ENVIRONMENTAL ASSESSMENT

Proposed Rule to Authorize the Incidental Take of Small Numbers of Polar Bear and Pacific Walrus During Oil and Gas Activities in the Beaufort Sea and Adjacent Coastal Alaska

DEPARTMENT OF INTERIOR

U.S. FISH AND WILDLIFE SERVICE

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Chapter 1 - Purpose and Need

1.1 Introduction

This environmental assessment (EA) is prepared to implement provisions of the National Environmental Policy Act. The action being considered under NEPA is whether issuance of regulations authorizing the incidental taking of Pacific walrus *(Odobenus rosmarus divergens*) and polar bears (*Ursus maritimus*) is or is not a major Federal action requiring the development of an Environmental Impact Statement. Oil and gas industry activities in Federal waters and on Federal lands are permitted by the Department of Interior's Mineral Management Service (MMS), and oil and gas industry activities on State lands are permitted by the State of Alaska. Incidental take regulations do not permit the actual oil and gas industry activities. Therefore, whatever alternative is selected, industry activities will likely continue to operate in polar bear and Pacific walrus habitat.

It is important to note that the USFWS is not evaluating the impact of industry on polar bears and Pacific walrus, rather we are evaluating the impact of issuing incidental take regulations on polar bear and Pacific walrus.

Based upon this environmental assessment, a decision will be made concerning the environmental impacts on polar bears and Pacific walrus resulting from the implementation of regulations governing the taking of small numbers of polar bear and Pacific walrus incidental to oil and gas activities in the Beaufort Sea and adjacent coastal Alaska. This EA will then determine if the action will have significant impacts, address unresolved environmental issues, and to provide a basis on whether or not to issue regulations authorizing the incidental take of walrus and polar bears.

1.2 By what authority can we issue incidental take regulations?

Section 101(a)(5)(A) of the Marine Mammal Protection Act (Act), as amended, gives the U.S. Fish and Wildlife Service (USFWS) the authority to allow the incidental, but not intentional, take of small numbers of marine mammals in a specified activity (other than commercial fishing) within a specified geographical area upon the request of U.S. citizens. The taking of marine mammals may be allowed if we find, based on the best scientific evidence available, that the total taking will have a negligible impact on the species or stock and will not have an unmitigable adverse impact on the availability of the species or stock for subsistence uses. If these findings are made, we will issue specific regulations that will include permissible methods of taking and other means to ensure the least practicable adverse impact on the species. The scope includes the species habitat and the availability of the species for subsistence uses while paying close attention to rookeries, mating grounds, and areas of similar significance, and monitoring and reporting requirements. We can issue Letters of Authorization (LOA) once specific regulations are issued to cover activities under the provisions of these regulations when requested by citizens of the United States. Definitions of key terms used in these regulations are listed below. Additional definitions can be found in 50 CFR Part 18.

Incidental, but not intentional. Incidental, but not intentional, take means take events that are infrequent, unavoidable, or accidental. It does not mean that the taking must be unexpected.

Take. The term "take" as defined by the Act means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.

Harass. The term "harass" as defined by the Act means any act of pursuit, torment, or annoyance that-

-has the potential to injure a marine mammal or marine mammal stock in the wild; or

-has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

Negligible impact. Negligible impact is an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

Small numbers. Small numbers means a portion of a marine mammal species or stock whose taking would have a negligible impact on that species or stock. We decline to determine small numbers explicitly. Such numerical limits would ignore the significant differences in the status and population dynamics among the various marine mammal stocks and the type of taking (i.e., harassment versus mortality) or other impacts. Furthermore, Congress recognized the imprecision of "small numbers" but offered no additional guidance. As a result, analyses are made on a case-by-case basis.

1.3 Why do we need incidental take regulations?

Section 101 of the Marine Mammal Protection Act of 1972 placed a moratorium on the taking of marine mammals. Section 101(a)(5)(A), as described in Section 1.2 of this document, allows the incidental, but not intentional, taking of marine mammals upon request of a U.S. Citizen after we make certain findings. In Alaska, the USFWS is responsible for the management of three marine mammal species: polar bear, sea otter (*Enhydra lutris*), and the Pacific walrus. These species are protected under the Act. None of the species are listed as threatened or endangered and, therefore, are not provided protection by the Endangered Species Act.

The Alaska Oil and Gas Association (AOGA), on behalf of the oil and gas industry (Industry) in Alaska, petitioned the USFWS to issue regulations to authorize the incidental take of small numbers of polar bear and Pacific walrus while engaged in a specified activity (other than commercial fishing) within a specified geographical region.

The oil and gas industry operates in polar bear and Pacific walrus habitat. Thus, it is possible that while conducting legal activities in pursuit of oil and gas resources, Industry could cause the take of polar bears or Pacific walrus. Section 101(a)(5)(A) of the Act authorizes incidental take as long as certain findings can be made. Section 101(a)(5)(A) of the Act requires Industry to conduct monitoring and reporting programs while operating under these regulations. Monitoring provides us with additional information to evaluate the effect of the activities on polar bears and Pacific walrus and also provides information to design and develop human/polar bear interaction plans which are designed to enhance human safety and to protect polar bears. Without the proposed regulations, industrial activities could continue; however, we would have no formal means of communicating with Industry or the ability to require monitoring and mitigation of specific activities.

1.3.1. Specified activity.

The specified activities described in this request include oil and gas industry exploration, development, and production and associated activities.

1.3.2. Specified geographical region.

The geographical extent of these regulations will be the same area, referred to as the Beaufort Sea Region, as covered by our previous regulations (March 30, 2000 through March 31, 2003). The geographic area is defined by a north/south line at Barrow, Alaska, including all Alaska state waters and Outer Continental Shelf waters, and east of that line to the Canadian border. The onshore region is the same north/south line at Barrow, 25 miles inland and east to the Canning River. The Arctic National Wildlife Refuge is excluded from these regulations (Figure 1).

1.3.3. Duration.

The regulations will be effective for a period of 16 months after the date of issuance.

1.3.4. Permissible methods of taking.

The following are types of take that are deemed permissible for the incidental take of small number of polar bears and Pacific walrus.

1.3.4.1. Noise.

Oil and gas exploration, development, and production activities produce noise from many different sources. Noise can be generated by stationary or mobile sources Stationary sources include coastal production facilities, or production facilities located either on offshore oil platforms, or on man-made or artificial islands. Mobile sources include vessel and aircraft traffic, open-water seismic exploration, geotechnical surveys, drilling, dredging, and ice-breaking vessels. The type of noise generated by industrial activities is also seasonally dependent, where activities occurring during the ice-covered season can be different than those occurring during the open-water season and may produce different sounds. Routine vessel traffic and seismic exploration activities can occur during the open-water season, while vibroseis activities, ice-road construction and associated vehicle traffic, geotechnical activities, and exploratory drilling are most likely to occur during the ice-covered season.

1.3.4.2. Physical obstruction.

The Endicott and West Dock causeways, associated production facilities, transportation corridors, and pipelines are examples of physical obstructions, which may impact movements of polar bears.

1.3.4.3. Human/animal encounters.

Oil field facilities on the North Slope overlap within polar bear habitat. Therefore, encounters between people and bears may occur. The LOA process requires each applicant to develop a polar bear interaction plan for each operation. These plans outline the steps the applicant will take to minimize impacts, such as garbage disposal procedures to reduce the attraction of polar bears. Interaction plans also outline the chain of command for responding to a polar bear sighting. In addition to interaction plans, Industry personnel participate in polar bear interaction training while on site. The result of these polar bear interaction plans and training allows the bear to be detected quickly when it encounters Industry activities, which responds to the bear appropriately. Most often, this response involves deterring the bear from the site. Without such plans and training, an undesirable outcome could be lethal take of the bear in defense of human life.

1.3.4.4. Contact with oil spills.

There is a possibility that polar bears or walrus may come into contact with oil that has been spilled. Should an oil spill occur during Industry operations, an incidental take may occur. The impacts associated with an oil spill would depend on the location, size of the spill, environmental conditions, and success of clean up measures.

1.3.5. Activities to be conducted.

The scope of the proposed regulations is limited to activities that will be conducted during the exploration, development, and production of oil and gas resources along the Beaufort Sea and adjacent northern coast of Alaska. Throughout the 16 months that the future regulations will be in place, it is expected that oil and gas activities will remain at similar levels as under the prior regulations. Exploration activities could include approximately 1 to 2 geotechnical surveys for pipeline routes and possibly one geochemical survey (chemical analysis of the geotechnical components). Exploratory drilling is estimated to be conducted at 2 to 12 locations annually. An additional 10 to 12 delineation/satellite wells may be drilled annually within the existing Prudhoe Bay, Kuparuk, Endicott, Milne Point, or Badami Units. An estimated 1,900 square miles of 3D seismic survey data and 1,800 linear miles of 2D seismic survey data may be collected annually. Approximately 50 percent of both the 3-D and 2-D seismic survey data will be collected onshore, and 50 percent offshore. The locations of these operations are assumed, for the purpose of meeting MMPA requirements, to be approximately equally divided among the onshore and offshore tracts presently under lease and to be leased during the period under consideration.

For the purpose of assessing possible impacts related to this action, it is assumed that these activities will occur equally spaced over time and area for the upcoming ice-covered (2003-2004) and open-water (2004) seasons (these data were compiled from information supplied by BP Exploration Alaska, Inc., ConocoPhillips Alaska, Western GeCo, and ExxonMobil Company).

Due to the large number of variables affecting exploration activities, predictions of exact dates and locations of operations for the upcoming open-water (2003) and ice-covered seasons (2003-2004) is speculative. However, operators must provide specific dates and locations of proposed activities prior to receiving an LOA.

Below is a summary of operations and actions submitted by Industry that are anticipated to be conducted for the upcoming open-water (2003) and ice-covered seasons (2003-2004). Similar activities have been conducted in the past and are likely to continue to be conducted over the life of the oil fields.

1.3.5.1. Exploration Operations.

Exploration includes a variety of types of geological and geophysical surveys aimed at gathering information about potential oil-bearing structures. Typical geophysical surveys, such as "shallow hazard" and "site clearance" surveys are designed to identify hazards that may be encountered during exploratory drilling. Geophysical surveys can be divided into two classes, "deep seismic" and "shallow hazard"; both classes generally use the "reflective" method of data collection. In geotechnical site investigations, shallow core samples provide information about soil conditions. Site investigations are required to develop foundation design criteria for any planned structure, and to determine the optimal location for the facility.

Several methods of seismic exploration are used. Reflective seismic exploration, deep seismic and shallow hazard surveys utilize the "reflection" seismic exploration process of gathering information about the earth's subsurface by measuring acoustic waves, which are generated on or near the surface. Large numbers of personnel (40-110) and vehicles (15) may be required to conduct seismic operations. Vibrator seismic data collection utilizes a continuous cable along the length of the seismic line being recorded. In a typical 16 to 18 hour day, four to five miles of vibrator seismic operation can be conducted. Air gun and water gun seismic data collection utilize compressed air or water to create a pressure wave, the seismic impulse. Air gun and water gun techniques are generally used in open water conditions and not during Arctic winter exploration. Vertical seismic profiles is a form of well logging that is conducted off the drill pad. This process is used to correlate the reflections on the seismic data with formations seen during drilling.

1.3.5.2. Drilling.

Exploratory drilling can be conducted off of a variety of platforms. Artificial islands are commonly used. These man-made structures are constructed in shallow offshore waters, usually less than 50 feet deep, primarily for the purpose of providing a foundation for drilling equipment and personnel. Artificial islands have been most utilized for exploratory operations; however, the Endicott facility is an example of an artificial island supporting production operations.

Artificial islands have been constructed from sand, gravel, and water (ice) at various times of the season. Usually the construction materials (sand and gravel) are hauled to the site via barge (open-water) or truck (ice-road).

Bottom-founded Structures can also be used during exploration. The Steel Drilling Caisson (SDC) is a drilling unit constructed by modifying the forward section of an oceangoing vessel designed to carry out year-round drilling operations under Arctic environmental conditions. The Kulluk is a floating drilling unit that was designed for extended-season drilling in Arctic waters of 60 to 600 deep. The Kulluk is capable of drilling wells to depths of 20,000 feet. The Kulluk is also capable of withstanding ice forces that may be encountered during breakup and freeze-up and this permits it to operate during periods well beyond those of an ordinary Arctic-class drillship.

Drillships are used in Arctic waters deeper than 60 to 80 feet because bottom-founded drilling structures (e.g., SDC) are limited to water depths of less than 80 feet. Drillships operate only during periods of open water. Drillships are usually supported by one or more ice management vessels (icebreakers) to ensure that ice will not damage the drilling operation. A blowout preventer is typically located at the seabed in a hole dug below the ice-scour depth. The blowout preventer is an important safety feature enabling the drillship to shut down operations and move from the site without exposing the well. A barge and a tug typically accompany the drill ship to serve as a standby safety vessel and also provide support for oil spill response and refueling. Personnel, usually around 100, are routinely ferried between the ship and shore by helicopter.

Ice pads and roads are commonly used to provide access to various facilities. Ice roads provide seasonal routes for heavy equipment and supplies to be moved to remote areas. These temporary, seasonal roads are constructed by spreading water from local sources (lakes or rivers) to create a rigid surface. Ice pads, islands, and roads can also be constructed using the spray ice technique. The technique consists of spraying water into the air allowing the water to freeze and fall to the surface. This technique is used to reduce cost and impacts to the area. For grounded ice roads in shallow (< 2 m) waters of the Beaufort Sea, seawater is initially used for the foundation and the ice road is eventually "capped" with freshwater, strengthening it. Floating ice roads may also be constructed in deeper water. Ice bridges may be constructed to provide winter access across frozen rivers; ice airstrips are built in the same manner as ice roads. Ice drilling pads are now commonly used for winter exploration pads. Ice pads are also built in a similar way to ice roads and airstrips. The thickness of ice roads, pads and bridges depends on the loads that must be supported and on terrain, and can range from 15 cm (6 in) to 3 m (10 ft).

1.3.5.3. Development and Production Operations.

North Slope oilfield developments include a series of major fields and their associated satellite fields. In some cases a new oilfield discovery has been developed completely using existing oilfield facilities. For example, the Kuparuk oilfield development incorporates the Kuparuk, West Sak, Tarn, Palm, Tabasco and Meltwater oilfields. After processing, oil and gas liquids are sent through gathering lines to the Trans-Alaska Pipeline System (TAPS). Development and production are ongoing year-round operations. Operations are likely to remain constant over the next 15 months as some reservoirs become depleted and other reserves are brought on-line and into production.

Details on some of the larger operating fields such as; Prudhoe Bay, Kuparuk, Endicott, Milne Point, Point McIntyre, Badami, Northstar, and Alpine are provided below. All of the oil fields lie within the range of polar bears, while those in the offshore/nearshore region may encounter Pacific walrus on an irregular basis.

Prudhoe Bay. The Prudhoe Bay field is the largest oil field in North America and the 18th largest field ever discovered worldwide. It encompasses approximately 350 square miles. The Prudhoe Bay Oilfield Unit encompasses the Prudhoe Bay, Lisburne, Niakuk, West Beach, North Prudhoe Bay, Pt. McIntyre, Borealis, Midnight Sun, Polaris, Aurora and Orion fields. Oil wells within the production area are clustered together on gravel pads. Approximately 10 billion barrels have been produced from a field originally estimated at 25 billion barrels. The Prudhoe Bay field also contains an estimated 46 trillion cubic feet of natural gas, with approximately 26 trillion cubic feet of that deemed recoverable. Information presented by Industry indicates that in early 1997 more than 1,300 wells had been drilled, and several hundred more may be required to fully develop the reservoir. This figure includes gas and water injection wells. The technology of directional drilling (angle drilling) allows greater subsurface areas to be developed while minimizing the number of gravel pads, thus impacting less surface area.

Approximately 2000 hectares (5000 acres) have been affected due to the construction of roads, pads and airstrips within the Prudhoe Bay oilfield and its associated satellite fields, including approximately 350 km (218 mi) of roads, 341 km (212 mi) of pipelines, 6 gravel mine sites, 43 gravel pads and 106 reserve pits. Production facilities at Prudhoe Bay include six separation centers, an electric power station, a central gas facility and the central compression plant. Each of these facilities provides a unique service, which prepares the crude oil for shipment down the TAPS.

Kuparuk. The Kuparuk field is the second-largest producing oil field in the U.S. More than 2.6 billion barrels of oil are expected to be produced from the 6 billion-barrel oilfield. The Greater Kuparuk Area includes the satellite oilfields of Tarn, Tabasco, West Sak and Meltwater. These satellite fields have been developed using existing facilities. To date, nearly 900 wells have been drilled in the Greater Kuparuk Area. The total area directly affected by development in the Greater Kuparuk Area is approximately 603 hectares (1508 acres), including 167 km (104 mi) of gravel roads, 231 km (144 mi) of pipelines, 6 gravel mine sites, and over 50 gravel pads. The major production installations include three separation centers called Central Production Facilities that separate the oil, gas and water and a seawater treatment plant at Oliktok Point. The seawater treatment plant treats seawater for injection into the reservoir for the enhancement of oil recovery.

Endicott. The Endicott field was discovered in 1978 and began production in 1987. It is located offshore in the Beaufort Sea and is about 10 miles northeast of Prudhoe Bay. Endicott is the first continuous, offshore producing field in the Arctic. The Endicott Production project consists of two artificial gravel islands; a 55-acre main production island and a 16-acre satellite drilling island. The two islands are connected to the mainland and the Prudhoe Bay road system by a 5-mile causeway. Approximately 100 wells have been drilled to develop the field. Two satellite fields—Sag Delta North and Sag Delta-have also been developed using existing infrastructure. The Endicott development has disturbed 156.8 hectare (392 acres) of land with 25 km (15 mi) of roads, 47 km (29 mi) of pipelines and one gravel mine site. Processed oil is sent through a 24-mile aboveground pipeline to the TAPS.

Milne Point. The Milne Point field is located along the south shore of Simpson Lagoon and immediately northeast of the Kuparuk field about 35 miles northwest of Prudhoe Bay. The field was discovered in 1969, and production began in 1985. The field consists of more than 220 wells drilled from 12 gravel pads. Three satellite fields (Cascade, Schrader Bluff and Sag River) have been developed within the Milne Point Unit, mainly using existing infrastructure. An additional 300 wells may be needed to fully develop the Schrader Bluff reservoir. Milne Point and its satellites have resulted in the disturbance of 94.4 hectares (236 acres) of tundra, including 31 km (19 mi) of gravel roads, 64 km (40 mi) of pipelines and 1 gravel mine site.

Point McIntyre. The Point McIntyre field is located nearshore, about two miles north of the Prudhoe Bay producing area and contains over 400 million barrels of recoverable oil. Production began in late 1993 from the first of two production pads. The second pad began production in mid-1994 in conjunction with field-wide waterflooding.

Badami. The Badami reservoir is located primarily offshore beneath Mikkelsen Bay, about 25 miles east of existing North Slope oil field facilities. The Badami Unit is located in the vicinity of the Shaviovik River, east of Prudhoe Bay and south of Mikkelsen Bay. The Facility includes a Central Processing Unit (CPU), satellite well pad, dock, airstrip, and an infield road system. Development drilling began in September 1997, and the Badami pipeline was constructed in 1998. An elevated pipeline connects the Badami Unit with the Endicott pipeline. There is no road access from Deadhorse to Badami. Summer access to the site is by barge, aircraft and helicopter. Winter access occurs via air or ice roads.

Northstar. The Northstar oil field is located approximately 6 miles offshore of the Point McIntyre/Point Storkersen area in the central Alaskan Beaufort Sea. The Northstar oilfield was discovered in 1983. The offshore oilfield is located 6 km (4 mi) northwest of the Point McIntyre field and 10 km (6 mi) from Prudhoe Bay. The 15,360-hectare (38,400-acre) reservoir has now been developed from a 5-acre artificial island. Production from the Northstar reservoir began in late 2001. The 2-hectare (5-acre) island will eventually contain 16 producing wells, 5 gas injectors, and one waste disposal well. A subsea pipeline connects facilities to the Prudhoe Bay oilfield.

Alpine. ConocoPhillips, Inc., and its partners are developing the Alpine oil field located in the Colville River delta 34 miles west of the Kuparuk oil field. Discovered in 1996, the Alpine oilfield began production in 2000. Alpine is the westernmost oilfield on the North Slope, located 55 km (34 mi) west of the Kuparuk oilfield and just 13 km (8 mi) from the village of Nuiqsut. Although the Alpine oilfield covers 16,000 hectares (40,000 acres), it has been developed from 38.8 hectares (97 acres) of pads. There are two drill sites and more than 112 wells. There is no permanent road connecting Alpine with the Kuparuk oilfield; small aircraft are used to provide supplies and crew changeovers.

1.3.5.4. Oil Production Processes.

Production Facilities

Oil production wells are grouped together at a number of locations surrounding each separation plant. New wells are drilled from these locations called well pads or drill sites. From the surface wellhead, crude oil flows into the manifold building, which is also located on the well pad. The primary function of the manifold building is to combine production from many wells and transport it to separation facilities through flow lines.

At the separation or gathering centers, gas and water are removed from the oil. For example, in the Prudhoe Bay Unit, following the separation process, oil is routed by pipeline to Pump Station 1, which is the beginning of the TAPS. The water is injected back into the underground rock formation to help maintain reservoir pressure and enhance recovery of petroleum products. The gas is routed to the Central Gas Facility (CGF) where natural gas liquids are extracted by a refrigeration process and sent down the TAPS with the crude oil. Miscible gas liquids are also removed and used as an injectant for enhanced oil recovery. The remaining gas is routed to the Central Compressor Plant (CCP) where it is compressed for reinjection into the gas cap of the reservoir.

Each production facility has emergency gas-flaring capabilities in case of compressor failure. For example, on the WOA, these consist of seven 15-m (50-ft) flares for each gathering center.

Production Wastes

Wastes generated from oil production activities include drilling muds and cuttings and are known as "associated wastes." The drilling mud is designed to prevent the uncontrolled release of oil or gas from the well and is typically water-based mixtures of naturally occurring clays and weighting materials with small amounts of other additives. Much of the muds and cuttings are recycled. When the muds and cuttings must be disposed, they are injected into confining subsurface geologic formations. Reserve pits, for surface disposal of cuttings, have been eliminated by new technology that grinds drilling cuttings to a size small enough to inject into a confining geologic layer. Also included in "associated wastes" are tank-bottom sludge, residues, and pigging wastes. The liquid wastes are injected into approved Class II disposal wells, and the solids are placed in lined surface impoundments. The small amounts of hazardous waste that are generated by the production area facilities are managed in accordance with current Federal regulations.

Other wastes generated by oilfield operations include well treatment fluids, spent chemicals used for processing crude oil, rig washwater, hydraulic fluids from rig equipment, and cooling waters. These wastes are disposed of by underground injection. A small amount of hazardous waste is generated by production facilities. These wastes are handled in accordance with Environmental Protection Agency regulations. Hazardous wastes are sent out of state by truck and barge to EPA-permitted disposal facilities in the contiguous United States.

Non-hazardous solid waste and sanitary wastes are also generated at North Slope Oilfield facilities. Solid wastes such as empty drums, paper products, wood, etc., are handled at the North Slope Borough landfill or incinerated. Disposable food waste is also handled at the North Slope Borough landfill facility, and predator-proof dumpsters have been installed in the oilfield to minimize wildlife attraction to these potential food sources. Sewage wastes are physically and chemically treated by wastewater treatment facilities. North Slope area facilities also operate various recycling programs. Paper products, wood, scrap metal, Styrofoam, cardboard, and other materials are collected and transported off the North Slope to appropriate recycling facilities.

Production Support Operations

Equipment and supplies are delivered by air, barge, and by the 360-mile Dalton Highway. Barge shipments are limited to a 6-week period each summer when the Arctic icepack moves offshore enough to allow passage of vessels. Two docks and staging areas handle bulk supplies and heavy equipment, including huge modular buildings delivered by barge. Aircraft landing at Deadhorse, Alaska are the primary carriers of personnel, mail, cargo, and perishable items.

Chapter 2 - Alternatives Including the Proposed Action

2.1. Alternative 1: No Action.

The no action alternative for this EA would result in no incidental take regulations being issued. The moratorium and prohibitions on the taking of marine mammals imposed by the Act prohibits Industry from "taking" marine mammals, including incidental taking. Letters of Authorization would not be issued. Therefore, no mitigation to minimize the effects of Industry activities on polar bears and walrus, monitoring, or reporting would be required. Under this alternative, takings that could occur incidental to oil and gas activities would be subject to prohibitions found in the Act, and Industry would be liable for penalties should a take occur.

2.2. Alternative 2: The Proposed Action (Incidental Take Regulations)

The proposed alternative is to promulgate regulations, which will authorize incidental take of small numbers of marine mammals associated with oil and gas activities in the Beaufort Sea and adjacent northern Alaska coast. These activities must be conducted according to state and Federal law.

The proposed action would allow us to issue LOAs for incidental take, which include mitigation, monitoring and reporting requirements. We will review each request for a LOA and a determination will be made on the adequacy of mitigation, monitoring and reporting requirements to protect polar bears and walrus. In addition, LOAs may be conditioned on a case-by-case basis to afford additional protection to sensitive areas, such as areas being used by denning polar bears.

2.3. Alternatives Considered but Not Feasible

Alternatives that the USFWS considered, but determined were not appropriate included separating Industry operations by the type of activity (i.e., exploration, development, production) as well as separating Industry operations by the location (i.e., geographic location or oil and gas units) or timing of the activity (i.e., ice-covered, open-water or calendar year).

In evaluating the effects of incidental take regulations on polar bears and Pacific walrus, the USFWS is required to evaluate takes expected from all specified activities in the specific geographic area, which involve the accumulation of impacts from all anticipated activities combined (the applicant's anticipated takes as well as takes from other citizens conducting similar activities in the geographic region), regardless of the type or location of activity, or season in order to evaluate the cumulative effects of Industry activities. Hence, separating Industry operations is not an alternative, as we cannot separate specific activities in making a negligible finding.

Chapter 3 - Affected Environment

3.1. Physical Environment

The regional climate is typical of the Arctic zone. Summers are short, cool and generally cloudy. During the summer the ground thaws to a depth of 12 to 16 inches and the landscape is dominated by wetlands. Winters are very cold. For 56 days in the winter, the sun never rises above the horizon and temperatures can drop to as low as -60 degrees Fahrenheit. Surface winds are common throughout the year and result in wind chill factors well below the actual temperature.

The Beaufort Sea can be divided into two separate dynamic conditions based upon seasonal variations:

Summer (open water). The open-water season, usually beginning in late June, is triggered by warming temperatures, prolonged insulation, and runoff from streams. The shore fast ice melts and the pack ice recedes northward, resulting in an area of open water along the coast. By mid-July, much of the lagoon and open-shelf area is ice free. The extent of open water along the coast varies from year to year depending upon climatic factors.

Winter (ice covered). Winter conditions in the Beaufort Sea begin with freeze-up and an increase in the amount of sea ice. There are considerable variations from year to year and the edge of the pack ice in September ranges from about 12 to 66 miles offshore (Labelle et al. 1983). In October, the ice edge has usually moved south of Barrow. From November through May, ice covers nearly all of the Beaufort Sea. The winter sea-ice regime can be divided into three distinct zones: landfast-ice, shear, and pack-ice.

Landfast-ice. The landfast-ice zone extends from the shore out to the zone of grounded ridges. These ridges first form in about 24 to 45 feet of water but by late winter may extend to deeper water. Wind and water stress on floating sheets of ice results in deformation and displacement. Ice deformations take the form of ridges and rubble fields. As winter progresses, displacements and deformations decrease because the ice in the landfast zone thickens and strengthens and becomes more resistant to movement.

Shear. Seaward of the landfast ice zone is the shear zone. The shear zone, as the name indicates, is a region of dynamic interaction between the stable land-fast ice and the moving ice of the pack-ice zone. This interaction in the shear zone results in the formation of ridges and leads. Leads are channels of open water through areas of ice which provide habitat for marine mammals.

Pack-Ice. The pack-ice zone lies seaward of the shear zone and includes first year ice, and multi-year ice. The first year ice that forms in the fractures, leads, and polynyas (large areas of open water) varies in thickness from less than one inch to greater than a few feet. Multi-year ice is ice that has persisted for more than a year.

The violent interactions between ice zones creates deformed ice, known as ice ridges. These ridges are usually about 3 to 6 feet in height, but may reach heights of 20 feet.

3.2. Biological Environment

Pacific walrus occasionally use the Beaufort Sea, while the Beaufort Sea and adjacent coastline area is important habitat for polar bears.

3.2.1. Pacific walrus.

The Pacific walrus, which includes about 80 percent of the world's walrus population, occurs primarily in the Bering and Chukchi seas (Sease and Chapman 1988). The minimum estimate for the Pacific walrus population is 188,316 animals (USDOC 2000).

Walrus distribution is closely tied to the movements of sea ice in the Chukchi and Bering seas (Figure 2). In winter and early spring, the entire walrus population congregates on the pack ice in the Bering sea, south of St. Lawrence Island. As the ice edge retreats northward, females with dependent young move north into the Chukchi sea. A few walrus may move east into the Beaufort Sea, but the majority of the population occurs north and west of Barrow, Alaska, outside of the area covered by these regulations. Adult and subadult males remain to the south, where they come ashore at terrestrial "haulouts" in Bristol Bay, Alaska, or along the Russian coast. As the ice edge advances southward in the fall, walrus reverse their migration, where they re-group on the Bering sea pack ice.

Walrus sightings in the Beaufort Sea have consisted solely of widely scattered individuals and small groups. While walruses have certainly been encountered and are present in the Beaufort Sea, there were only five sightings of walruses between 146^{o} and 150^{o}W during aerial surveys conducted from 1979 to 1995 (LGL and Greeneridge 1996).

In addition, only 3 walrus sightings have been reported between 1994 to 2000 as a result of Industry monitoring efforts (Kalxdorff and Bridges 2003). In June 1996, one walrus was observed from a seismic vessel near Point Barrow. In October 1996, one walrus was sighted approximately five miles northwest of Howe Island. In September

1997, one walrus was sighted approximately twenty miles north of Pingok Island. The latter two sightings occurred during aerial surveys associated with the Northstar Project.

3.2.2. Polar Bear.

Polar bears are found throughout the Arctic. In Alaska, they have been observed as far south in the eastern Bering Sea as St. Matthew Island and the Pribilof Islands (Ray 1971), but are most commonly found within 180 miles of the Alaskan coast of the Chukchi and Beaufort seas, from the Bering Strait to the Canadian border (Amstrup and DeMaster 1988). In Alaska, two stocks occur: 1) Bering/Chukchi Sea stocks; and 2) Beaufort Sea stock (Figure 3). A reliable population estimate is not available for the Bering/Chukchi Sea stock. The Southern Beaufort Sea population (from Point Hope, Alaska, to Banks Island, Northwest Territories) was estimated at 2,200 bears in 2002 (USFWS Stock Assessment 2002a; 2002b). The most recent population growth rate was estimated at 2.4% annually based on data from 1982 through 1992, although the population is believed to have slowed their growth or stabilized since 1992.

Nearshore Alaskan Beaufort Sea polar bears are generally widely distributed in low numbers across the Beaufort Sea area with an average density of about one bear per 30 to 50 square miles. However, polar bears have been observed congregating on the barrier islands in the fall and winter because of available food and favorable environmental conditions. Polar bears will occasionally feed on bowhead whale carcasses on nearby Cross Island. In November 1996, biologists from the U.S. Geological Survey observed 28 polar bears near a bowhead whale carcass on Cross Island, and approximately 11 polar bears within a 2-mile radius of another bowhead whale carcass near the village of Kaktovik on Barter Island. More recently, from 2000 to

2003, biologists from the USFWS have conducted systematic coastal aerial surveys for polar bears from Cape Halkett to Barter Island. During these surveys as many as 5 polar bears at Cross Island and 51 polar bears on Barter Island have been observed within a 2-mile radius of bowhead whale carcasses (Schliebe et al. 2001; Kalxdorff et al. 2002). In one survey during October 2002, we observed 109 polar bears on barrier islands and the coastal mainland from Cape Halkett to Barter Island, a distance of approximately 350 kilometers.

Polar bears spend most of their time in the shear zone and the active ice adjacent to the shear zone. Sea ice and food availability are two important factors affecting the distribution of polar bears. Polar bears feed primarily on ringed seals (*Phoca hispida*) and to a much lesser extent on bearded seals (*Erignathus barbatus*) and walrus. Due to the abundance and availability of seals, drifting pack ice off the Alaskan Beaufort Sea coast supports many polar bears. Polar bears may also come to shore to feed on human refuse or marine mammal carcasses found on coastal beaches and barrier islands.

Male polar bears do not hibernate or spend extended periods of time in dens. Occasionally male polar bears may seek temporary protective shelter from extreme harsh weather. Pregnant female polar bears occupy winter dens for extended periods.

Although insufficient data exist to accurately quantify polar bear denning along the Alaskan Beaufort Sea coast, dens in the area appear to be less concentrated than in Canada to the east and in Russia to the west. Females without dependent cubs breed in the spring and enter maternity dens by late November. Females with cubs do not mate. Pregnant females enter dens by late November and the young are usually born in late December or early January (Harington 1968). An average of two cubs are usually born and after giving birth the female and her cubs remain in the den where the cubs are nurtured until they can walk and stay close to the female. Only pregnant females den for an extended period during the winter; however, other polar bears may excavate temporary dens to escape harsh winter winds. Reproductive potential (intrinsic rate of increase) is low. The average reproductive interval for a polar bear is 3- 4 years and a female polar bear may produce about 8-10 cubs in her lifetime. Female bears are quite sensitive to disturbances during this denning period (Belikov 1976, Lentfer and Hensel 1980, Amstrup 1986).

In late March or early April, the female and cubs emerge from the den. If the mother moves young cubs from the den before they can walk or withstand the cold, their death is likely. Therefore, successful denning, birthing, and rearing activities require a relatively undisturbed environment. Radio and satellite telemetry studies indicate that denning in multi-year pack ice in the Alaskan Beaufort Sea is common (Amstrup 1986). Between 1981 and 1991, of the 90 dens found in the Beaufort Sea, 48 (53%) were on pack ice (Amstrup and Gardner 1994). The highest density of land dens occur along the coastal barrier islands of the eastern Beaufort Sea and within the Arctic National Wildlife Refuge.

3.3. Socio-Economic Environment

Pacific walrus and polar bears have been traditionally harvested by Alaska Natives for subsistence purposes. The harvest of these species plays an important role in the culture and economy of many villages throughout coastal Alaska. An exemption under the Act allows Alaska Natives to take polar bears and walrus if such taking is for subsistence purposes or is done for purposes of creating and selling authentic native articles of handicrafts and clothing. Sport hunting of both species has been prohibited under the Act since 1972.

3.3.1. Pacific walrus.

As the primary range of Pacific walrus is west and south of the Beaufort Sea, it is not surprising that few walrus are harvested in the Beaufort Sea along the northern coast of Alaska. Walrus constitute a small portion of the total marine mammal harvest for the village of Barrow. According to records from the USFWS Marking, Tagging and Reporting Program, from 1994 to 2002, 182 walrus were reported taken by Barrow hunters through the Marking, Tagging, and Reporting Program. Reports indicate that up to 4 of 182 animals were taken east of Point Barrow, within the limits of the incidental take regulations. Hunters from Nuiqsut and Kaktovik do not normally hunt walrus east of Point Barrow and have taken only one walrus in the last 13 years.

3.3.2 Polar Bear.

The Service has monitored Alaska Native harvest of polar bears since the latter part of 1988. Native harvest of polar bears has averaged about 77 animals per year from 1987 to 1997. Approximately 60 percent of this harvest is by residents of the Chukchi and Bering Sea regions, with the remainder in the Beaufort Sea area. Data from our Marine Mammal Management Office indicate that from July 1, 1993, to June 30, 2002, a total of 194 polar bears were reported harvested by residents of Barrow; 26 by residents of the village of Nuiqsut; and 26 by residents of the village of Kaktovik.

Under the Act there are no restrictions on numbers, seasons, sex or age of polar bears that can be killed by Alaska Natives unless the population is declared depleted.

The subsistence harvest in Alaska is known to fluctuate so there is the risk that an over-harvest could occur legally continue until the population is declared depleted. Presently, it is thought that the Native harvest of polar bears is near a level that the population can sustain under a user group agreement between the North Slope Borough (Alaska) and the Inuvialuit Game Council (Canada).

The Commissioners for the Inuvialuit-Inupiat Agreement set an original quota of 76 polar bears in the Southern Beaufort Sea population in 1988. That quota was later revised to 80. In Alaska, the annual subsistence harvest has fluctuated around 36 bears. The annual subsistence harvest for the Southern Beaufort Sea population (Alaska and Canada combined) has been approximately 62 bears. This allocation appears to be both sustainable and equitable. The quota was derived in consideration of the best available scientific information regarding population size and sustainable yield at the time. Originally, the quota was based on pooled capture and recapture data from Alaska and Canada the population was estimated to be between 1,800 and 2,000 animals. Taylor et al. (1987) estimated a sustainable harvest of 1.5% of the female population. Using a 2:1 male: female harvest ratio results in a population harvest rate of 4.5% per year. This agreement is the first of its kind between aboriginal groups in the Canadian and U.S. Arctic Beaufort Sea area and, although more restrictive than the Act, has no formal status in law for enforcement purposes in Alaska (Brower et al. 2002).

In addition, tourism, such as, wildlife viewing (predominantly polar bears), has occurred in Barrow and Kaktovik. Viewing opportunities, however, are unpredictable as polar bears are limited to certain seasons when the bears move along the coast. Wildlife viewing is also limited to these communities, which are located on the periphery of Industry activities.

3.4. Nature of Effects between Industry and Biological Resources

Current incidental take regulations which allow the take of small numbers of polar bear and Pacific walrus have been in effect since November 1993. Each Letter of Authorization issued pursuant to the regulations required the operator to monitor the effects of the activity on polar bear and Pacific walrus. Potential impacts likely to affect polar bear and/or Pacific walrus and Native subsistence harvest are noise, physical obstructions, animal/human encounters, and accidental oil spills.

3.4.1. Pacific Walrus.

Noise. Oil and gas industry activities that generate noise such as air and vessel traffic, seismic surveys, ice breakers, supply ships, and drilling may frighten or displace Pacific walrus. Nonetheless, the primary range of the Pacific Walrus is west of Point Barrow. Pacific walrus do not normally range into the Beaufort Sea. Occasionally, a single walrus may be sighted east of Point Barrow.

Pacific walrus generally inhabit the pack ice of the Bering Sea. As the winter range of the Pacific walrus is well beyond the geographic area covered by these regulations (as defined above), we do not expect any impacts to walrus from oil and gas activities during winter. Seismic surveys generally take place on solid ice or in open water. Since walrus activity occurs near the ice edge, interactions between walrus and seismic surveys are unlikely.

It is highly improbable that the noise from stationary sources would impact many walruses. Currently, Endeavor Island, the saltwater treatment plant located on the West Dock causeway, and Northstar are the only offshore facilities that could potentially produce noise that could disturb walruses; however, walruses are rare in the vicinity of these facilities.

Physical Obstructions. Walrus could use physical structures such as causeways and manmade islands as areas to haulout. These facilities are not likely to impede the movement of walrus. If walrus are present, their movements may be affected by stationary drilling structures. Walrus are attracted to certain activities and are repelled from others by noise or smell. In 1989, an incident occurred during a drilling operation in the Chukchi Sea where a young walrus surfaced in the center hole (i.e., moonpool) of a drill ship. The crew used a cargo net to remove the walrus from the drilling area, after which the walrus left the scene of the incident and was not seen again. No similar incidents have been reported in the area of these proposed regulations.

Walrus/Human Encounters. It is extremely unlikely that a walrus/human encounter will result in the Beaufort Sea due to the distribution of Pacific walrus. From 1994 to 2000, only three Pacific walrus were sighted during the open-water season east of Point Barrow as a result of monitoring efforts associated with incidental take regulations.

Contact with Oil Spills. As stated in earlier, the Beaufort Sea is not within the primary range for the Pacific walrus, therefore the probability of individual walrus encountering oil, as a result of an oil spill from Industry activities is low. Onshore oil spills would not impact walrus unless oil moved into the offshore environment. During the open-water season, if a small spill occurred at offshore facilities or by vessel traffic, few walrus would likely encounter the oil. In the event of a larger spill during the open-water season, oil in the water column could drift offshore and possibly encounter a limited number of walrus. During the ice-covered season, spilled oil would be incorporated into the thickening sea ice. During spring melt, the oil would then travel to the surface of the ice, via brine channels, where most could be collected by spill response activities, but may contact a limited number of walrus.

3.4.2. Polar Bear.

Noise. Female polar bears with cubs, especially in dens, are thought to be more sensitive than other age and sex groups to noises. Although, it is assumed that polar bears, like most animals would avoid sources of extremely loud noises, they commonly approach noise sources, such as industrial sites (Stirling 1988) and ships (Fay et al. 1986). Industry activities could disturb polar bears that are close to the noise sources; however, polar bears have approached to within 100 m (328 ft) of some of these noise sources in the Canadian Beaufort Sea during the winter (Stirling 1988), and in the late fall and early winter are observed regularly within the production infrastructure of Prudhoe Bay and the satellite oilfields (USFWS unpubl. data). Offshore production islands, such as the Northstar production facility, could potentially attract polar bears. Such offshore facilities could potentially increase the rate of human/bear encounters, which could result in the harassment of a bear. Employee training and company policies are implemented to reduce and avoid such encounters.

Mobile noise could impact polar bear denning activities. If these activities coincide with the initiation of denning by a pregnant female polar bear, there is a possibility that the preferred denning site may be avoided. Also, if a female bear is disturbed and leaves the den before the cubs are of adequate size or strength, the cubs may not survive.

On-ice seismic exploration may have various effects on polar bears. Although the reaction of bears to human disturbance is highly variable, polar bears are especially susceptible to disturbance during the denning period. Altricial cubs are unable to leave dens post-partum for > 2 months (T. Smith, USGS, pers comm.). Even after the bears emerge, disturbance may cause den abandonment before cubs are developed enough to survive on the ice. For example, a female bear fitted with a satellite collar was monitored during on-ice vibroseis exploration in 1998 (Amstrup and Gardner 1994). The female and her two cubs remained in their den when vibroseis operations passed within 1 km (0.6 mi) of the den. While this bear left her den early during the season, it was not possible to correlate her early departure with these activities. However, after leaving the den, the female moved a short distance to the southeast, which might indicate some avoidance of the exploration activities (Amstrup and Gardner 1994).

Although the auditory ability of polar bears is not known, researchers have quantified noise levels produced by Industry activities. Blix and Lentfer (1992) studied the propagation of sounds and vibrations from various human activities into artificial bear dens. They concluded that only seismic testing activities less than 100 m (328 ft) from a den produced noise significantly louder than ambient levels inside the den.

More recently, MacGillivray et al. (2003) studied noise and ground vibration data collected at man-made dens in polar bear habitat on Flaxman Island, in the vicinity of remediation activities involving the use of heavy equipment, helicopter activity and blasting. The study was conducted to determine the absolute sound levels of various industrial activities and estimate potential noise and vibration exposure to denning polar bears. Comparison of sound levels, measured with microphones placed outside and inside the dens, permitted estimation of the sound-insulating properties of the dens and vibration data were acquired from sensors placed in the tundra and snow of the den floors. A single blast event, which was used to cut a well pipe, was recorded in the dens.

MacGillivray et al. (2003) found that the maximum distance vehicle noise was detected above background noise in the dens ranged from < 500 m to 2000 m. In-den sound pressure levels for vehicles at the closest point of approach ranged from 37 – 55 dB re 20 μPa. The Hägglunds tracked vehicle produced the loudest noises near the den, while the Tucker Sno-Cat and pick-up trucks produced the lowest. Helicopter noise was well above background levels in the den until helicopters were at least 1000 m from the den. The man-made dens were found to be very good at reducing noise exposure. The snow surrounding the man-made dens reduced the level of outside sounds by 25 dB at 50 Hz, and by 40 dB at 1000 Hz. The in-den ambient noise levels for the man-made dens were typically very low.

Another recent study examining potential disturbance of anthropogenic noise to polar bears investigated the post emergence behavior of polar bears at den sites (USGS unpubl. data). During the winter of 2001-02, polar bear family groups at four maternal dens along the Beaufort Sea coastline were studied to observe behavior. Observation blinds were placed 0.5 km from dens and observations commenced when the adult polar bear opened the den. Behavior states of the sow and cubs were recorded as well as all occurrences of human activity in the immediate area (e.g., foot travel, aircraft over flights, or snowmobile), and weather variables. Once initiated, observations continued daily, until bears abandoned the den site.

USGS found that the average duration at dens from emergence to den site abandonment was approximately 9 days. Family groups emerged from their dens at least once daily, where outside of the den, adults spent 49 % of their time resting, while cubs spent 57 % of their time outside of the den playing.   In addition, post emergence observations of polar bears at den sites suggested that bears respond with varying degrees of intensity, ranging from slight reaction to significant reaction, when exposed to human disturbances near den sites. Polar bears reacted to vehicle and foot traffic near their den by re-entering dens or focusing on the source of disturbance.

Physical Obstructions. Physical structures such as causeways, roadways, artificial islands, and offshore drill rigs appear to have very little effect on the movements of polar bears. Bears routinely traverse causeways and roads, and investigate artificial islands and offshore drill rigs. Given the small size of these structures and the ability of bears to travel great distances, these structures have little direct impact on polar bear movement. Industry has also developed polar bear encounter plans to educate personnel in safely working in polar bear habitat. Many of these practices have been incorporated into the standard operating procedures of the LOAs.

Bear/Human Encounters. Bear/human encounters can be dangerous for the polar bear. Whenever humans work in the habitat of the animal, there is a chance of an encounter, even though, historically, such encounters have been uncommon.

Although bears may be found along the coast during open-water periods, encounters are more likely to occur during winter operations. Potentially dangerous encounters are most likely to occur at gravel islands or on ice exploratory sites. These sites are at ice level and are easily accessible by polar bears. Industry has developed and uses devices to aid in detecting polar bears, including bear monitors and motion detection systems.

Contact with oil spills. The possibility of oil spills from Industry activities and the subsequent impacts on polar bears are a major concern. Polar bears could encounter oil spills during the open-water and ice-covered seasons in offshore or onshore habitat. Although the majority of the Southern Beaufort Sea polar bear population spends a large amount of their time offshore on the pack ice, it is likely that some bears will encounter oil from a spill regardless of the seas and location.

Operational spills may occur during transfer of fuel, during refueling, during handling of lubricants and liquid products, and during general maintenance of equipment. These spills are projected to be small in quantity, commonly involving < 1 to 50 barrels of spilled oil per incident.

To date, large oil spills from Industry activities in the Beaufort Sea and coastal regions that have impacted polar bears have not occurred, although the development of offshore production facilities has increased the potential for large offshore oil spills. Anderson et al. (1999) modeled a large oil spill for the Northstar production facility in August and October, months when an oil spill at Northstar would most likely impact polar bears. In a large spill (i.e., 3,600 barrels: the size of a rupture in the Northstar pipeline and a complete drain of the subsea portion of the pipeline), oil would be influenced by seasonal weather and sea conditions. These would include temperature, winds, and for offshore events wave action and currents. In normal weather conditions for the August spill scenario (open-water season) the model indicated that within eight hours of stopping the leak, only scattered thin sheens would be expected on the water surface; at least 25% of the oil was expected to evaporate, and the remainder would naturally disperse into the water column or on shore. Weather and sea conditions would also affect the type of equipment needed for spill response and how effective spill clean-up would be. For example, spill response has been unsuccessful in the clean-up of oil in broken ice conditions. These factors, in turn, would dictate how large spills impact polar bear habitat and numbers.

The major concern regarding large oil spills is the impact a spill would have on the Southern Beaufort Sea polar bear population. Given the estimated size and its annual subsistence harvest, the polar bear population may be able to sustain the additional mortality caused by a large oil spill of a small number of bears, such as 1-5 individuals. The additive effect, however, of numerous bear deaths (i.e. in the range of 20-30) caused by an oil spill coupled with the subsistence harvest and other potential impacts, both natural and human- induced, may reduce recruitment and survival. The removal rate of bears from the population would then increase higher than what could be sustained by the population, potentially causing a decline in the bear population and affecting bear productivity and subsistence use.

During the ice-covered season, mobile, non-denning bears would have a higher probability of encountering oil or other production wastes than denning females. Current management practices in place by Industry try to minimize the potential for such incidents on requiring the proper use, storage and disposal of hazardous materials. In the event of an oil spill, it is also likely that polar bears would be deliberately hazed to move them away from the area, further reducing the likelihood of impacting the population.

Polar bears may be impacted by external contact with oil and/or ingestion of oil. Polar bears could contact spilled oil in the water, on ice, or on land. External contact with oil could foul fur, irritate skin and eyes, and cause severe inflammation of the nasal passages. Effects on experimentally oiled bears (where bears have been forced into oil) have included acute inflammation of the nasal passages, marked epidermal responses, anemia, anorexia, biochemical changes indicative of stress, renal impairment, and death (Engelhardt 1981; Øritsland et al. 1981). In experimental oiling, many effects did not become evident until several weeks after exposure to oil (Engelhardt 1981).

External oiling of the pelt could cause significant thermoregulatory problems by reducing the insulation value of the pelt (Øritsland et al. 1981; Hurst and Øritsland 1982; Hurst et al. 1982). Polar bears rely on their fur as well as their layer of blubber for thermal insulation (Irving 1972; Frisch et al. 1974). In addition, an oiled bear would probably ingest oil while grooming to restore the insulation value of the oiled fur (Øritsland et al. 1981). Derocher and Stirling (1991) observed a bear with lubricating oil matted into its fur on parts of its head, neck and shoulders. The bear was re-sighted two months later, at which time he had suffered substantial hair loss in the contaminated areas. Four years later, the bear was recaptured and no skin or hair damage was detectable, which suggests that while oiling can damage the fur and skin, in some instances this damage is temporary.

Oil ingestion by polar bears through consumption of contaminated prey and by grooming or nursing could have adverse effects, depending on the amount of oil ingested and the individual's physiological state. Death would be likely if a large amount of oil were ingested or if volatile components of oil were aspirated into the lungs. Ingestion of sub-lethal amounts of oil can have various physiological effects on a polar bear, depending on whether the animal is able to excrete and/or detoxify the hydrocarbons. Oil can be eliminated by vomiting and in the feces, but some can be absorbed into the body fluids and tissues (Engelhardt 1981).

It is likely that polar bears swimming in or walking adjacent to an oil spill will inhale petroleum vapors. Øritsland et al. (1981) reported on the effects of vapor inhalation on polar bears. Their report indicated that inhalation of hydrocarbons from unweathered crude oil in an confined space may have been a contributing factor in the death of two of three polar bears exposed to oil in their experiments. Given the effects of diffusion, dispersion and winds on an open ocean spill, it is likely that harmful concentrations of vapors would be short lived. Following an oil spill, most light hydrocarbons would evaporate within a few days to a week and would not pose a serious threat from inhalation to polar bears or the population.

A local reduction in ringed seal numbers as a result of direct or indirect effects of an oil spill could, also, temporarily affect the local distribution of polar bears. A reduction in density of seals as a direct result of mortality from contact with spilled oil could result in polar bears not using a particular area for hunting. In addition, if the spill were widespread and affected seal pups regionally, it could affect physiological conditions of numerous polar bears. Also, seals that die as a result of an oil spill could be scavenged by polar bears, thus increasing the bears' exposure to hydrocarbons.

Such incidents should be avoided by current management practices, which require the proper use, storage or disposal of hazardous materials. In a strategy to minimize effects of oil spill on bears, it is likely that polar bears would be deliberately hazed (under separate authority) to prevent them from entering the affected area, and thus further reduce the likelihood of human/bear interactions.

Oil spilled from an offshore subsea pipeline, such as Northstar, is a unique scenario that has recently been considered in our previous regulations. The Northstar Project transports crude oil from a gravel island in the Beaufort Sea to shore via a 5.96-mile buried subsea pipeline. The pipeline is buried in a trench in the sea floor deep enough to theoretically remove the risk of damage from ice gouging and strudel scour. Northstar began producing oil in 2001.

Polar bears are at risk from an oil spill in the Beaufort Sea. Limited data from a Canadian study suggest that polar bears experimentally oiled with crude oil may die. This finding is consistent with what is known of other marine mammals that rely on their fur for insulation. The Northstar FEIS concluded that mortality of up to 30 polar bears could occur as the result of an oil spill greater than 1,000 barrels. This estimate was based on observations of aggregations of polar bears on barrier islands in the Beaufort Sea.

Two independent lines of evidence support our determination that only a negligible impact to the Beaufort Sea polar bear stock will occur from Northstar, one largely anecdotal, and the other quantitative. The anecdotal information is based on observations of polar bear aggregations on barrier islands and coastal areas in the Beaufort Sea. This information suggests that polar bear aggregations may occur for brief periods in the fall. The presence and duration of these aggregations are influenced by the presence of sea ice near shore and the availability of marine mammal carcasses, notably bowhead whales from subsistence hunts. In order for significant impacts on polar bears to occur, an oil spill would have to occur, an aggregation of bears would have to be present, the spill would have to contact the aggregation, and many of the bears would have to be killed. We believe the probability of all these events occurring simultaneously is low.

The quantitative rationale for negligible impact is based on a risk assessment that considered oil spill probability estimates for the Northstar Project, an oil spill trajectory model, and a polar bear distribution model. The Northstar FEIS provides estimates of the probability that one or more spills greater than 1,000 barrels of oil will occur over the project's life of 15 years. We considered only spill probabilities for the drilling platform and sub-sea pipeline, as these are the spill locations that will affect polar bears. Using exposure variables and production estimates from the Northstar EIS, we estimate the likelihood of one or more spills greater than 1,000 barrels in size occurring in the marine environment is 1-5 percent during the 16-month period covered by the proposed regulations.

The quantitative assessment was based on the following information. Applied Sciences Associates, Inc., was contracted by BP Exploration Alaska Inc. to run the OILMAP oil spill trajectory model. The size of the modeled spill was set at 3,600 barrels, simulating rupture and drainage of the entire sub-sea pipeline. Each spill was modeled by tracking the location of 100 "spillets," each representing 36 barrels. Spillets were driven by wind, and their movements were stopped by the presence of sea ice. Open water and broken ice scenarios were each modeled with 250 simulations. A solid ice scenario was also modeled, in which oil was trapped beneath the ice and did not spread. In this event, we found it unlikely that polar bears will contact oil, and removed this scenario from further analysis. Each simulation was run for 96 hours with no cleanup of containment efforts simulated. At the end of each simulation, the size and location of each spill was represented in a geographic information system.

Telemetry data suggest that polar bears are widely distributed in low numbers across the Beaufort Sea with a density of about one bear per 30–50 square miles. Movement and distribution information was derived from radio and satellite relocations of collared adult females. The U.S. Geological Survey, Biological Resources Division, developed a polar bear distribution model based on an extensive telemetry data set of over 10,000 relocations (Durner et al. 2000). Using a technique called ‘‘kernel smoothing,’’ they created a grid system centered over the Northstar production island and estimated the number of bears expected to occur within each 0.25km^2 grid cell. Each of the simulated oil spills was overlaid with the polar bear distribution grid. If a spillet passed through a grid cell, the bears in that cell were considered killed by the spill. In the open water scenario, the estimated number of bears killed ranged from less than 1 to 78 bears, with a median of 8 bears. In the broken ice scenario, results ranged from less than 1 to 108, with a median of 21. These results are based on an ‘‘average’’ distribution of polar bears and do not include potential aggregation of bears, such as on Cross Island in the fall.

In addition, we estimated the likelihood of occurrence of mortality for various numbers of bears by multiplying the probability of mortality by the spill probability for each period of the year, and summing those probabilities over the entire year. We calculated that the probability of a spill that will cause mortality of one or more bears is 0.4–1.3 percent. As the threshold number of bears is increased, the likelihood of that event decreases; the likelihood of taking more bears becomes less and less. Thus, the probability of a spill that will cause a mortality of 5 or more bears is 0.3–1.1 percent; for 10 or more bears is 0.3–0.9 percent; and for 20 or more bears is 0.1– 0.5 percent.

The greatest source of uncertainty in our calculations is the probability of an oil spill occurring. The oil spill probability estimates for the Northstar Project were calculated using data for sub-sea pipelines outside of Alaska and outside of the Arctic. These spill probability estimates, therefore, do not reflect conditions that are routinely encountered in the Arctic, such as permafrost, ice gouging, and strudel scour. They may include other conditions unlikely to be encountered in the Arctic, such as damage from anchors and trawl nets. Consequently, there is some uncertainty about oil spill probabilities as presented in the Northstar FEIS. If the probability of a spill were actually twice the estimated value, however, the probability of a spill that will cause a mortality of one or more bears is still low (approximately three percent).

The spill analysis was dependent on numerous assumptions, some of which underestimate, while others overestimate, the potential risk to polar bears. These include variation in spill probabilities during the year, the length of time the oil spill trajectory model was run, whether or not containment occurred during the trajectory model, lack of efforts to deter wildlife during the model runs, contact with a spillet constitutes mortality, and that aggregations of bears were not included. We determined that the assumptions that will overestimate and underestimate mortalities were generally in balance. For example, if an oil spill were to occur during the fall or spring broken-ice periods, a significant impact to polar bears could occur; however, in balancing the level of impact with the probability of occurrence, we concluded that the probability of serious impacts (large-volume spills that cause high polar bear mortalities) was low.

3.4.3. Native subsistence.

The affected region contains the Inupiat communities of Barrow, Nuiqsut, and Kaktovik. All are represented by Alaska Native Claims Settlement Act Corporations, municipal governments, and active tribal organizations. The North Slope Borough (NSB), the Arctic Slope Regional Corporation, and the Inupiat Community of the Arctic Slope also represent the entire North Slope region. The NSB provides opportunities for education, job-training and employment to the local residents. Barrow, Nuiqsut and Kaktovik are influenced by the geographical and economic expanse of the oil industry.

Subsistence activities could be adversely impacted by a major oil spill. Polar bear populations may be impacted by direct contact with oil. Populations may decrease or be unavailable during oil spill cleanup activities. Both polar bears and subsistence hunters may avoid historical hunting grounds. A decrease in the population of polar bears could affect the subsistence harvest allocation of polar bears (USDOI-MMS/DEIS 1997).

3.5. Current and Proposed Impacts of Oil and Gas Activities

When incidental take regulations were first issued in 1993, seven oil fields were in production: Prudhoe Bay, Kuparuk, Endicott, Lisburne, Milne Point, Niakuk and Pt. McIntyre. Oil and gas development is an ongoing activity on Alaska's North Slope, which now contains 8 oil and gas units in production with 25 oil and gas fields, including satellite fields. Exploration, development and production are ongoing year-round, and we anticipate additional exploration activities.

Exploration activities may consist of one or two to ten geotechnical surveys and one to two geochemical surveys. Exploratory drilling is estimated to be conducted at 2 to 12 locations annually. An additional 10 to 12 delineation wells may be drilled annually within existing fields. An estimated 1,900 square miles of 3D seismic and 1,800 linear miles of 2D seismic may be collected annually. Because of the large number of variables influencing exploration activity, any predictions as to the exact dates and locations of these operations that will take place over the effective period of the regulations is highly speculative.

3.5.1. Pacific walrus.

Current impacts from Industry activities on Pacific walrus have been minimal. From 1994 to 2000, three Pacific walrus were sighted by Industry during the open-water season. Due to the small number of walrus that are found in the Beaufort Sea because Pacific walrus do not normally range into the Beaufort Sea, the impact of proposed Industry activities to the walrus population is expected to be minimal as well.

3.5.2. Polar Bears.

3.5.2.1. Current activities.

Actual impacts on polar bears by the oil and gas industry during the past 30 years have been minimal as well. In the southern Beaufort Sea, polar bears spend the majority of their lives on the ice, limiting the opportunity for impacts on bear recruitment or survival from Industry. In addition, polar bears also spend a limited amount of time on land, moving onshore to feed, den, or traverse to other areas. At times when the ice edge is near shore and then quickly retreats northward, bears may remain along the coast or on barrier islands for several weeks until the ice returns. During those periods, the likelihood of interactions between polar bears and Industry activities increases. Indeed, polar bears have been encountered at or near most coastal and offshore production facilities, or along the roads and causeways that link these facilities to the mainland. We have found that polar bear interaction planning and training requirements of the LOA process have increased polar bear awareness and have helped minimize these encounters. For example, in 1999, Exxon terminated work on Flaxman Island due to the presence of several polar bears in the vicinity of the work area.

Disturbances to denning females, either on land or on ice, are of particular concern. As part of the LOA application for seismic surveys during denning season, Industry provides us with the proposed seismic survey routes. To minimize the likelihood of disturbance to denning females, we evaluate these routes along with information about known polar bear dens, historic denning sites, and probable denning habitat.

A standard condition of LOAs requires Industry to maintain a 1-mile buffer between survey activities and known denning sites. In addition, we may require Industry to avoid denning habitat until the time when bears have left their dens. To further reduce the potential for disturbance to denning females, we have conducted research, in cooperation with Industry, to allow us to accurately detect active polar bear dens and minimize impacts to polar bears. We have evaluated the use of remote sensing techniques, such as Forward Looking Infrared (FLIR) imagery (USGS, unpubl. data) and the use of scent-trained dogs to locate dens (Perham and Williams 2003). In addition, Industry has sponsored cooperative research evaluating noise and vibration propagation through substrates and the received levels of noise and vibration in polar bear dens (MacGillvray et al. 2003) and behavior of bears at dens (USGS, unpubl. data).

During winter 2002, Perham and Williams (2003) conducted a pilot study to determine if trained, air-scenting dogs could verify the locations of known or suspected polar bear dens. Coastline bluff denning habitat on various barrier islands in the Beaufort Sea was surveyed with dogs. The dogs alerted at the dens of three radio-instrumented bears, but did not alert on any of four hotspots previously identified during forward-looking infrared (FLIR) aerial surveys conducted earlier in the winter. The use of trained dogs to locate occupied polar bear dens appears to be a viable technique that could help minimize impacts from oil and gas industry activities on denning polar bears and could be a technique used conditionally in LOAs, if warranted.

In addition, numbers of LOAs issued to Industry may serve as an indicator to the characteristics of the oil and gas activity throughout the Beaufort Sea region, the extent of which may indirectly impact polar bear population (Kalxdorff and Bridges 2003). For example, monitoring results from regulations issued for incidental (unintentional) take of polar bears and Pacific walrus documented 115 LOAs issued for oil and gas related activities between January 1, 1994 and March 31, 2000. These activities included exploratory operations, such as seismic surveys and drilling; development activities, such as construction and remediation; and production activities for operational fields. Seventy-seven percent (n=89) of LOAs issued were for exploratory activities, 10 percent (n=11) for development, and 13 percent (n=15) for production activities. Less than 33 percent (32 of 115) of these activities actually sighted polar bears, and approximately 67 percent of sightings (171 of 258) occurred during production activities.

The majority of impacts from current activities on polar bears have resulted from direct human/bear encounters. Monitoring efforts by Industry required under previous regulations for the incidental take of polar bears and walrus have documented various types of interaction between polar bears and Industry. During a 7-year period (1994-2000) while incidental take regulations were in place, Industry reported 258 polar bear sightings. Throughout this period, polar bears were sighted during 32 of the 115 activities covered by incidental take regulations. Approximately two-thirds of the sightings (171 of 258 sightings) occurred during production activities, which suggests that Industry activities that occur on or near the Beaufort Sea coast have a greater possibility for encountering polar bears than Industry activities occurring inland. Sixty-one percent of polar bear sightings (157 of 258 sightings) consisted of observations of polar bears traveling through or resting near the monitored areas without a perceived reaction to human presence, while 101 polar bear sightings involved bear-human interactions.

Twenty-one percent of all bear-human interactions (21 of 101 sightings) involved anthropogenic attractants, such as garbage dumpsters and landfills, where these attractants altered the bear's behavior. Sixty-five percent of polar bear-human interactions (66 of 101 sightings) involved Level B harassment to maintain human and bear safety by preventing bears from approaching facilities and people. We have no indication that encounters, which alter the behavior and movement of individual bears, have any effects on the recruitment or survival of those bears.

The LOA process also requires the applicant to develop a polar bear interaction plan for each operation for bears that may be attracted by the activity. The plans outline the steps the applicant must take to minimize impacts, such as garbage disposal procedures to reduce the attraction of polar bears. Interaction plans also outline the chain of command for responding to a polar bear sighting. In addition to interaction plans, Industry personnel participate in polar bear interaction training while on site. The objective of these polar bear interaction plans and training is to detect the bear quickly when it encounters Industry activities, and respond to the bear appropriately. Most often, this response involves deterring the bear from the site. Without such plans and training, an undesirable outcome could be lethal take of the bear in defense of human life.

No lethal takes or injuries associated with Industry have occurred during the period covered by incidental take regulations. Prior to the issuance of regulations, lethal takes by Industry were rare. Since 1968, there have been two documented cases of lethal take of polar bears associated with oil and gas activities. In winter 1968-1969, an industry employee on the Alaskan North Slope shot and killed a polar bear. In 1990 a female polar bear was killed at a drill site on the west side of Camden Bay. In both instances, the lethal take was in defense of human life. This is the only documented lethal take of a polar bear related to oil and gas activities in over 25 years of exploratory work in the area. In contrast, 33 polar bears were killed in the Canadian Northwest Territories between 1976 to 1986 as a result of encounters with Industry.

Polar bears are known to eat toxic nonfood items such as car batteries (Lunn and Stirling 1985); hydraulic and lubricating fluids (Russell 1975, Derocher and Stirling 1990); and one polar bear, discovered on Leavitt Island, is known to have died as a result of consuming antifreeze (ethylene glycol colored with rhodamine B). This chemical combination is used for marking airport runway centerlines on snow and ice (Amstrup et al. 1989).

3.5.2.2. Proposed activities.

Industry effects on polar bears are expected to occur on a similar level to what has occurred in the previous regulation. We expect no change in impact to polar bears as a result of the proposed activities.

Chapter 4 - Environmental Consequences

4.1. Alternative 1: No Action

The current Incidental Take Regulations expired on March 31, 2003. If this alternative were implemented, no further Incidental Take Regulations and LOAs would be issued. These regulations do not explicitly permit or prohibit Industry activity; however, it is likely that Industry would continue to conduct exploration, development, and production activities as planned. Without regulations, monitoring and reporting of interactions between Industry and polar bears and/or Pacific walrus would not be required and our interaction with the Industry to monitor potential effects on polar bear and Pacific walrus would be greatly reduced.

4.2. Alternative 2: Proposed Action (Incidental Take Regulations)

The USFWS concludes that the effect of promulgating Incidental Take Regulations to allow for the incidental take of small numbers of polar bears and Pacific walrus would be positive for polar bears and Pacific walrus. Under terms of the MMPA and based on nine years of monitoring and reporting, Industry effects on Pacific walrus and polar bears resulting from incidental take authorization appear to be negligible. Between 1994 and 2003, Industry activities have not resulted in any polar bear or Pacific walrus deaths while incidental take regulations have been in place, while at the same time, 223 LOAs were issued. It is likely that this alternative will actually reduce the level of incidental take that would occur in the absence of regulations, due to active monitoring and reporting of polar bears and Pacific walrus.

Under this alternative, monitoring and reporting will be implemented to evaluate the effects of Industry activities on polar bear and Pacific walrus populations. Section 101(a)(5)(A) of the Act states that the Secretary of the Interior may allow the incidental, but not intentional, taking of marine mammals provided regulations set forth requirements pertaining to the monitoring and reporting of such taking.

Prior to issuance of a LOA, the applicant will be required to submit a monitoring and reporting plan to the USFWS. Upon review and approval of the submitted monitoring and reporting plan, the plan will become an integral part of the LOA.

The purpose of monitoring and reporting is to determine effects of authorized oil and gas activities on polar bear and walrus in the Beaufort Sea and the northern coast of Alaska. Plans will be required to identify the methods used to determine and assess the effects of the authorized activity on polar bear and walrus. Monitoring and reporting plans will be reviewed annually and modifications will be made, if necessary, based upon interpretation of results.

Based on the information presented, and under terms of the MMPA, small number of encounters anticipated to occur between polar bears or walrus and Industry are unlikely to have any significant effect on polar bears or Pacific walrus. In addition, any take reasonably likely to or reasonably expected to be caused by oil and gas activities will not result in more than a negligible effect on the recruitment or survival or polar bear or walrus populations inhabiting the Beaufort Sea region.

Chapter 5 - Agencies/Persons Consulted

A copy of the petition submitted by the Alaska Oil and Gas Association, on August 23, 2002, was distributed to the following groups.

Arctic Connection, Anchorage

Alaska Nanuuq Commission

North Slope Borough

Alaska Eskimo Whaling Commission

Eskimo Walrus Commission

U.S. Fish and Wildlife Service

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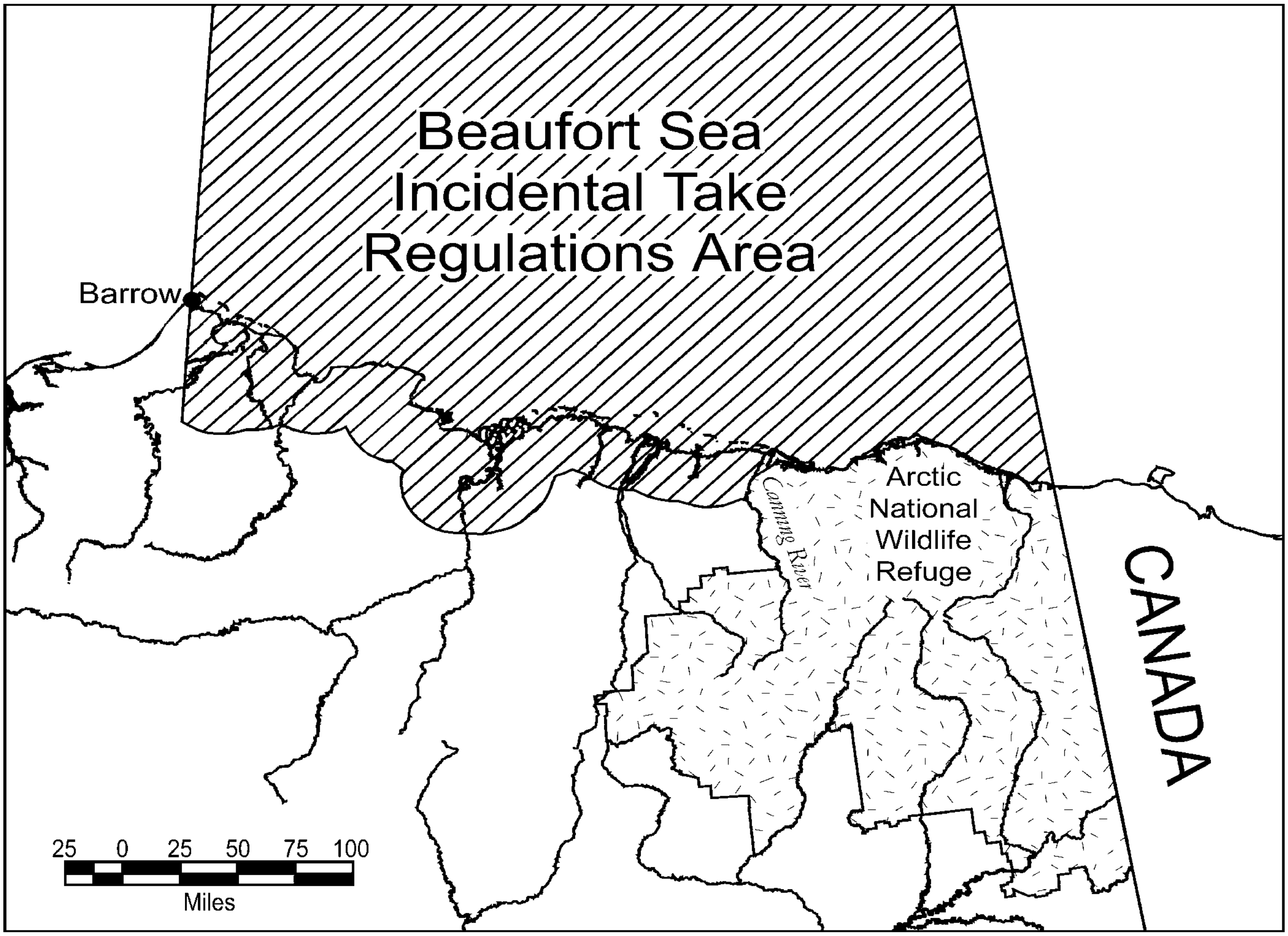

Figure 1. Specific geographic area covered by the 2003 Beaufort Sea incidental take regulations.

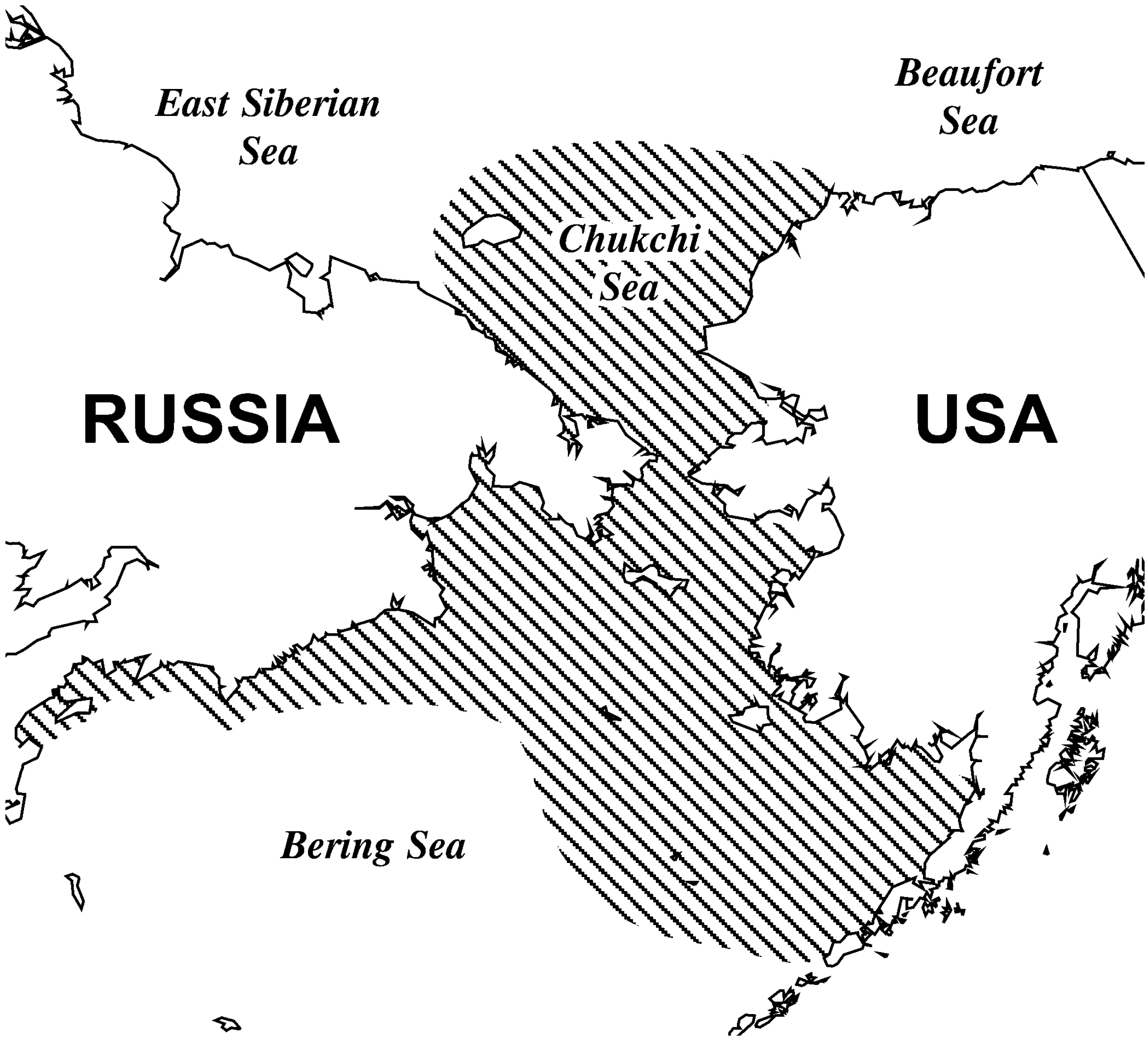

Figure 2. Distribution of Pacific walrus.

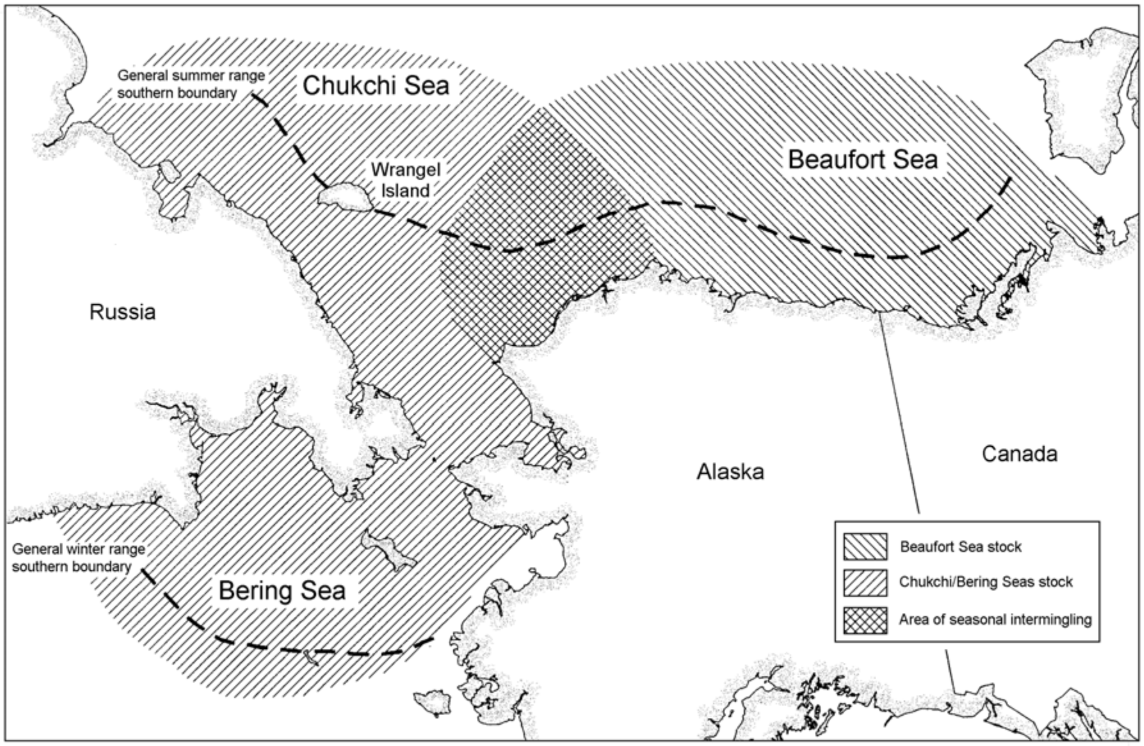

Figure 3. Stock boundaries for polar bears in Alaska.