	-	-	**-**
57	-	-	-	-	3	Rig	-		-	-	-	-	-	-	-	-	-	-	-	5	54	**58.523**	-	-	**-**
58	-	-	-	-	3	Rig	-		-	-	-	-	-	-	-	-	-	-	-	4	42	**45.468**	-	-	**-**
59	-	-	-	-	3	Rig	-		-	-	-	-	-	-	-	-	-	-	-	3	33	**35.272**	-	-	**-**
60	-	-	-	-	3	Rig	-		-	-	-	-	-	-	-	-	-	-	-	2	25	**27.370**	-	-	**-**
61	-	-	-	-	3	Rig	-		-	-	-	-	-	-	-	-	-	-	-	1	20	**21.206**	-	-	**-**
62	-	-	-	-	2	Rig	-		-	-	-	-	-	-	-	-	-	-	-	1	15	**16.386**	-	-	**-**
63	-	-	-	-	2	Rig	-		-	-	-	-	-	-	-	-	-	-	-	1	12	**12.675**	-	-	**-**
64	-	-	-	-	2	Rig	-		-	-	-	-	-	-	-	-	-	-	-	0	9	**9.766**	-	-	**-**
65	-	-	-	-	3	Rig	-		-	-	-	-	-	-	-	-	-	-	-	0	7	**7.463**	-	-	**-**
66	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	0	6	**5.740**	-	-	**-**
67	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	0	4	**4.277**	-	-	**-**
68	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	3	**3.196**	-	-	**-**
69	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	2	**2.334**	-	-	**-**
70	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	2	**1.643**	-	-	**-**
71	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	1	**1.144**	-	-	**-**
72	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	1	**0.735**	-	-	**-**
73	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	0	**0.398**	-	-	**-**
74	-	-	-	-	-		-		-	-	-	-	-	-	-	-	-	-	-	-	0	**0.174**	-	-	**-**
75-77	**Decommissioning of platforms, remaining wells, and pipelines.**																								
Annual Maximum	**1**	**2**	**2**	**4**	**4**		**1**		**32**	**9**	**40**	**40**	**75**	**75**	**1**	**1**	**1**	**1**	**1**	**84**	**102**	**114.835**	**204**	**137**	**204**
Total:	**8**	**13**	**13**	**40**	**80**		**8**		**459**	**90**	**210**	**210**	**300**	**300**	**1**	**1**	**1**	**1**	**1**	**1,179**	**1,024**	**2,203**	**2,875**	**1,384**	**4,258**

Notes: A “#” = number.
A “-“ = 0
Green colored cells indicate that only Anchor A related factors occur.
Numbers shown over two years indicate that project completion requires two years.

APPENDIX C

Marine Mammal Mitigation Measures

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Appendix C. Marine Mammal Mitigation Measures

C-1. Lease Stipulations

Lease Stipulations are binding contractual provisions that apply to all Ancillary Activities, Exploration Plans (EPs), Development and Production Plans (DPPs), and Development Operations Coordination Documents (see 30 CFR §550.202). Lease Sale Stipulations often consist of protective measures designed to decrease the likelihood of impacts to environmental resources such as marine mammals. A complete list of the stipulations applicable to Lease Sale 193 leases is provided in Appendix D. A brief summary of those Lease Stipulations which may serve to reduce impacts to marine mammals is provided below.

Stipulation No. 1. Protection of Biological Resources. Stipulation 1 is intended to protect biological resources that are discovered during the course of operations. If previously unidentified biological populations or habitats that may require additional protection – for example, marine mammal haul out areas – are identified in the lease area, the lessee may be required to conduct biological surveys to determine the extent and composition of such biological populations or habitats. The lessee may also be required to do one of more of the following: relocate the site of operations; establish that its operations will not have a significant adverse effect upon the resource identified, or that a special biological community does not exist; operate during those periods of time that do not adversely affect the biological resources; and/or modify operations to ensure that significant biological populations or habitats deserving protection are not adversely affected.

Stipulation No. 2. Orientation Program. Stipulation 2 requires that any EP or DPP include a proposed orientation program for all personnel involved in exploration or development and production activities. The orientation program must inform these individuals of relevant environmental, social, and cultural concerns along with pertinent mitigation that protect biological and cultural resources in the Leased Area and the adjacent offshore and onshore environments. The orientation programs address the importance of not disturbing important resources, such as marine mammals, and provide guidance on how to avoid disturbance.

Stipulation No. 3. Transportation of Hydrocarbons. Stipulation 3 is intended to decrease the risk of an oil spill by requiring pipelines if, among other factors, they are feasible and environmentally preferable. This stipulation may also be used to specify the location where pipelines come to shore.

Stipulation No. 4. Industry Site-Specific Monitoring Program for Marine Mammal Subsistence Resources. Stipulation 4 may be used to require lessees to monitor activities which take place on lease blocks that are within identified marine mammal subsistence hunting areas in order to minimize the potential for impacts to subsistence hunting.

Stipulation No. 5. Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Marine Mammal Subsistence-Harvesting Activities. Stipulation 5 requires that all exploration and development and production operations – including support activities – be conducted in a manner that prevents unreasonable conflicts between the oil and gas industry and subsistence activities. Like Stipulation 4, this stipulation is designed to protect subsistence harvest practices, but may also serve to reduce potential disturbance to marine mammals.

Stipulation No. 6. Pre-Booming Requirements for Fuel Transfers. Stipulation 6 requires pre-booming during fuel transfers in order to reduce the potential impacts of a spill, should one occur during fuel transfer.

Stipulation No. 7. Measures to Minimize Effects to Spectacled and Steller's Eiders During Exploration Activities. The stipulation prohibits travel, except for emergencies or human/navigation safety, through the Ledyard Bay Critical Habitat Area by surface vessel associated with exploration and delineation drilling operations between July 1 and November 15. It also restricts operating altitudes for aircraft supporting drilling operations to above 1,500 feet above sea level over certain areas including Ledyard Bay Critical Habitat between July 1 and November 15. While designed to prevent effects to the eiders, these area and temporal restrictions may reduce effects to marine mammals from vessel and aircraft transit.

C-2. Marine Mammal Protection Act (MMPA)

All oil and gas activities described in the Second SEIS Scenario (Section 2.3.5., hereafter "Scenario") must comply with the Marine Mammal Protection Act (MMPA). The MMPA prohibits the unauthorized "take" of marine mammals. Under the MMPA and regulations promulgated by NMFS and USFWS (collectively, the "Services"), "take" is defined broadly to include not only "serious injury" or mortality, but also "harassment." The Services may authorize "take" of marine mammals where certain criteria are met. Specifically, the taking must:

- Be of small numbers of marine mammals
- Have no more than a "negligible impact" on those marine mammal species or stocks
- Not have an "immitigable adverse impact on the availability of the species or stock for "subsistence" uses

Where appropriate, the Services will condition their "take" authorizations (such as Letters of Authorization and Incidental Harassment Authorizations) upon the operator's implementation of mitigation measures designed to ensure that the substantive criteria of the MMPA will be met. Over the years, several standard mitigation measures have been applied to the types of oil and gas activities described in the Scenario. The following paragraphs identify these standard mitigation measures required in MMPA "take" authorizations and briefly describe how they serve to reduce potential impacts to marine mammals.

Shutdown / power down procedures for vessels and other equipment that could operate within habitat used by marine mammals. Such procedures usually require that the equipment be shut down or powered down if a marine mammal comes within a specified radius. The purpose of this measure is to avoid injury, and to reduce the likelihood of other adverse impacts to marine mammals from exposure to high noise levels. NMFS and USFWS use the best science available to recommend appropriate sound thresholds (dB levels) to avoid/minimize adverse impacts to marine mammals under their jurisdictions. The distance from the sound source associated with those thresholds is established through acoustic modeling or onsite verification tests.

Ramp-up procedures for airgun arrays or other equipment. This procedure involves the gradual increase in emitted sound levels over a specified time period. As an example, airgun ramp up begins with firing a single airgun, and additional airguns are gradually added over a period of 20 to 40 minutes, until the desired operating level of the full array is obtained. The purpose of a ramp-procedure is to provide a gradually increasing sound so that marine mammals near source of the sound have the opportunity to move away before being exposed to sound levels that might be strong enough to cause injury.

PSOs (Protected Species Observers) on vessels, including seismic source vessels, icebreakers, drill ships, and monitoring vessels. The presence of staff dedicated to overseeing implementation of the mitigation measures is crucial to ensuring their success. PSOs are placed on source vessels and monitor to ensure appropriate implementation of measures such as shutdown and power down measures, and for estimating potential impacts. PSOs may also be used to collect required monitoring information. PSOs are trained in species identification and many other operational and data recording procedures.

Minimum flight altitudes for all support aircraft, and/or areas to be avoided. These requirements are intended to reduce the chance of disturbing marine mammals in the water or hauled out on the ice or land. Exceptions are made for landing, takeoff, emergency situations, and unsafe flying conditions (such as poor weather or low visibility). Typically, aircraft shall not operate fly within 305 m (1,000 ft) of marine mammals or below 457 m (1,500 ft) above ground level or sea level (except for take-off, landing, emergency situations, and inclement weather). Aircraft flight routes will be designed to avoid overflights of seal and walrus haulouts.

Procedures for changing vessel speed, direction, or routes. Restrictions on vessel speed as well as the number of direction changes can reduce the risk of collisions, especially during conditions of poor visibility. Reduced speeds also reduce the chance that a vessel strike is lethal if it occurs. Specifying that shipping routes avoid important habitat areas where marine mammals may occur in high densities is also a means to reduce the risk of disturbance.

Decrease or shutdown of activities during certain periods of time or near certain locations. This measure is intended to avoid and minimize adverse impacts to marine mammals in particularly important habitat during biologically sensitive time periods.

Prohibition of activity within 150 m from any observed ringed seal lair and 500 m from any known polar bear den. NMFS or USFWS may require surveys to determine the presence of lairs and/or den sites.

Notification of lost equipment that could pose a danger to marine mammals. The operator shall notify BOEM or BSEE (dependent upon the type of activity), and NMFS in the event of any loss of cable, streamer, or other equipment that could pose a danger to marine mammals through entanglement.

Prohibition on drill ships and rigs and associated support vessels entering the Chukchi Sea before July 1; avoidance of the spring lead system. Unless authorized by the USFWS based upon a review of seasonal ice conditions and other factors (50 CFR 18.118 (a)(2)(iv)), vessels will not enter the Chukchi Sea prior to July 1. To minimize impacts on marine mammals and subsistence-hunting activities, the drillship and support vessels traversing north through the Bering Strait will transit through the Chukchi Sea along a route that avoids the spring lead system while allowing for the highest degree of safety regarding ice conditions and sea states.

Prohibition of vessels operating within 0.5 mi (805 m) of walrus on haul outs. When within 1,000 ft (300 m) of walrus in water, vessels will reduce speed and avoid multiple changes of direction.

Prohibition of aircraft and vessels operating within 0.5 mi (800 m) of walrus or polar bears when observed on land or ice. When polar bears are seen by aircraft, the aircraft will change route to avoid disturbing bears.

Incineration of solid food wastes onboard ships or rigs, eliminating the wastes as a potential attractant for polar bears.

C-3. Endangered Species Act

Several marine mammal species found in and around the Leased Area receive additional protections under the Endangered Species Act (ESA). The marine mammal species in the Chukchi Sea that are listed as “Endangered” or “Threatened” under the ESA are the bowhead whale, fin whale, humpback whale, ringed seal, bearded seal, and polar bear. (Note: The Pacific walrus is a candidate species under the ESA). Unauthorized “take” of these species is prohibited by the ESA. The ESA requires Federal agencies to consult with the Services prior to authorizing activities that “may affect” a listed species. The purpose of the consultation process is two-fold:

- To ensure that agency-authorized activities are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat.
- To authorize the incidental take of listed species where appropriate through the consultation process, the Services will also require the implementation of appropriate mitigation measures to reduce the amount of incidental take that actually occurs.

Over the years, several standard or typical mitigation measures (called “terms and conditions”) have been applied to the types of oil and gas activities described in the Scenario. These standard or typical mitigation measures are derived from Biological Opinions (BO) – the end product of formal ESA consultations. Because these mitigation measures largely mirror those implemented through the MMPA take authorization process, they are not repeated here. It is noted that an MMPA incidental take authorization is a prerequisite to the Services’ authorization of incidental take under the ESA– i.e. an authorization to “take” species listed under the ESA – within the Biological Opinion.

APPENDIX D

Guide to Lease Stipulations

Background

Considerations in Reading the Sale 193 Lease Stipulations

Sale 193 Lease Stipulations

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Appendix D. Guide to Lease Stipulations

D-1. Background

After the Outer Continental Shelf (OCS) Oil and Gas Lease Sale 193 (Lease Sale 193) for the Chukchi Sea Planning Area was held by the Minerals Management Service (MMS) on February 6, 2008, the U.S. Department of the Interior (DOI) restructured and reassigned responsibilities from MMS to three newly established agencies. This Appendix explains the references to the new agencies, organization titles, and regulations for the Lease Sale 193 Lease Stipulations, which are included as terms and conditions on each lease issued from Lease Sale 193. This Appendix does not alter the requirements of these Lease Stipulations for Lease Sale 193. These Lease Stipulations are addressed in this Draft Second Supplemental Environmental Impact Statement.

On May 19, 2010, Department of the Interior (DOI) Secretary Ken Salazar signed Secretarial Order No. 3299 that directed the division of the MMS into three organizations, each with separate and clearly defined missions. Subsequently, MMS was renamed the Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) on June 18, 2010 by Secretarial Order No. 3302.   On October 1, 2010, DOI officially established the Office of Natural Resources Revenue (ONRR) within the Office of Assistant Secretary for Policy, Management and Budget. ONRR is responsible for collecting and disbursing revenues from energy production on Federal and American Indian lands and on the OCS. The ONRR's responsibilities also include auditing and compliance, investigation and enforcement, and asset management for Indian and federal lands, both onshore and offshore.

On October 1, 2011, the DOI established two new, independent bureaus– the Bureau of Safety and Environmental Enforcement (BSEE) and the Bureau of Ocean Energy Management (BOEM) – to carry out the offshore energy management and safety and environmental oversight missions formerly under the jurisdiction of the BOEMRE. BSEE enforces safety and environmental regulations in field operations including Permitting and Research, Inspections, Offshore Regulatory Programs, Oil Spill Response, and newly formed Training and Environmental Compliance functions. BOEM is responsible for managing development of the nation's offshore resources in an environmentally and economically responsible way. Functions include: Leasing, Plan Administration, Environmental Studies, National Environmental Policy Act (NEPA) Analysis, Resource Evaluation, Economic Analysis and the Renewable Energy Program.

D-2. Considerations in Reading the Sale 193 Lease Stipulations

The following list refers to each Lease Stipulation with previous reference to MMS, Regional Supervisor, Field Operations, and /or regulations as these references relate to the two independent bureaus –BOEM and BSEE – and the regulations.

D-2.1.1. STIPULATION NO. 1. PROTECTION OF BIOLOGICAL RESOURCES.

- The term "Regional Supervisor, Field Operations (RS/FO)" refers to the Regional Supervisor, Leasing and Plans (RS/LP) at BOEM.
- All acronyms "RS/FO" in this stipulation refer to the RS/LP at BOEM.

D-2.1.2. STIPULATION NO. 2. ORIENTATION PROGRAM.

- The regulations "30 CFR 250.211" and "250.241" are now 30 CFR 550.211 and 550.241, respectively.
- All acronyms "RS/FO" in this stipulation refer to the RS/LP at BOEM.

D-2.1.3. STIPULATION NO. 3. TRANSPORTATION OF HYDROCARBONS.

- All acronyms "RS/FO" in this stipulation refer to the Regional Supervisor, Field Operations at BSEE.

D-2.1.4. STIPULATION NO. 4. INDUSTRY SITE-SPECIFIC MONITORING PROGRAM FOR MARINE MAMMAL SUBSISTENCE RESOURCES.

- In the first paragraph:
  - All acronyms "RS/FO" in this stipulation refer to the RS/LP at BOEM. "Minerals Management Service (MMS)" in this stipulation is Bureau of Ocean Energy Management (BOEM).
- In the subsections under the second paragraph:
  - (2) - the acronym "MMS" refers BOEM
  - (4) - the acronym "RS/FO" refers to RS/LP at BOEM
  - (5) - all acronym "RS/FO" refers to RS/LP at BOEM
  - (7) - all acronyms "RS/FO" refers to RS/LP at BOEM
- In the remaining paragraphs, all acronyms "RS/FO" are now RS/LP at BOEM, and all acronyms "MMS" are now BOEM.

D-2.1.5. STIPULATION NO. 5. CONFLICT AVOIDANCE MECHANISMS TO PROTECT SUBSISTENCE WHALING AND OTHER MARINE MAMMAL SUBSISTENCE-HARVESTING ACTIVITIES.

- All acronyms "MMS" in this stipulation refer to BOEM or BSEE depending on the action.
- "[O]il-spill response plans" must be submitted to BSEE.
- "[E]xploration plan or development and production plan" will be submitted to the RS/LP at BOEM.

D-2.1.6. STIPULATION NO. 6. PRE-BOOMING REQUIREMENTS FOR FUEL TRANSFERS.

- Although the stipulation does not refer to an agency or title, for ease of reader understanding BSEE is the bureau for the oil spill response plans.

D-2.1.7. STIPULATION NO. 7. MEASURES TO MINIMIZE EFFECTS TO SPECTACLED AND STELLER'S EIDERS DURING EXPLORATION ACTIVITIES.

- Under General Conditions all acronyms "MMS" in this stipulation refer to BOEM.
- Under Lighting Protocols (1) "MMS" in this stipulation refers to RS/LP at BOEM, and regulation 30 CFR 250.203 is 30 CFR 550.203.

Leasing Activities Information

MMS

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

Final
Lease Stipulations
Oil and Gas Lease Sale 193
Chukchi Sea
February 6, 2008

Stipulation 1. Protection of Biological Resources
Stipulation 2. Orientation Program
Stipulation 3. Transportation of Hydrocarbons
Stipulation 4. Industry Site-Specific Monitoring Program for Marine Mammal Subsistence Resources
Stipulation 5. Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Marine Mammal Subsistence-Harvesting Activities
Stipulation 6. Pre-Booming Requirements for Fuel Transfers
Stipulation 7. Measures to Minimize Effects to Spectacled and Steller's Eiders During Exploration Activities

Stipulation No. 1. Protection of Biological Resources. If previously unidentified biological populations or habitats that may require additional protection are identified in the lease area by the Regional Supervisor, Field Operations (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.

Based on any surveys that the RS/FO may require of the lessee or on other information available to the RS/FO on special biological resources, the RS/FO may require the lessee to:

(1) Relocate the site of operations;
(2) Establish to the satisfaction of the RS/FO, on the basis of a site-specific survey, either that such operations will not have a significant adverse effect upon the resource identified or that a special biological resource does not exist;
(3) Operate during those periods of time, as established by the RS/FO, that do not adversely affect the biological resources; and/or

(4) Modify operations to ensure that significant biological populations or habitats deserving protection are not adversely affected.

If any area of biological significance should be discovered during the conduct of any operations on the lease, the lessee shall immediately report such finding to the RS/FO and make every reasonable effort to preserve and protect the biological resource from damage until the RS/FO has given the lessee direction with respect to its protection.

The lessee shall submit all data obtained in the course of biological surveys to the RS/FO with the locational information for drilling or other activity. The lessee may take no action that might affect the biological populations or habitats surveyed until the RS/FO provides written directions to the lessee with regard to permissible actions.

Stipulation No. 2. Orientation Program. The lessee shall include in any exploration plan (EP) or development and production plan (DPP) submitted under 30 CFR 250.211 and 250.241 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 activities and pertinent mitigation.

The program shall be attended at least once a year by all personnel involved in onsite exploration or development and production activities (including personnel of the lessee's agents, contractors, and subcontractors) and all supervisory and managerial personnel involved in lease activities of the lessee and its agents, contractors, and subcontractors.

The lessee shall maintain a record of all personnel who attend the program onsite for so long as the site is active, not to exceed 5 years. This record shall include the name and date(s) of attendance of each attendee.

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 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 Federal, State, and local governments 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 an emergency. Determinations as to emergency conditions and appropriate responses to these conditions will be made by the RS/FO.

Stipulation No. 4. Industry Site-Specific Monitoring Program for Marine Mammal Subsistence Resources. A lessee proposing to conduct exploration operations, including ancillary seismic surveys, on a lease within the blocks identified below during periods of subsistence use related to bowhead whales, beluga whales, ice seals, walruses, and polar bears 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 appropriate agencies and co-management organizations, determines that a monitoring program is not necessary. Organizations currently recognized by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) for the co-management of the marine mammals resources are the Alaska Eskimo Whaling Commission, the Alaska Beluga Whale Committee, the Alaska Eskimo Walrus Commission, the Ice Seal Commission, and the Nanuk Commission. The RS/FO will provide the appropriate agencies and co-management organizations a minimum of 30 calendar days, but no longer than 60 calendar days, to review and comment on a proposed monitoring program prior to Minerals Management Service (MMS) approval. The monitoring program must be approved each year before exploratory drilling operations can be commenced.

The monitoring program will be designed to assess when bowhead and beluga whales, ice seals, walruses, and polar bears are present in the vicinity of lease operations and the extent of behavioral effects on these marine mammals due to these operations. In designing the program, the lessee must consider the potential scope and extent of effects that the type of operation could have on these marine mammals. Experiences relayed by subsistence hunters indicate that, depending on the type of operations, some whales demonstrate avoidance behavior at distances of up to 35 miles. The program must also provide for the following:

(1) Recording and reporting information on sighting of the marine mammals of concern and the extent of behavioral effects due to operations;
(2) Coordinating the monitoring logistics beforehand with the MMS Bowhead Whale Aerial Survey Project and other mandated aerial monitoring programs;
(3) Inviting a local representative, to be determined by consensus of the appropriate co-management organizations, to participate as an observer in the monitoring program;
(4) Submitting daily monitoring results to the RS/FO;
(5) Submitting a draft report on the results of the monitoring program to the RS/FO within 90 days following the completion of the operation. The RS/FO will distribute this draft report to the appropriate agencies and co-management organizations;
(6) Allowing 30 days for independent peer review of the draft monitoring report; and
(7) Submitting a final report on the results of the monitoring program to the RS/FO within 30 days after the completion of the independent peer review. The final report will include a discussion of the results of the peer review of the draft report. The RS/FO will distribute this report to the appropriate agencies and co-management organizations.

The RS/FO may extend the report review and submittal timelines if the RS/FO determines such an extension is warranted to accommodate extenuating circumstances.

The lessee will be required to fund an independent peer review of a proposed monitoring plan and the draft report on the results of the monitoring program for bowhead whales. The lessee may be required to fund an independent peer review of a proposed monitoring plan and the draft report on the results of the monitoring program for other co-managed marine mammal resources. This peer review will consist of independent reviewers who have knowledge and experience in statistics, monitoring marine mammal behavior, the type and extent of the proposed operations, and an awareness of traditional knowledge. The peer reviewers will be selected by the RS/FO from experts recommended by the appropriate agencies and co-management resource organizations. The results of these peer reviews will be provided to the RS/FO for consideration in final MMS approval of the monitoring program and the final report, with copies to the appropriate agencies and co-management organizations.

In the event the lessee is seeking a Letter of Authorization (LOA) or Incidental Harassment Authorization (IHA) for incidental take from NMFS and/or FWS, the monitoring program and review process required under the LOA or IHA may satisfy the requirements of this stipulation. The lessee must advise the RS/FO when it is seeking an LOA or IHA in lieu of meeting the requirements of this stipulation and must provide the RS/FO with copies of all pertinent submittals and resulting correspondence. The RS/FO will coordinate with the NMFS and/or FWS and will advise the lessee if the LOA or IHA will meet these requirements.

The MMS, NMFS, and FWS will establish procedures to coordinate results from site-specific surveys required by this stipulation and the LOA's or IHA's to determine if further modification to lease operations are necessary.

This stipulation applies to the following blocks:

NR02-06, Chukchi Sea:
6624, 6625, 6674, 6675, 6723-6725, 6773-6775, 6822, 6823, 6872

NR03-02, Posey:
6872, 6873, 6918-6923, 6967-6973, 7016-7023, 7063-7073, 7112-7123

NR03-03, Colbert
6674, 6723, 6724, 6771-6774, 6820-6824, 6869-6874, 6918-6924, 6966-6974, 7015-7024, 7064-7074, 7113-7124

NR03-04, Solivik Island
6011-6023, 6060-6073, 6109-6122, 6157-6171, 6206-6219, 6255-6268, 6305-6317, 6354-6365, 6403-6414, 6453-6462, 6502-6511, 6552-6560, 6601-6609, 6651-6658, 6701-6707, 6751-6756, 6801-6805, 6851-6854, 6901-6903, 6951, 6952, 7001

NR03-05, Point Lay West
6014-6024, 6062-6073, 6111-6122, 6160-6171, 6209-6221, 6258-6269, 6307-6317, 6356-6365, 6406-6414, 6455-6462, 6503-6510, 6552-6558, 6602-6606, 6652-6655, 6702, 6703

NR04-01, Hanna Shoal
6223, 6267-6273, 6315-6323, 6363-6373, 6411-6423, 6459-6473, 6507-6523, 6556-6573, 6605-6623, 6654-6671, 6703-6721, 6752-6771, 6801-6819, 6851-6868, 6901-6916, 6951-6964, 7001-7010, 7051-7059, 7101-7107

NR04-02, Barrow
6003-6022, 6052-6068, 6102-6118, 6151-6164, 6201-6214, 6251-6262, 6301-6312, 6351-6359, 6401-6409, 6451-6456, 6501-6506, 6551, 6552, 6601, 6602

NR04-03, Wainwright
6002-6006, 6052, 6053

NS04-08, (Unnamed)
6816-6822, 6861-6872, 6910-6922, 6958-6972, 7007-7022, 7055-7072, 7104-7122

This stipulation applies during the time periods for subsistence-harvesting described below for each community.

Subsistence Whaling and Marine Mammal Hunting Activities by Community

Barrow: Spring bowhead whaling occurs from April to June; Barrow hunters hunt from ice leads from Point Barrow southwestward along the Chukchi Sea coast to the Skull Cliff area. Fall whaling occurs from August to October in an area extending from approximately 10 miles west of Barrow to the east side of Dease Inlet. Beluga whaling occurs from April to June in the spring leads between Point Barrow and Skull Cliff; later in the season, belugas are hunted in open water around the barrier islands off Elson Lagoon. Walrus are harvested from June to September from west of Barrow southwestward to Peard Bay. Polar bear are hunted from October to June generally in the same vicinity used to hunt walrus. Seal hunting occurs mostly in winter, but some open-water sealing is done from the Chukchi coastline east as far as Dease Inlet and Admiralty Bay in the Beaufort Sea.

Wainwright: Bowhead whaling occurs from April to June in the spring leads offshore of Wainwright, with whaling camps sometimes as far as 10 to 15 miles from shore. Wainwright hunters hunt beluga whales in the spring lead system from April to June but only if no bowheads are in the area. Later in the summer, from July to August, belugas can be hunted along the coastal lagoon systems. Walrus hunting occurs from July to August at the southern edge of the retreating pack ice. From August to September, walrus can be hunted at local haulouts with the focal area from Milliktagvik north to Point Franklin. Polar bear hunting occurs primarily in the fall and winter around Icy Cape, at the headland from Point Belcher to Point Franklin, and at Seahorse Island.

Point Lay: Because Point Lay's location renders it unsuitable for bowhead whaling, beluga whaling is the primary whaling pursuit. Beluga whales are harvested from the middle of June to the middle of July. The hunt is concentrated in Naokak and Kukpowruk Passes south of Point Lay where hunters use boats to herd the whales into the shallow waters of Kasegaluk Lagoon where they are hunted. If the July hunt is unsuccessful, hunters can travel as far north as Utukok Pass and as far south as Cape Beaufort in search of whales. When ice conditions are favorable, Point Lay residents hunt walrus from June to August along the entire length of Kasegaluk Lagoon, south of Icy Cape, and as far as 20 miles offshore. Polar bear are hunted from September to April along the coast, rarely more than 2 miles offshore.

Point Hope: Bowhead whales are hunted from March to June from whaling camps along the ice edge south and southeast of the point. The pack-ice lead is rarely more than 6 to 7 miles offshore. Beluga whales are harvested from March to June in the same area used for the bowhead whale hunt. Beluga whales can also be hunted in the open water later in the summer from July to August near the southern shore of Point Hope close to the beaches, as well as areas north of the point as far as Cape Dyer. Walruses are harvested from May to July along the southern shore of the point from Point Hope to Akoviknak Lagoon. Point Hope residents hunt polar bears primarily from January to April and occasionally from October to January in the area south of the point and as far out as 10 miles from shore.

This stipulation will remain in effect until termination or modification by the Department of the Interior after consultation with appropriate agencies.

Stipulation No. 5. Conflict Avoidance Mechanisms to Protect Subsistence Whaling and Other Marine Mammal Subsistence-Harvesting Activities. 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. This stipulation applies to exploration, development, and production operations on a lease within the blocks identified below during periods of subsistence use related to bowhead whales, beluga whales, ice seals, walruses, and polar bears. The stipulation also applies to support activities, such as vessel and aircraft traffic, that traverse the blocks listed below or Federal waters landward of the sale during periods of subsistence use regardless of lease location. Transit for human safety emergency situations shall not require adherence to this stipulation.

This stipulation applies to the following blocks:

NR02-06, Chukchi Sea:
6624, 6625, 6674, 6675, 6723-6725, 6773-6775, 6822, 6823, 6872

NR03-02, Posey:
6872, 6873, 6918-6923, 6967-6973, 7016-7023, 7063-7073, 7112-7123

NR03-03, Colbert
6674, 6723, 6724, 6771-6774, 6820-6824, 6869-6874, 6918-6924, 6966-6974, 7015-7024, 7064-7074, 7113-7124

NR03-04, Solivik Island
6011-6023, 6060-6073, 6109-6122, 6157-6171, 6206-6219, 6255-6268, 6305-6317, 6354-6365, 6403-6414, 6453-6462, 6502-6511, 6552-6560, 6601-6609, 6651-6658, 6701-6707, 6751-6756, 6801-6805, 6851-6854, 6901-6903, 6951, 6952, 7001

NR03-05, Point Lay West
6014-6024, 6062-6073, 6111-6122, 6160-6171, 6209-6221, 6258-6269, 6307-6317, 6356-6365, 6406-6414, 6455-6462, 6503-6510, 6552-6558, 6602-6606, 6652-6655, 6702, 6703

NR04-01, Hanna Shoal
6223, 6267-6273, 6315-6323, 6363-6373, 6411-6423, 6459-6473, 6507-6523, 6556-6573, 6605-6623, 6654-6671, 6703-6721, 6752-6771, 6801-6819, 6851-6868, 6901-6916, 6951-6964, 7001-7010, 7051-7059, 7101-7107

NR04-02, Barrow
6003-6022, 6052-6068, 6102-6118, 6151-6164, 6201-6214, 6251-6262, 6301-6312, 6351-6359, 6401-6409, 6451-6456, 6501-6506, 6551, 6552, 6601, 6602

NR04-03, Wainwright
6002-6006, 6052, 6053

NS04-08, (Unnamed)
6816-6822, 6861-6872, 6910-6922, 6958-6972, 7007-7022, 7055-7072, 7104-7122

Prior to submitting an exploration plan or development and production plan (including associated oil-spill response plans) to the MMS for activities proposed during subsistence-use critical times and locations described below for bowhead whale and other marine mammals, the lessee shall consult with the North Slope Borough, and with directly affected subsistence communities (Barrow, Point Lay, Point Hope, or Wainwright) and co-management organizations to discuss potential conflicts with the siting, timing, and methods of proposed operations and safeguards or mitigating measures that could be implemented by the operator to prevent unreasonable conflicts. Organizations currently recognized by the NMFS and the FWS for the co-management of the marine mammals resources are the Alaska Eskimo Whaling Commission, the Alaska Beluga Whale Committee, the Alaska Eskimo Walrus Commission, the Ice Seal Commission, and the Nanuk Commission. 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 marine mammal subsistence hunting activities and will not result in unreasonable interference with subsistence harvests.

A discussion of resolutions reached during this consultation process and plans for continued consultation shall be included in the exploration plan or the development and production plan. In particular, the lessee shall show in the plan how its activities, in combination with other activities in the area, will be scheduled and located to prevent unreasonable conflicts with subsistence activities. The lessee shall also include a discussion of multiple or simultaneous operations, such as ice management and seismic activities, that can be expected to occur during operations in order to more accurately assess the potential for any cumulative affects. Communities, individuals, and other entities who were involved in the consultation shall be identified in the plan. The RS/FO shall send a copy of the exploration plan or development and production plan (including associated oil-spill response plans) to the directly affected communities and the appropriate co-management organizations at the time the plans are submitted to the MMS to allow concurrent review and comment as part of the plan approval process.

In the event no agreement is reached between the parties, the lessee, NMFS, FWS, the appropriate co-management organizations, and any communities that could be directly affected by the proposed activity may request that the RS/FO assemble a group consisting of representatives from the parties to specifically address the conflict and attempt to resolve the issues. The RS/FO will invite appropriate parties to a meeting if the RS/FO determines such a meeting is warranted and relevant before making a final determination on the adequacy of the measures taken to prevent unreasonable conflicts with subsistence harvests.

The lessee shall notify the RS/FO of all concerns expressed by subsistence hunters during operations and of steps taken to address such concerns. Activities on a lease may be restricted if the RS/FO determines it is necessary to prevent unreasonable conflicts with local subsistence hunting activities.

In enforcing this stipulation, the RS/FO will work with other agencies and the public to assure that potential conflicts are identified and efforts are taken to avoid these conflicts.

Subsistence-harvesting activities occur generally in the areas and time periods listed below.

Subsistence Whaling and Marine Mammal Hunting Activities by Community

Barrow: Spring bowhead whaling occurs from April to June; Barrow hunters hunt from ice leads from Point Barrow southwestward along the Chukchi Sea coast to the Skull Cliff area; fall whaling occurs from August to October in an area extending from approximately 10 miles west of Barrow to the east side of Dease Inlet. Beluga whaling occurs from April to June in the spring leads between Point Barrow and Skull Cliff; later in the season, belugas are hunted in open water around the barrier islands off Elson Lagoon. Walrus are harvested from June to September from west of Barrow southwestward to Peard Bay. Polar bear are hunted from October to June generally in the same vicinity used to hunt walruses. Seal hunting occurs mostly in winter, but some open-water sealing is done from the Chukchi coastline east as far as Dease Inlet and Admiralty Bay in the Beaufort Sea.

Wainwright: Bowhead whaling occurs from April to June in the spring leads offshore of Wainwright, with whaling camps sometimes as far as 10 to 15 miles from shore. Wainwright hunters hunt beluga whales in the spring lead system from April to June but only if no bowheads are in the area. Later in the summer, from July to August, belugas can be hunted along the coastal lagoon systems. Walrus hunting occurs from July to August at the southern edge of the retreating pack ice. From August to September, walruses can be hunted at local haulouts with the focal area from Milliktagvik north to Point Franklin. Polar bear hunting occurs primarily in the fall and winter around Icy Cape, at the headland from Point Belcher to Point Franklin, and at Seahorse Island.

Point Lay: Because Point Lay’s location renders it unsuitable for bowhead whaling, beluga whaling is the primary whaling pursuit. Beluga whales are harvested from the middle of June to the middle of July. The hunt is concentrated in Naokak and Kukpowruk Passes south of Point Lay where hunters use boats to herd the whales into the shallow waters of Kasegaluk Lagoon where they are hunted. If the July hunt is unsuccessful, hunters can travel as far north as Utukok Pass and as far south as Cape Beaufort in search of whales. When ice conditions are favorable, Point Lay residents hunt walruses from June to August along the entire length of Kasegaluk Lagoon, south of Icy Cape, and as far as 20 miles offshore. Polar bears are hunted from September to April along the coast, rarely more than 2 miles offshore.

Point Hope: Bowhead whales are hunted from March to June from whaling camps along the ice edge south and southeast of the point. The pack-ice lead is rarely more than 6 to 7 miles offshore. Beluga whales are harvested from March to June in the same area used for the bowhead whale hunt. Beluga whales can also be hunted in the open water later in the summer from July to August near the southern shore of Point Hope close to the beaches, as well as areas north of the point as far as Cape Dyer. Walruses are harvested from May to July along the southern shore of the point from Point Hope to Akoviknak Lagoon. Point Hope residents hunt polar bears primarily from January to April and occasionally from October to January in the area south of the point and as far out as 10 miles from shore.

Stipulation No. 6. Pre-Booming Requirements for Fuel Transfers. Fuel transfers (excluding gasoline transfers) of 100 barrels or more 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. The lessee's oil spill response plans must include procedures for the pre-transfer booming of the fuel barge(s)**.**

Stipulation No. 7. Measures to Minimize Effects to Spectacled and Steller's Eiders During Exploration Activities. This stipulation will minimize the likelihood that spectacled and Steller's eiders will strike drilling structures or vessels. The stipulation also provides additional protection to eiders within the blocks listed below and Federal waters landward of the sale area, including the Ledyard Bay Critical Habitat Area, during times when eiders are present.

(A) General conditions: The following conditions apply to all exploration activities.

(1) An EP must include a plan for recording and reporting bird strikes. All bird collisions (with vessels, aircraft, or drilling structures) shall be documented and reported within 3 days to MMS. Minimum information will include species, date/time, location, weather, identification of the vessel, and aircraft or drilling structure involved and its operational status when the strike occurred. Bird photographs are not required, but would be helpful in verifying species. Lessees are advised that the FWS does not recommend recovery or transport of dead or injured birds due to avian influenza concerns.

(2) The following conditions apply to operations conducted in support of exploratory and delineation drilling.

(a) Surface vessels (e.g., boats, barges) associated with exploration and delineation drilling operations should avoid operating within or traversing the listed blocks or Federal waters between the listed blocks and the coastline between April 15 and June 10, to the maximum extent practicable. If surface vessels must traverse this area during this period, the surface vessel operator will have ready access to wildlife hazing equipment (including at least three *Breco* buoys or similar devices) and personnel trained in its use; hazing equipment may located onboard the vessel or on a nearby oil spill response vessel, or in Point Lay or Wainwright. Lessees are required to provide information regarding their operations within the area upon request of MMS. The MMS may request information regarding number of vessels and their dates of operation within the area.

(b) Except for emergencies or human/navigation safety, surface vessels associated with exploration and delineation drilling operations will avoid travel within the Ledyard Bay Critical Habitat Area between July 1 and November 15. Vessel travel within the Ledyard Bay Critical Habitat Area for emergencies or human/navigation safety shall be reported within 24 hours to MMS.

(c) Aircraft supporting drilling operations will avoid operating below 1,500 feet above sea level over the listed blocks or Federal waters between the listed blocks and the coastline between April 15 and June 10, or the Ledyard Bay Critical Habitat Area between July 1 and November 15, to the maximum extent practicable. If weather prevents attaining this altitude, aircraft will use pre-designated flight routes. Pre-designated flight routes will be established by the lessee and MMS, in collaboration with the FWS, during review of the EP. Route or altitude deviations for emergencies or human safety shall be reported within 24 hours to MMS.

(B) Lighting Protocols. The following lighting requirements apply to activities conducted between April 15 and November 15 of each year.

(1) Drilling Structures: Lessees must adhere to lighting requirements for all exploration or delineation drilling structures so as to minimize the likelihood that migrating marine and coastal birds will strike these structures. Lessees are required to implement lighting requirements aimed at minimizing the radiation of light outward from exploration or delineation drilling structures to minimize the likelihood that birds 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 while operating on a lease or if staged within nearshore Federal waters pending lease deployment.

Measures to be considered include but need not be limited to the following:

- Shading and/or light fixture placement to direct light inward and downward to living and work structures while minimizing light radiating upward and outward;
- Types of lights;
- Adjustment of the number and intensity of lights as needed during specific activities;
- Dark paint colors for selected surfaces;
- Low-reflecting finishes or coverings for selected surfaces; and
- Facility or equipment configuration.

Lessees are encouraged to consider other technical, operational, and management approaches that could be applied to their specific facilities and operations to reduce outward light radiation. Lessees must provide MMS with a written statement of measures that will be or have been taken to meet the lighting objective, and must submit this information with an EP when it is submitted for regulatory review and approval pursuant to 30 CFR 250.203.

(2) Support Vessels: Surface support vessels will minimize the use of high-intensity work lights, especially when traversing the listed blocks and federal waters between the listed blocks and the coastline. Exterior lights will be used only as necessary to illuminate active, on-deck work areas during periods of darkness or inclement weather (such as rain or fog), otherwise they will be turned off. Interior lights and lights used during navigation could remain on for safety.

For the purpose of this stipulation, the listed blocks are as follows:

NR02-06, Chukchi Sea:
6624, 6625, 6674, 6675, 6723-6725, 6773-6775, 6822, 6823, 6872

NR03-02, Posey:
6872, 6873, 6918-6923, 6967-6973, 7016-7023, 7063-7073, 7112-7123

NR03-03, Colbert
6674, 6723, 6724, 6771-6774, 6820-6824, 6869-6874, 6918-6924, 6966-6974, 7015-7024, 7064-7074, 7113-7124

NR03-04, Solivik Island
6011-6023, 6060-6073, 6109-6122, 6157-6171, 6206-6219, 6255-6268, 6305-6317, 6354-6365, 6403-6414, 6453-6462, 6502-6511, 6552-6560, 6601-6609, 6651-6658, 6701-6707, 6751-6756, 6801-6805, 6851-6854, 6901-6903, 6951, 6952, 7001

NR03-05, Point Lay West
6014-6024, 6062-6073, 6111-6122, 6160-6171, 6209-6221, 6258-6269, 6307-6317, 6356-6365, 6406-6414, 6455-6462, 6503-6510, 6552-6558, 6602-6606, 6652-6655, 6702, 6703

NR04-01, Hanna Shoal
6223, 6267-6273, 6315-6323, 6363-6373, 6411-6423, 6459-6473, 6507-6523, 6556-6573, 6605-6623, 6654-6671, 6703-6721, 6752-6771, 6801-6819, 6851-6868, 6901-6916, 6951-6964, 7001-7010, 7051-7059, 7101-7107

NR04-02, Barrow
6003-6022, 6052-6068, 6102-6118, 6151-6164, 6201-6214, 6251-6262, 6301-6312, 6351-6359, 6401-6409, 6451-6456, 6501-6506, 6551, 6552, 6601, 6602

NR04-03, Wainwright
6002-6006, 6052, 6053

NS04-08, (Unnamed)
6816-6822, 6861-6872, 6910-6922, 6958-6972, 7007-7022, 7055-7072, 7104-7122

Nothing in this stipulation is intended to reduce personnel safety or prevent compliance with other regulatory requirements (e.g., U.S. Coast Guard or Occupational Safety and Health Administration) for marking or lighting of equipment and work areas.

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally-owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration.