BIOLOGICAL OPINION

for

EXXONMOBIL'S POINT THOMSON PROJECT

Consultation with the
U.S. Army Corps of Engineers
Anchorage, Alaska

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1. INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) on a proposal by Exxon Mobil Corporation (ExxonMobil) to initiate development of a hydrocarbon reservoir at Point Thomson on State of Alaska leases on the Arctic Coastal Plain, approximately 80 km (50 miles) east of Prudhoe Bay. Because the project will impact waters of the United States, ExxonMobil has requested a section 404 permit from the U.S. Army Corps of Engineers (USACE). The USACE submitted a Biological Assessment (BA; Johnson et al. 2011) for the Point Thomson Project prepared by ABR, Inc. Environmental Research and Services on behalf of ExxonMobil to the Service on January 26, 2011. The applicant and designated non-federal representative is ExxonMobil; the PTE Pipeline LLC, a wholly owned subsidiary of ExxonMobil Pipeline Company, is a joint applicant (Johnson et al. 2011). PTE Pipeline LLC will own and operate the project's export pipeline.

This BO describes the effects of the Proposed Action on Alaska-breeding Steller's eiders (*Polysticta stelleri*), spectacled eiders (*Somateria fischeri*), polar bears (*Ursus maritimus*), and polar bear critical habitat pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). Conference reports for yellow-billed loon (*Gavia adamsii*) and Pacific walrus (*Odobenus rosmarus divergens*), which are listed as candidate species under the ESA, are also included in the document. We used information provided in the project BA; project-specific communications with the USFWS Alaska Region Marine Mammal Management (USFWS MMM) office; other Service documents; and published and unpublished literature to develop this BO.

Section 7(a)(2) of the ESA states that Federal agencies must ensure that their 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.

The Service has determined the Proposed Action may affect but is not likely to adversely affect Steller's eiders and may adversely affect spectacled eiders, polar bears, and polar bear critical habitat. We have also determined that the Proposed Action is not likely to jeopardize the continued existence of yellow-billed loons or Pacific walruses.

Following review of the status and environmental baseline of spectacled eiders, polar bears, and polar bear critical habitat, and analysis of the potential effects of the Proposed Action to these listed entities, the Service has concluded the Proposed Action is not likely to jeopardize the continued existence of spectacled eiders or polar bears, and is not likely to destroy or adversely modify polar bear critical habitat.

If you have comments or concerns regarding this BO, please contact Ted Swem, Endangered Species Branch Chief, Fairbanks Fish and Wildlife Field Office at (907) 456-0441.

2. DESCRIPTION OF THE PROPOSED ACTION

Project Overview

ExxonMobil is proposing to initiate hydrocarbon production from the Thomson Sand reservoir on the eastern Arctic Coastal Plain (ACP). Surface development (Figure 1) would occur approximately 80 km (50 mi) east of Prudhoe Bay and approximately 3–10 km (2–6 mi) west of the Staines River. ExxonMobil proposes to produce gas from the reservoir, recover liquid hydrocarbons, re-inject the residual gas back into the reservoir, and delineate and test other hydrocarbon resources encountered during project implementation.

The primary project components are:

- Three gravel pads—Central, East, and West Pads
- Central Processing Facility (CPF) located on Central Pad
- Infrastructure required to drill and produce five development wells including two existing wells at Central Pad
- Marine offloading facilities (service pier and sealift bulkhead) and boat launch
- Gravel airstrip for all-season transportation and emergency response
- Gravel mine site
- Gravel road network (18.4 km [11.4 mi])
- Winter ice roads (239 km [149 mi]) in support of construction and operations
- Export pipeline (35 km [22 mi]), a common carrier pipeline to transport hydrocarbon liquids from the Central Pad at Point Thomson to the Badami Development.
- Infield gathering lines (16 km [10 mi])

The Point Thomson Project will place gravel fill on approximately 1.08 km² (267 acres) of tundra. Footprint coverage and road lengths are summarized in Table 2.3 of the project BA (Johnson et al. 2011). Project facilities will not be connected to other oilfields or developed areas by all-season roads. Equipment, materials, supplies, and personnel will be transported via seasonal ice roads, aircraft, and sea-going barges. Gravel structures will be constructed primarily in the winter by using standard North Slope equipment and methods. Some gravel placement will also occur during summer; however, no placement of gravel directly on tundra during the summer is planned.

ExxonMobil has proposed to construct the Point Thomson Project over four winter seasons (2012/2013–2015/2016). Facility commissioning/startup and construction demobilization is expected to occur in late 2015–early 2016. Estimated timeframes for major elements of the Project are shown in Table 2.1. Two wells at the Central Pad were drilled, cased, flow-tested, and suspended in 2009 and 2010; additional drilling is expected to begin in 2015. The operational life of the project is expected to be ~30 years. Detailed facility closure and abandonment procedures have not been developed and are not part of the Proposed Action.

Action Area
The Action Area is the area in which direct and indirect effects of the action to listed species and designated critical habitat may occur. The area directly affected by the proposed project includes gravel pads and roads (including the airstrip), the export pipeline and infield gathering lines, ice roads and pads, the material source site, barge routes and facilities, and areas potentially affected by terrestrial or marine spills. The area indirectly affected by the proposed project is delineated by a zone of influence[1] surrounding new infrastructure within which listed species may be affected by disturbance resulting from construction activities.

The Point Thomson Project BA (Johnson et al. 2011) delineates the Action Area (Figure 2) as an area generally between the Staines River on the east and Prudhoe Bay on the west, and from 10 km (6 mi) seaward side of the barrier islands to a point inland of the proposed airstrip. In addition to proposed new development, the Action Area includes winter ice road routes, coastal and sealift barge routes in the Beaufort Sea, docking facilities at West Dock in Prudhoe Bay, and areas potentially affected directly and indirectly by air and sea transportation and marine spills, and at least a 1.6-km (1 mi) zone surrounding transportation routes and facilities (Figure 2).

Proposed Action
Project components and associated construction, operations, and maintenance activities are summarized below. Project infrastructure and implementation are described further in the Point Thomson BA (Johnson et al. 2011).

Central Pad
The approximately 22.7-ha (56-acre) Central Pad includes the existing 5.36-ha (13-acre) PTU-3 exploration pad site and two existing development wells. The Central Pad is located to access the core of the Thomson Sand reservoir. The following facilities will also be located on the Central Pad:

- CPF (main process and utility modules) and associated support and infrastructure facilities
- Class I disposal well
- High- and low-pressure flares and auxiliary equipment
- Diesel and methanol storage tanks
- Cold storage area with associated pipe racks, cable racks, warehouse, and storage equipment and Staging areas
- Grind and inject module
- Camp and camp utility modules
- Communications facility

[1] This zone of influence is assumed to be 200 m (656 ft) for spectacled eiders and 1.6 km (1 mi) for polar bears.

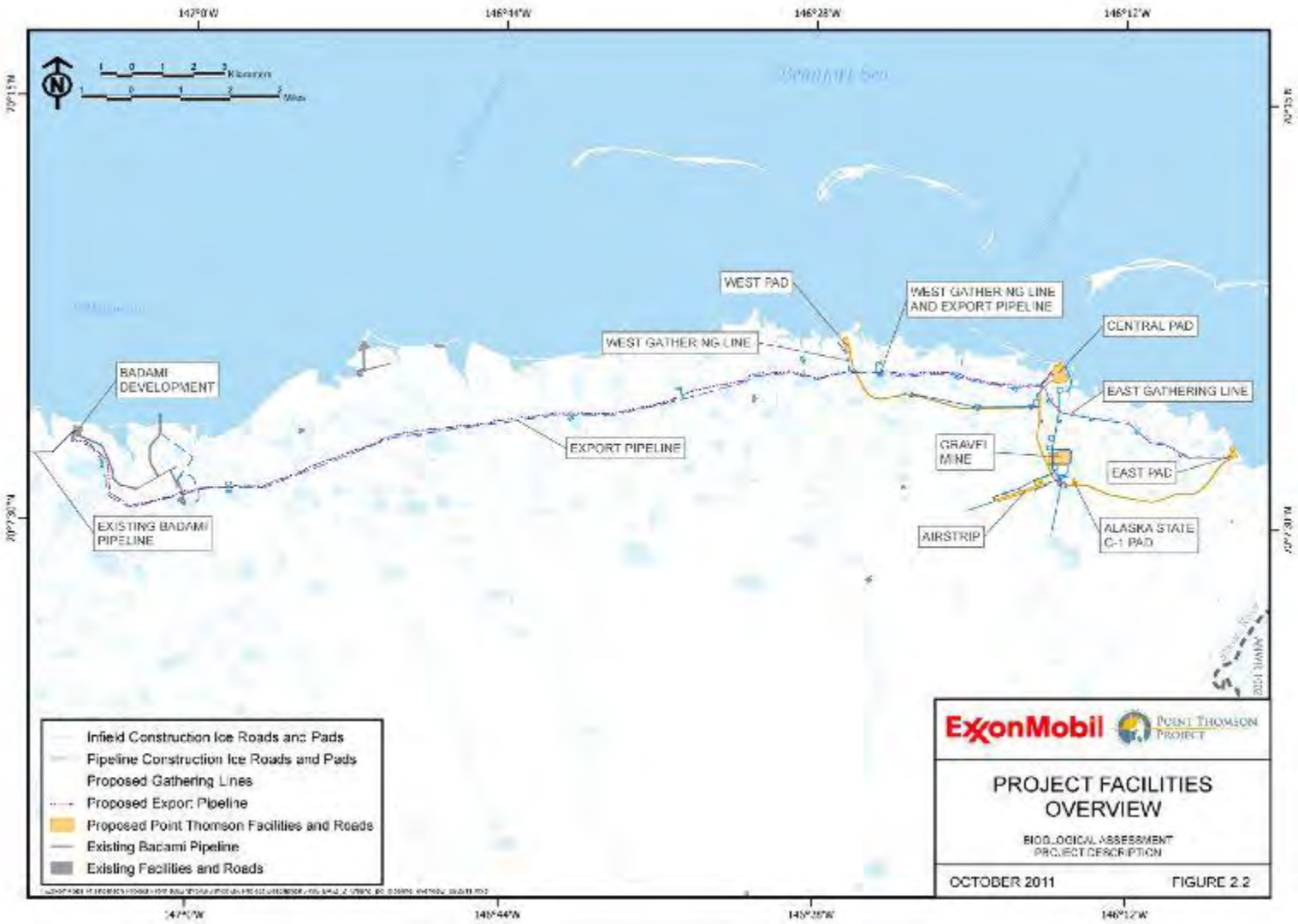

Figure 1. Project facilities overview. Figure 2.2 of the BA (Johnson et al. 2011)

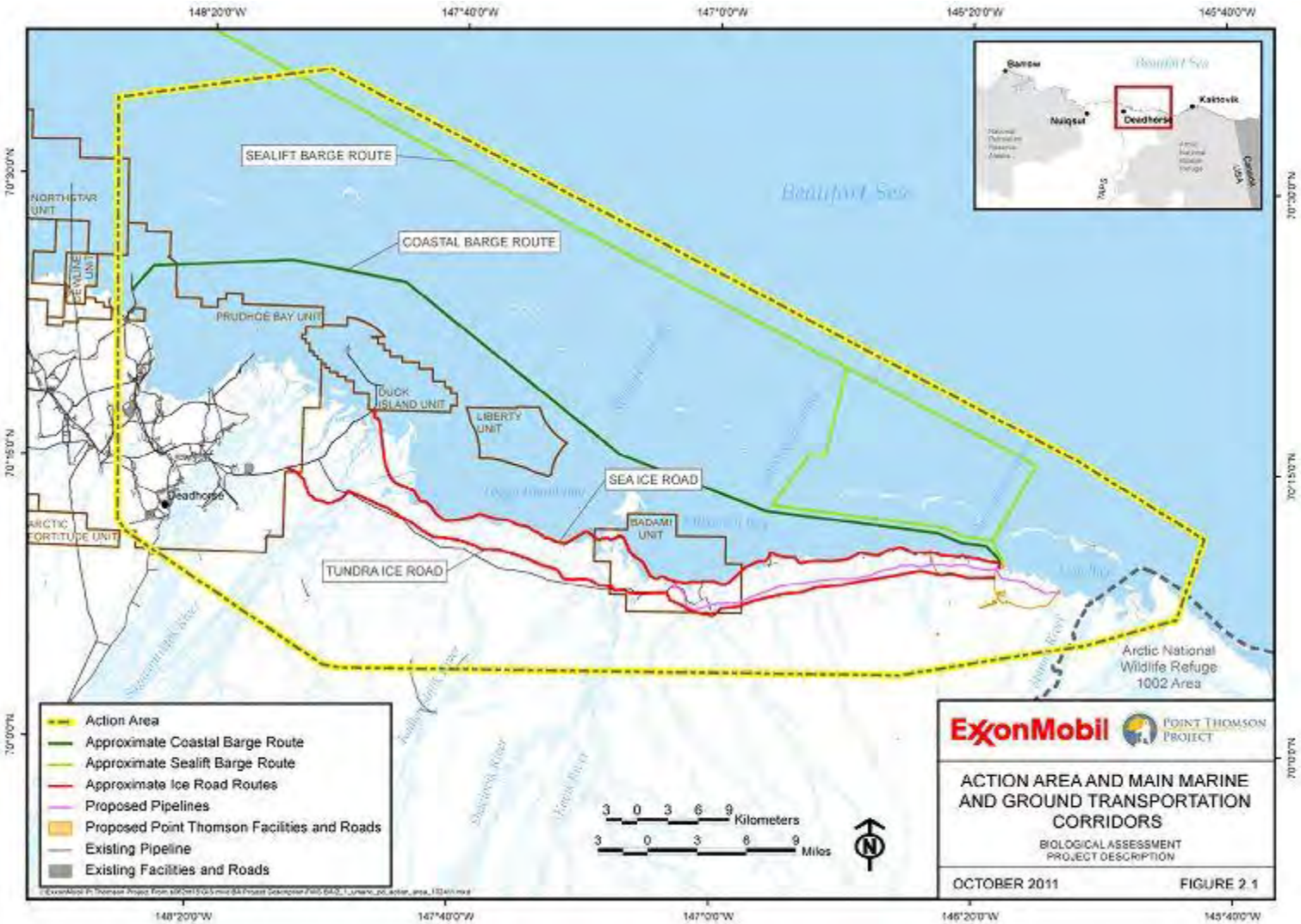

Figure 2. Point Thomson Project Action Area. Figure 2.1 in the BA (Johnson et al. 2011).

At the CPF, the 3-phase stream (gas, water, and hydrocarbon liquids) produced from the wells will be separated with a design capacity of up to 5.7 million standard cubic meters per day of natural gas for recovery of approximately 10,000 barrels per day of hydrocarbon liquids (condensate). Hydrocarbon liquids will be recovered and stabilized for transport through the Export Pipeline. Produced water will be injected into the Class 1 disposal well; produced gas will be conserved and used as a fuel source for the facility or re-injected into the reservoir through the gas injection well. The flare system will be used to burn natural gas when pipelines and facilities are depressurized for maintenance, during a process upset, or in an emergency situation. Flares will be combined into a single flare stack just west of the main Central Pad; flare tips will not exceed 46 m (150 ft.) above ground surface.

Drilling pads
The East and West drilling pads will be located 6.3 and 6.9 km (3.9 and 4.3 mi) from the Central Pad (Figure 1). The East Pad will be approximately 6.31 ha (15.6 acres) in size and has been located to include the existing North Staines River State No.1 gravel pad (1.94 ha [4.8 acres]). The West Pad will be a new gravel pad approximately 7.66 ha (18.9 acres) in size. Drilling will also be conducted at the Central Pad.

Other gravel pads
The project also includes the following additional gravel pads:

- Existing Alaska State C-1 Pad – 1.65 ha (4.1 acres)
- Badami Pads – two small pads associated with the Export Pipeline; 0.17 ha (0.4 acres)
- Gravel Storage Pad – 5.21 ha (12.9 acres)
- Airstrip/Helipad/Navaid Pad – 19 ha (47 acres; discussed further below)

Pipelines
The infield gathering lines and the Export Pipeline will be supported on vertical support members (VSMs) sized to maintain a minimum 2.1 m (7 ft) height between the bottom of the pipe and the tundra surface. Construction will be accomplished during the winter from tundra ice roads and small ice pads located along the ice road for materials storage and staging. The East Pad and West Pad gathering lines are each ~7.7 km (4.8 mi) in length and the Export Pipeline is ~35 km (22 mi). The Export Pipeline and West Pad gathering line will be placed on common VSMs for about 6.2 km (4 mi).

Roads and ground transportation
Ground transportation will use a system of onshore (tundra) and offshore (sea) ice roads during winter construction and a network of gravel infield roads during drilling and operations. Off road tundra travel using approved tundra travel vehicles may also occur during construction and operations.

Infield access roads – Approximately 18.4 km (11.4 mi) of in-field gravel roads will be constructed to connect gravel pads, the airstrip, the gravel mine, and freshwater supply source(s) to the Central Pad (Figure 2.1). Bridges or culverts will be installed at 9 stream

crossings during winter construction with the exception of two culverts designed for fish passage, which will be installed during low flow conditions in late summer.

Ice roads and pads – Ice roads and pads will be constructed during winter as needed to support construction and operations and to connect Point Thomson to the existing gravel road system at Endicott (Figure 2.2). Approximately 72 km (45 mi) of infield and pipeline ice roads and 46.8 ha (116 acres) of ice pads will be used to support construction in the Point Thomson Project Area. The ice road between Point Thomson and Endicott could be constructed on the sea ice adjacent to the Beaufort Sea coast or the tundra (each option 75.6 km [47 mi] long). Ice road size and route will vary depending on seasonal ice conditions, polar bear den locations, and the expected size and weight of the loads, and may be up to 23 m (75 ft) wide for large equipment access and safety. Freshwater for ice roads and pads will be supplied from approved water sources. Ice road activity could begin as early as November each winter, depending on weather conditions and permitting status.

ExxonMobil, working with the USFWS MMM, will survey ice road routes and the proposed pipeline routes using Forward-looking Infrared (FLIR) imaging technology for the purpose of detecting polar bear dens prior to ice road construction. Known locations of radio- or satellite-collared bears, U.S. Geological Survey (USGS) denning habitat maps, and ground-truthing would also be used as necessary to detect dens. Conservation measures to avoid adverse effects to dens would be implemented based on recommendations by USFWS MMM and may include rerouting ice roads to maintain a distance of 1.6 km (1 mile) from known dens.

Airstrip and air transport
A year-round gravel airstrip will be constructed south of the Central Pad, approximately 5 km (3 mi) from the coast (Figure 1). The airstrip's dimensions will be approximately 1,707 m (5,600 ft) long by 61 m (200 ft) wide, with an access road, apron, helipad, and ancillary navigation aid pads (total area of 19 ha [47 ac], Table 2.3). After the gravel runway has been installed, navigational aids, approach lighting, and control buildings will be installed. The area for approach lights will require an ice road to be constructed prior to pile installation. This ice road will also be used for installation of the power cable and lights.

Power cables will be trenched beside the gravel access road to the airport, and then run through a conduit strung along sleepers to service the runway lights. A temporary helipad will be located at the Central Pad and used until the helipad at the gravel airstrip is operational.

Aircraft will be used year-round to transport equipment, materials, supplies, and personnel, and for emergency support. Initially, air traffic will be restricted to helicopters. After the gravel airstrip is constructed and commissioned, fixed-wing aircraft will be the normal method used to transport personnel and emergency medical evacuation. Both helicopter and fixed-wing aircraft will be required to support on-site activities. One to two C-130 flights may be used to transport or materials and equipment

early in the construction period and when materials and equipment cannot otherwise be moved in a timely manner. Fixed-wing cargo and passenger aircraft (e.g., Beechcraft 1900, Casas, Dash 8/SAAB 340, Twin Otter turbo-prop or DC-6) and helicopters will transport normal operational materials, equipment, supplies, and personnel between Deadhorse and Point Thomson. Up to 2–3 flights per day will occur through all phases of construction. Aircraft flying between Deadhorse and the Point Thomson airstrip will maintain a normal operational altitude of 457 m (1,500 ft) and follow a route inland of the coast unless deviations are required for safety or operation requirements.

Marine facilities and transportation

Three marine facilities, the boat launch, sealift bulkhead, and service pier, are associated with the Central Pad. The boat launch will be located in a protected lagoon on the east side of the Central Pad and suitable for launching the smaller emergency response vessels that will be stationed at Point Thomson. The onshore (above mean high water) sealift bulkhead and four offshore mooring dolphins will be constructed adjacent to and offshore of the Central Pad. The service pier for offloading coastal barges will be constructed adjacent to the sealift bulkhead; the docking facility will consist of a 36-m × 9-m (120-ft × 30-ft) pier, extending ~21 m (70 ft) offshore of the Central Pad shoreline, and four mooring dolphins. Screeding or shallow dredging will be used as needed to achieve and maintain the required seabed depth profile for marine facilities, affecting a total area of up to ~14,307 m² (5.5 acres), with disposal of seabed material above mean high water along the nearby shoreline.

Equipment and materials will be transported to Point Thomson via coastal barges and oceangoing (sealift) barges when ice roads are not available and for heavy loads that cannot be transported by aircraft. Coastal barges will be used to transport material, equipment, fuel, and other supplies to Point Thomson and to remove wastes and excess equipment during the open water season. Two to four coastal barges could operate during the barging season (approximately July 15 – August 25). ExxonMobil estimates 80 roundtrips per season would be required during construction and construction demobilization (2013–2016), 20–100 during drilling (2015–2017), and 15 per year during operations (2017 and beyond). Sealift (oceangoing) barges supported by tugboats will transport large, prefabricated facility (production and camp) modules and heavy equipment from locations outside of Alaska using standard marine shipping routes. In the Beaufort Sea these routes generally occur offshore of the barrier islands and pass through either the Challenge or Mary Sachs Entrance to access Point Thomson (Figure 2). Modules will be offloaded via a barge bridge system consisting of three barges temporarily grounded in place during offloading operations. Sealift barges will be docked at Point Thomson approximately 2–4 weeks during July or August. A single delivery of modules is planned by sealift barge flotilla in the 2015 or 2016 summer season.

Gravel mine

The primary gravel source will be a new 20 ha (49.6-acre) mine site located ~3 km (2 mi) south of the Central Pad and just north and east of the airstrip (Figure 1). ExxonMobil estimates 1,720,248 m³ (2,250,000 yd³) of gravel and 802,783 m³ (1,050,000 yd³) of

organic and inorganic overburden will be removed from the mine site over a two-year period.

The rehabilitation plan includes placing back overburden into the excavated area and creating stabilized sidewalls and a mosaic of wet and moist habitat conditions. The excavated area is expected to fill with water over 5–10 years, forming shallow water habitat for birds and deep-water habitat for fish, and may serve as a potential backup water source for the project.

Construction camps and workforce estimate
Construction camps in Deadhorse and at Point Thomson will be used to house workers in the field. There will be a small camp addition to ExxonMobil's existing facility near Deadhorse and the project will also use existing camps in Deadhorse to the extent practicable. The Point Thomson camps will be placed on either single-season ice pads or gravel pads. The number of beds, utilities specifics, and timing of mobilization/ demobilization is expected to peak at 500–600 beds during the construction period. The construction workforce is expected to peak at approximately 500 personnel. Drilling-related employment is estimated to be 150–180 personnel and the operations workforce is estimated to be 80 people.

Communications
Communications services will be supported by tower structures at multiple project locations. The CPF main communication tower will be located on the Central Pad and will be up to 61 m (200 ft) in height. Four lattice towers will be installed at the airstrip for communications, lighting, navigational aids, and speaker mounting and will be 11–17 m (35–55 ft) in height. Permanent towers will be free-standing with no guy wires.

A temporary, 23-m (75-ft) lattice telecommunications tower is planned to be installed in December 2012 at the Central Pad in support of early construction activities and will be removed March–April 2013 after the permanent telecommunications tower is commissioned for service. The temporary tower will be supported by two sets of three guy wires, each equipped with striped, high visibility guards.

Electrical power facilities
Temporary diesel fuel-powered electrical generators will provide power during construction. Once natural gas is available, four gas-fired turbine generators will be used to meet peak power requirements. Power cables from the CPF to East and West Pads will be attached to gathering line VSMs. Power cables from the CPF to the airstrip and the Alaska State C-1 water supply reservoir will be buried in a trench along the roadbed. No overhead power lines are planned.

Operations and maintenance
Operations and maintenance responsibilities would include road and pad maintenance using typical North Slope construction equipment; pipeline monitoring and maintenance; snow removal; installation of snow fences; culvert inspections and debris removal. Fuel and hazardous substances will be stored and handled in accordance with applicable

regulations and permit stipulations. Pipelines may be accessed by using Rolligons (or similar tundra travel equipment) when tundra travel is allowed, from winter ice roads, or by helicopter. Integrity monitoring of pipelines will involve inline inspection tools and visual inspection of the pipelines, including weekly aerial surveillance of the pipelines and surrounding area except when precluded by safety or weather conditions.

Waste management
ExxonMobil will develop a comprehensive Waste Management Plan prior to project implementation. Wastes will be handled in accordance with the Alaska Waste Disposal and Reuse Guide (Red Book), in full compliance with federal, state, and North Slope Borough regulatory requirements.

Most waste fluids from drilling, production, operations and maintenance, and domestic sources will be injected into a Class I disposal well; when the disposal well is unavailable (e.g., during construction) treated wastewater from construction camps will be discharged in compliance with Alaska Pollutant Discharge Elimination System (APDES) and/or National Pollution Discharge Elimination System (NPDES) permits. Some wastes and recyclable materials will be transported to other facilities in Alaska or the Lower-48 states for treatment, disposal, or recycling. All hazardous waste must be sent to authorized off-site disposal facilities. Food wastes and garbage that could attract wildlife to Project facilities will be stored in enclosed, bear-proof containers and incinerated on a daily basis. A wastewater treatment plant will be located on the Central Pad. Sewage sludge will be incinerated on-site or stored in enclosed tanks until being shipped to the North Slope Borough treatment plant in Deadhorse.

Spill prevention and response
Numerous prevention, design, detection, reporting, response, and training measures are described in the Project Plan of Operations Alaska Department of Environmental Conservation approved Oil Discharge Prevention and Contingency Plan (ODPCP), and Environmental Protection Agency required Spill Prevention, Control and Countermeasure (SPCC) Plans and Facility Response Plans for project activities. These are summarized in sections 2.8.1 and 2.8.2 of the project BA (Johnson et al. 2011). The project specific oil spill prevention and preparedness plan is described in more detail in Appendix C of the project BA (Johnson et al. 2011).

Conservation Measures
Measures identified in the project BA (Johnson et al. 2011) to minimize potential adverse impacts of the Point Thomson Project on federally listed and candidate species are listed below.

Listed eiders and yellow-billed loons
- Implementing operational controls to minimize nesting opportunities for predatory birds and denning opportunities for predatory mammals.
    - Blocking off nest sites on structures with fabric/netting or other bird nest deterrent.

    - Using devices to deter the birds when they land in places likely to be nesting sites.
    - Removing nest material before birds lay eggs.

- Deterring foxes from denning by elimination of open containers, culverts, pipes, and other potential shelters at ground level.

- Minimizing attraction of predatory birds and mammals to food and wastes at facilities.

- Designing facilities to minimize potential for bird strikes.
    - Design of facility lighting (e.g., light hoods to reduce outward radiating light) minimizes the potential for disorienting migrating birds.
    - Buildings and stack heights will be as low as practicable.
    - Flares will be free standing (no guy wires).
    - The primary Central Pad communications tower will be free standing (no guy wires; the tower will be lighted according to Federal Aviation Agency requirements).
    - Other communications towers (e.g., at the airstrip or other pads) will avoid the use of guy wires and will be attached to camps or other larger structures when possible.
    - Power lines and fiber-optic cables will either be buried or placed on the pipeline VSMs.

- Reducing disturbance to birds by completing most construction activities during winter. Should site preparation and/or construction activities occur during the summer on the tundra prior to July 31, the areas in the vicinity of these field activities will be searched for nesting birds by qualified biologists prior to the start of work. If an active nest of a migratory bird is found (even after July 31), the appropriate USFWS Field Office will be contacted for instructions on how to avoid or mitigate the potential loss of the active nest.

- Reducing disturbance to birds by controlling vehicle speed and aircraft altitude and flight routes. Vehicle speeds will be limited to 35 mph and aircraft will fly at 457 m (1,500 ft) above ground level and follow a route inland of the coast to avoid the most likely breeding areas except when required for operational or safety reasons.

- Minimizing overall vegetation and habitat loss by use of existing gravel pads, minimal footprint size, and roadless connection to Prudhoe Bay and Alaska Highway system.

- Rehabilitating the gravel mine to enhance habitat for waterfowl.

- Implementing spill prevention and response programs.

Polar bears
Conservation measures for polar bears will be implemented through the Point Thomson Project's Polar Bear and Wildlife Interaction Plan (Appendix A of the Project BA [Johnson et al. 2011]) and through compliance with any Letters of Authorization (LOAs) issued by USFWS for incidental take by harassment of polar bears, under the existing Beaufort Sea Incidental Take Regulations (Beaufort Sea ITRs; 76 FR 47010). Conservation measures identified in the project BA (Johnson et al. 2011) include:

- Conducting FLIR surveys annually for potential maternal polar bear dens along ice road routes.
- Implementing procedures and communications protocols for wildlife (polar bear) encounters.
- Rerouting an ice road if an active polar bear den is discovered within 1.6 km (1 mi) of the ice road route or taking other actions approved by the USFWS.
- Closing an ice road if a maternal polar bear den is observed during the den emergence period (early March to mid-April), in consultation with the USFWS.
- Conducting ice road closure drills to practice the ice road closure protocol.
- Watching for polar bears by using bear monitors [and deterring polar bears from Project activities, as necessary, using USFWS-approved deterrent methods].
- Employing operational controls (e.g., road and air traffic restrictions).
- Ensuring Project workers attend training programs, such as *Arctic Pass*, which cover polar bear and wildlife awareness.
- Communicating with the workforce on polar bear issues through Environmental Bulletins, posters, safety meeting discussions, etc.
- Developing project design and operational features to avoid or discourage wildlife encounters and to protect wildlife and human safety (e.g., building walkways, doors, lighting, snow management, and traffic control).
- Implementing spill prevention and response programs.

3. EFFECT DETERMINATION FOR STELLER'S EIDER

In Alaska, Steller's eiders breed almost exclusively on the ACP, migrating to the breeding grounds in late spring and remaining in the region as late as mid-October. However, nesting is concentrated in tundra wetlands near Barrow, AK and Steller's

eiders occur at very low densities elsewhere on the ACP (Larned et al. 2010). USFWS aerial surveys for breeding eiders conducted annually on the ACP from 1992–2010 reported only 5 observations of Steller's eiders east of the Colville River, with the most recent observation in 1998 (USFWS Alaska Region Migratory Bird Management, unpublished data). Because available data indicate Steller's eiders are unlikely to nest near or migrate through the project area, we conclude that adverse effects to the species are extremely unlikely to occur, and will therefore be discountable, and the Proposed Action is *not likely to adversely affect* Steller's eiders.

4. CONFERENCE REPORT ON YELLOW-BILLED LOON

The yellow-billed loon was listed as a candidate species under the ESA on March 25, 2009 (USFWS 2009) due to its small population size range-wide and concerns about levels of subsistence harvest and other potential impacts to the species. Within Alaska, there are two breeding areas – the North Slope region north of the Brooks Range and the region surrounding Kotzebue Sound in northwest Alaska, primarily the northern Seward Peninsula (Earnst 2004, North 1993). Nest sites are usually located on islands, hummocks, peninsulas, or along low shorelines, within 1 m of water. Young leave the nest soon after hatching and the brood may move from the natal lake to a brood-rearing lake within days of hatch. Both males and females participate in feeding and caring for young (North 1994). Successfully breeding adults feed their young almost entirely from the brood-rearing lake (North 1994). Non-breeding individuals remain in marine waters throughout the year, either in wintering areas or offshore from breeding grounds.

Yellow-billed loon density is very low in the Action Area, with higher concentrations occurring to the west, between the Meade and Colville rivers (Earnst 2004, Larned et al. 2011). Density polygons constructed from data collected during the 2007–2010 waterfowl breeding population surveys of the ACP place yellow-billed loon density in the Action Area in the range of 0–0.030 birds/km^2 (Larned et al. 2011; also see Figure 3.10 of the Point Thomson Project BA [Johnson et al. 2011]). Although yellow-billed loons have been observed in the project area and on the Canning River Delta to the east (see review in Johnson et al. 2011), there is no evidence of nesting in these areas. Yellow-billed loons occur in low numbers in nearshore marine waters (see Figure 3.8 of the project BA [Johnson et al. 2011]).

Adverse effects to yellow-billed loons could occur through direct and indirect long-term habitat loss, collisions with structures, increased predator populations, loss of marine foraging habitat associated with construction of marine facilities at the Central Pad, and direct effects from oil spills. Because loon densities are relatively low in the Action Area, we expect the number of birds that could be potentially affected by these threats to be very low. Some yellow-billed loons that nest in Canada may migrate through the Action Area, and thus are possibly exposed to risk of collision with structures, but to date we have no information to suggest that yellow-billed loons are susceptible to colliding with large industrial structures. Thus, we have no reason to believe that population-level effects of collisions from the Proposed Action are a possibility. We expect potential

adverse effects to yellow-billed loons would be reduced through proposed conservation measures, such as designing facility lighting to reduce collision risk, preventing raven nests on project infrastructure, controlling the availability of anthropogenic food sources, and oil spill prevention and containment measures.

A conference on a candidate species results in a determination of whether the Proposed Action is likely to jeopardize the continued existence of the species. Because yellow-billed loons occupy both terrestrial and marine habitats in the Action Area at very low densities and conservation measures are in place to reduce risks to yellow-billed loons that do occur in the area, we conclude that effects from the Proposed Action would be insignificant and the Proposed Action is *not likely to jeopardize* the continued existence of yellow-billed loons.

5. CONFERENCE REPORT ON PACIFIC WALRUS

The Pacific walrus was listed as a candidate species under the ESA with the publication of the 12-month petition finding on February 10, 2011 (USFWS 2011a). Pacific walruses occur in the Beaufort Sea in extremely low numbers because the continental shelf is relatively narrow along the Beaufort Sea and its deeper, less productive waters provide limited food resources. In years of low ice concentrations in the Chukchi Sea, some animals range east of Point Barrow into the Beaufort Sea (Fay 1982). However, from 1994 to 2004, oil industry monitoring programs recorded only 10 animals in the Beaufort Sea (USFWS 2011a). The USGS also reported that only a few tagged walruses entered the extreme western portion of the Beaufort Sea near Barrow during studies of Pacific walrus movement in 2007–2011 (USGS 2012).

A conference on a candidate species results in a determination of whether the Proposed Action is likely to jeopardize the continued existence of the species. Because walruses are rarely observed in the Beaufort Sea, we conclude that effects from the Proposed Action would be discountable and the Proposed Action is not likely to jeopardize the continued existence of the Pacific walrus.

6. STATUS OF THE SPECIES AND CRITICAL HABITAT

This section presents biological and ecological information relevant to formation of the BO. Appropriate information on the species' life history, habitat and distribution, and other factors necessary for their survival is included for analysis in later sections.

Spectacled Eider

Spectacled eiders (**Error! Reference source not found.**A) were listed as threatened throughout their range on May 10, 1993 (USFWS 1993) based on indications of steep declines in the two Alaska-breeding populations. There are three primary spectacled eider populations, based on breeding distribution; these are the North Slope, Yukon–Kuskokwim Delta (YKD), and northern Russia populations. The YKD population

declined 96% between the early 1970s and 1992 (Stehn et al. 1993). Data from the Prudhoe Bay oil fields (Warnock and Troy 1992) and information from Native elders at Wainwright, AK (R. Suydam, pers. comm. in USFWS 1996) suggested concurrent localized declines on the North Slope, although data for the entire North Slope breeding population were not available. Spectacled eiders molt in several discrete areas (**Error! Reference source not found.**B) during late summer and fall, with birds from the different populations and genders apparently favoring different molting areas (Petersen et al. 1999). All three spectacled eider populations overwinter in openings in pack ice of the central Bering Sea, south and southwest of St. Lawrence Island (Petersen et al. 1999; Figure 3.9B), where they remain until March–April (Lovvorn et al. 2003).

Life history

Breeding – In Alaska, spectacled eiders breed primarily on the North Slope (ACP) and the YKD. On the ACP, spectacled eiders breed north of a line connecting the mouth of the Utukok River to a point on the Shaviovik River about 24 km (15 miles) inland from its mouth. Breeding density varies across the ACP (Figure 4). Although spectacled eiders historically occurred throughout the coastal zone of the YKD, they currently breed primarily in the central coast zone within about 15 km (~9 miles) of the coast from Kigigak Island north to Kokechik Bay (USFWS 1996). However, a number of sightings on the YKD have also occurred both north and south of this area during the breeding season (R. Platte, USFWS, pers. comm. 1997).

Spectacled eiders arrive on the ACP breeding grounds in late May to early June. Numbers of breeding pairs peak in mid-June and decline 4–5 days later when males begin to depart from the breeding grounds (Smith et al. 1994, Anderson and Cooper 1994, Anderson et al. 1995, Bart and Earnst 2005). Mean clutch size reported from studies on the Colville River Delta was 4.3 (Bart and Earnst 2005). Mean spectacled eider clutch size near Barrow was 4.1 ± 0.3 SE in 2009–2010 and 4.7 ± 0.3 in 2011 (Safine 2011, Safine *in prep*). Hatching occurs in mid-July (Bart and Earnst 2005, Safine 2011, Safine *in prep*).

Nest initiation on Kigigak Island on the YKD occurs from mid-May to mid-June (Lake 2007). Incubation lasts approximately 24 days (Dau 1974). Mean spectacled eider clutch size is higher on the YKD compared to the ACP. Mean annual clutch size ranged from 3.8–5.4 in coastal areas of the YKD (1985–2011; Fischer at al. 2011), and 4.0–5.5 on Kigigak Island (1992–2011; Gabrielson and Graff 2011), with clutches of up to eight eggs reported (Lake 2007).

(A)

(B)

Figure 3. (A) Male and female spectacled eiders in breeding plumage. (B) Distribution of spectacled eiders. Molting areas (green) are used July–October. Wintering areas (yellow) are used October –April. The full extent of molting and wintering areas is not yet known and may extend beyond the boundaries shown.

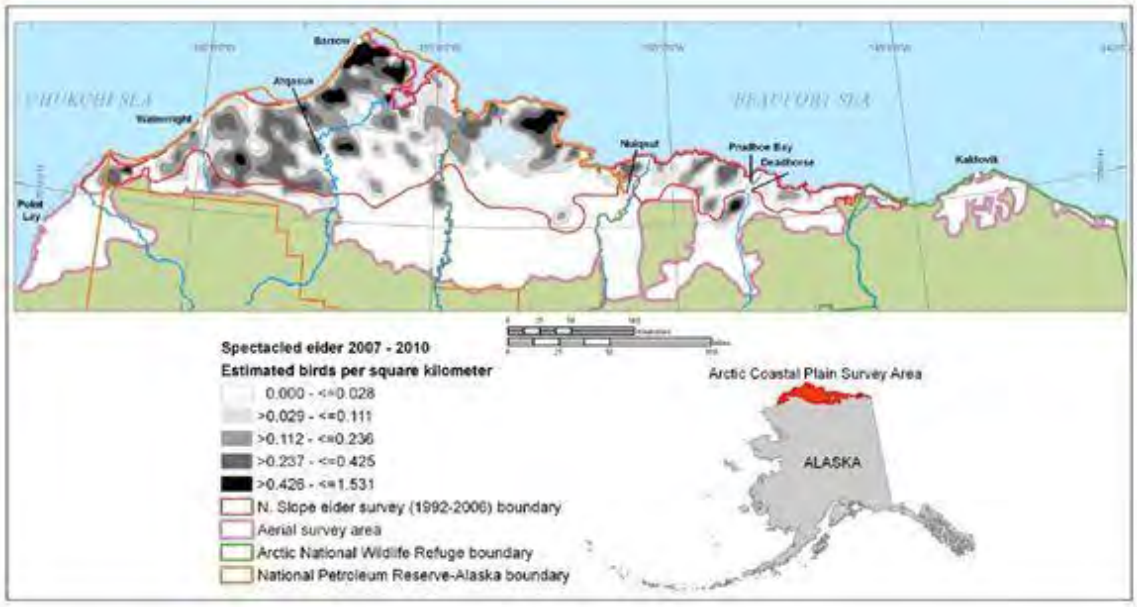

Figure 4. Density distribution of spectacled eiders observed on aerial transects sampling 57,336 km^2 of wetland tundra on the North Slope of Alaska during early to mid-June, 2007–2010 (Larned et al. 2011).

On the breeding grounds, spectacled eiders feed on mollusks, insect larvae (craneflies, caddisflies, and midges), small freshwater crustaceans, and plants and seeds (Kondratev and Zadorina 1992) in shallow freshwater or brackish ponds, or on flooded tundra. Ducklings fledge approximately 50 days after hatch, and then females with broods move directly from freshwater to marine habitat to stage prior to fall migration.

Nest success is highly variable and thought to be influenced by predators, including gulls (*Larus* spp.), jaegers (*Stercorarius* spp.), and red (*Vulpes vulpes*) and arctic (*Alopex lagopus*) foxes. In arctic Russia, apparent nest success was calculated as <2% in 1994 and 27% in 1995; low nest success was attributed to predation (Pearce et al. 1998). On the ACP, apparent nest success was 40% for 15 spectacled eiders nests monitored in the Prudhoe Bay oil fields from 1981 to 1991 (Warnock and Troy 1992) and 35% (range 27–42%) for nests in the Kuparuk oilfields in 1993–1998 (Anderson et al. 1998). On Kigigak Island in the YKD, nest survival probability ranged from 0.06–0.92 from 1992–2007 (Lake 2007); nest success tended to be higher in years with low fox numbers or activity (i.e., no denning) or when foxes were eliminated from the island prior to the nesting season. Estimates of spectacled eider nest success within the YKD coastal zone in 1985–2011 varied from 45% to 93% (Fischer at al. 2011).

Available data indicates egg hatchability is high for spectacled eiders nesting on the ACP, in arctic Russia, and at inland sites on the YKD, but considerably lower in the coastal region of the YKD. Spectacled eider eggs that are addled or do not hatch are very rare in the Prudhoe Bay area (Declan Troy, TERA, pers. comm. 1997), and Esler et al. (1995) found very few addled eggs on the Indigirka River Delta in Arctic Russia. Additionally, from 1969 to 1973 at an inland site on the Yukon Delta National Wildlife Refuge, only 0.8% of spectacled eider eggs were addled or infertile (Dau 1974). In contrast, 24% of

all nests monitored in a coastal region of the YKD during the early to mid-1990s contained inviable eggs and ~10% of eggs in successful nests did not hatch due to either embryonic mortality or infertility (Grand and Flint 1997). This relatively high occurrence of inviable eggs near the coast of the YKD may have been related to exposure to contaminants (Grand and Flint 1997). It is unknown whether hatchability of eggs in this region has improved with decreased use of lead shot in the region and natural attenuation of existing lead pellets (Flint and Schamber 2010) in coastal YKD wetlands.

Recruitment rate (the percentage of young eiders that hatch, fledge, and survive to sexual-maturity) of spectacled eiders is poorly known (USFWS 1999) because there is limited data on juvenile survival. In a coastal region of the YKD, duckling survival to 30 days averaged 34%, with 74% of this mortality occurring in the first 10 days, while survival of adult females during the first 30 days post hatch was 93% (Flint and Grand 1997).

Fall migration and molting – As with many other sea ducks, spectacled eiders spend the 8–10 month non-breeding season at sea, but until recently much about the species' life in the marine environment was unknown. Satellite telemetry and aerial surveys led to the discovery of spectacled eider migrating, molting, and wintering areas. These studies are summarized in Petersen et al. (1995), Larned et al. (1995), and Petersen at al. (1999). Results of recent satellite telemetry research (2008–2011) are consistent with earlier studies (Matt Sexson, USGS, pers. comm.). Phenology of spring migration and breeding, including arrival, nest initiation, hatch, and fledging, is 3–4 weeks earlier in western Alaska (YKD) than northern Alaska (ACP); however, phenology of fall migration is similar between areas. Individuals depart breeding areas July–September, depending on their breeding status and molt in September–October (Matt Sexson, USGS, pers. comm.).

Males generally depart breeding areas on the North Slope (ACP) when females begin incubation in late June (Anderson and Cooper 1994, Bart and Earnst 2005). Use of the Beaufort Sea by departing males is variable. Some appear to move directly to the Chukchi Sea over land, while the majority moved rapidly (average travel of 1.75 days), over near shore waters from breeding grounds to the Chukchi Sea (TERA 2002). Of 14 males with satellite transmitters, only four spent an extended period of time (11–30 days), in the Beaufort Sea (TERA 2002). Preferred areas for males appeared to be near large river deltas such as the Colville River where open water is more prevalent in early summer when much of the Beaufort Sea is still frozen. Most adult males marked in northern and western Alaska in a recent satellite telemetry study migrated to northern Russia to molt (USGS, unpublished data). Results from this study also suggest that male eiders are likely to follow coast lines but also migrate straight across the northern Bering and Chukchi seas en route to northern Russia (Matt Sexson, USGS, pers. comm.).

Females generally depart the breeding grounds later, when much more of the Beaufort Sea is ice-free, allowing for more extensive use of the area. Females spent an average of two weeks in the Beaufort Sea (range 6-30 days) with the western Beaufort Sea the most heavily used (TERA 2002). Females also appeared to migrate through the Beaufort Sea an average of 10 km further offshore than the males (Petersen et al. 1999). The greater

use of the Beaufort Sea and offshore areas by females was attributed to the greater availability of open water when females depart the area (Petersen et al. 1999, TERA 2002). Recent telemetry data indicates that molt migration of failed/non-breeding females from the Colville River Delta through the Beaufort Sea is relatively rapid, 2 weeks, compared to 2–3 months spent in the Chukchi Sea (Matt Sexson, USGS, pers. comm.).

Spectacled eiders use specific molting areas from July to late October/early November. Larned et al. (1995) and Petersen et al. (1999) discussed spectacled eiders' apparently strong preference for specific molting locations, and concluded that all spectacled eiders molt in four discrete areas (Table 3.2). Females generally used molting areas nearest their breeding grounds. All marked females from the YKD molted in nearby Norton Sound, while females from the North Slope molted in Ledyard Bay, along the Russian coast, and near St. Lawrence Island. Males did not show strong molting site fidelity; males from all three breeding areas molted in Ledyard Bay, Mechigmenskiy Bay, and the Indigirka/Kolyma River Delta. Males reached molting areas first, beginning in late June, and remained through mid-October. Non-breeding females, and those that nested but failed, arrived at molting areas in late July, while successfully-breeding females and young of the year reached molting areas in late August through late September and remained through October. Fledged juveniles marked on the Colville River Delta usually staged in the Beaufort Sea near the delta for 2–3 weeks before migrating to the Chukchi Sea.

Avian molt is energetically demanding, especially for species such as spectacled eiders that complete molt in a few weeks. Molting birds must have ample food resources, and the rich benthic community of Ledyard Bay (Feder et al. 1989, 1994a, 1994b) likely provides these for spectacled eiders. Large concentrations of spectacled eiders molt in Ledyard Bay to use this food resource; aerial surveys on 4 days in different years counted 200 to 33,192 molting spectacled eiders in Ledyard Bay (Petersen et al. 1999; Larned et al. 1995).

Table 1. Important molting areas for female and male spectacled eiders from each breeding population.

Population and Sex	Molting Area
Arctic Russia males	Indigirka-Kolyma Delta Area
	Mechigmenskiy Bay
	Ledyard Bay
Arctic Russia females	unknown
North Slope males	Ledyard Bay
	Indigirka-Kolyma Delta Area
	Mechigmenskiy Bay
North Slope females	Ledyard Bay
	Mechigmenskiy Bay
Yukon–Kuskokwim Delta males	Mechigmenskiy Bay Eastern Norton Sound Indigirka-Kolyma Delta Area
Yukon–Kuskokwim Delta females	Eastern Norton Sound

Wintering – Spectacled eiders generally depart all molting sites in late October/early November (Matt Sexson, USGS, pers. comm.), migrating offshore in the Chukchi and Bering Seas to a single wintering area in openings in pack ice of the central Bering Sea south/southwest of St. Lawrence Island (**Error! Reference source not found.**B). In this relatively shallow area, > 300,000 spectacled eiders (Petersen et al. 1999) rest and feed, diving up to 70 m to eat bivalves, other mollusks, and crustaceans (Cottam 1939, Petersen et al. 1998, Lovvorn et al. 2003, Petersen and Douglas 2004).

Spring migration – Recent information about spectacled and other eiders indicates they probably make extensive use of the eastern Chukchi spring lead system between departure from the wintering area in March and April and arrival on the North Slope in mid-May or early June. Limited spring aerial observations in the eastern Chukchi have documented dozens to several hundred common eiders (*Somateria mollissima)* and spectacled eiders in spring leads and several miles offshore in relatively small openings in rotting sea ice (W. Larned, USFWS; J. Lovvorn, University of Wyoming, pers. comm.). Woodby and Divoky (1982) documented large numbers of king eiders (*Somateria spectabilis*) and common eiders using the eastern Chukchi lead system, advancing in pulses during days of favorable following winds, and concluded that an open lead is probably requisite for the spring eider passage in this region. Preliminary results from an ongoing satellite telemetry study conducted by the USGS Alaska Science Center (Figure 5; USGS, unpublished data) suggest that spectacled eiders also use the lead system during spring migration.

Adequate foraging opportunities and nutrition during spring migration are critical to spectacled eider productivity. Like most sea ducks, female spectacled eiders do not feed substantially on the breeding grounds, but produce and incubate their eggs while living primarily off body reserves (Korschgen 1977, Drent and Daan 1980, Parker and Holm 1990). Clutch size, a measure of reproductive potential, was positively correlated with

body condition and reserves obtained prior to arrival at breeding areas (Coulson 1984, Raveling 1979, Parker and Holm 1990). Body reserves must be maintained from winter or acquired during the 4-8 weeks (Lovvorn et al. 2003) of spring staging, and Petersen and Flint (2002) suggest common eider productivity on the western Beaufort Sea coast is influenced by conditions encountered in May to early June during their spring migration through the Chukchi Sea (including Ledyard Bay). Common eider female body mass increased 20% during the 4-6 weeks prior to egg laying (Gorman and Milne 1971, Milne 1976, Korschgen 1977, Parker and Holm 1990). For spectacled eiders, average female body weight in late March in the Bering Sea was 1,550 ± 35 g (n = 12), and slightly (but not significantly) more upon arrival at breeding sites (1,623 ± 46 g, n = 11; Lovvorn et al. 2003), indicating that spectacled eiders must maintain or enhance their physiological condition during spring staging.

Abundance and trends

The most recent rangewide estimate of spectacled eider population size was 369,122 ± 4,932 90% CI, obtained by aerial surveys of the known wintering area in the northern Bering Sea south of St. Lawrence Island, Alaska in late winter 2010 (Larned et al. 2012). Fewer birds were documented in the wintering area in 2009 (305,261 ± 2,977 90% CI); however, satellite telemetry and other survey data indicated the survey may have been timed late relative to the beginning of spring migration (Larned et al. 2012). Comparison of the appropriately timed 2010 estimate (369,122) to the results of similar aerial surveys in 1997 (363,030 eiders) and 1998 (374,792 eiders) suggests a stable global wintering population (Larned et al. 2012).

Population indices for North Slope-breeding spectacled eiders are unavailable prior to 1992. However, Warnock and Troy (1992) documented an 80% decline in spectacled eider abundance from 1981 to 1991 in the Prudhoe Bay area. Since 1992, the Service has conducted annual aerial surveys for breeding spectacled eiders on the ACP. The 2010 population index based on these aerial surveys was 6,286 birds (95% CI, 4,877–7,695; unadjusted for detection probability), which is 4% lower than the 18-year mean (Larned et al. 2011). In 2010, the index growth rate was significantly negative for both the long-term (0.987; 95% CI, 0.974–0.999) and most recent 10 years (0.974; 95% CI, 0.950–0.999; Larned et al. 2011). Stehn et al. (2006) developed a North Slope-breeding population estimate of 12,916 (95% CI, 10,942–14,890) based on the 2002–2006 ACP aerial index for spectacled eiders and relationships between ground and aerial surveys on the YKD. If the same methods are applied to the 2007–2010 ACP aerial index reported in Larned et al. (2011), the resulting North Slope-breeding population estimate is 11,254 (8,338–14,167, 95% CI).

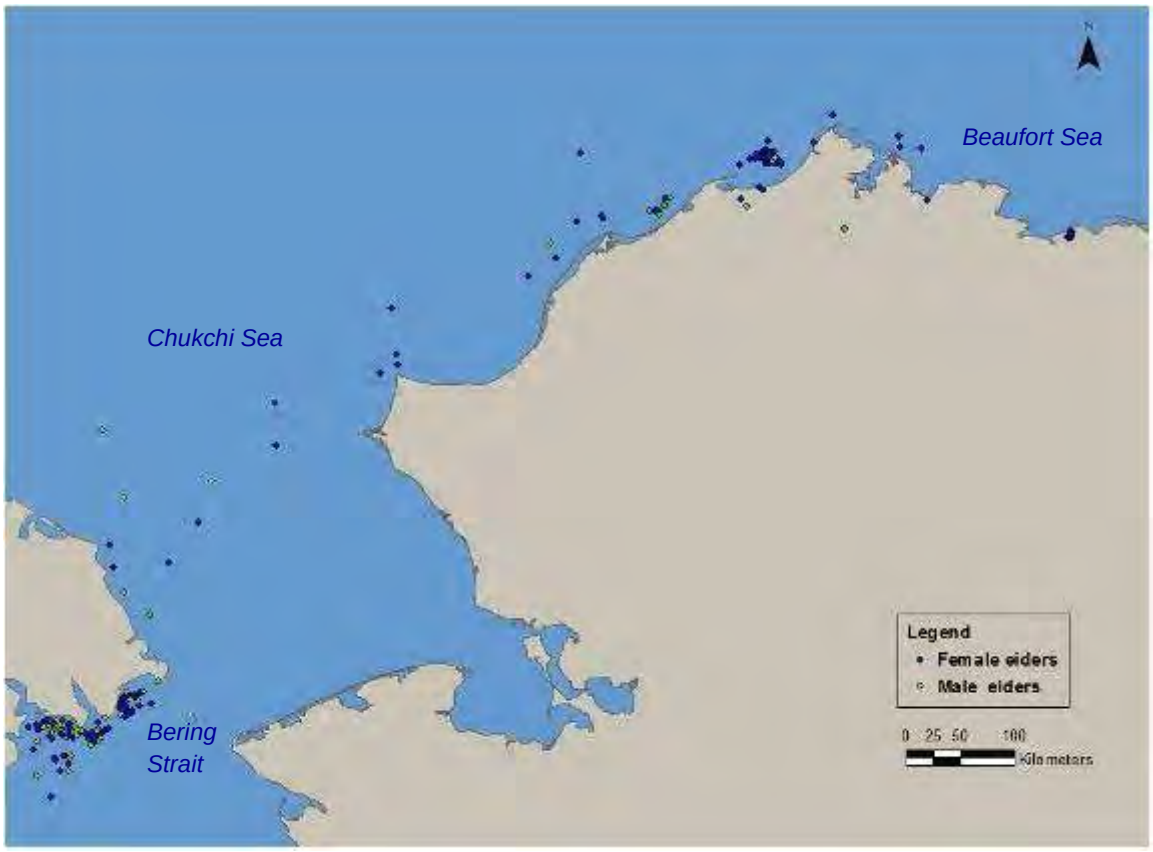

Figure 5. Spectacled eider satellite telemetry locations for 12 female and 7 male spectacled eiders in the eastern Chukchi Sea from 1 April – 15 June 2010 and 1 April – 15 June 2011. Additional locations from the northern coast of Russia are not shown. Eiders were tagged on the North Slope during the 2009 and 2010 breeding seasons. Data provided by Matt Sexson, USGS Alaska Science Center (USGS, unpublished).

The YKD spectacled eider population was thought to be about 4% of historical levels in 1992 (Stehn et al. 1993). Evidence of the dramatic decline in spectacled eider nesting on the YKD was corroborated by Ely et al. (1994). They documented a 79% decline in eider nesting between 1969 and 1992 for areas near the Kashunuk River. Aerial and ground survey data indicated that spectacled eiders were undergoing a decline of 9–14% per year from 1985–1992 (Stehn et al. 1993). Further, from the early 1970s to the early 1990s, the number of pairs on the YKD declined from 48,000 to 2,000, apparently stabilizing at that low level (Stehn et al. 1993). Before 1972, an estimated 47,700–70,000 pairs of spectacled eiders nested on the YKD in average to good years (Dau and Kistchinski 1977).

Fischer et al. (2011) used combined annual ground-based and aerial survey data to estimate the number of nests and eggs of spectacled eiders on the coastal area of the YKD in 2011 and evaluate long-term trends in the YKD breeding population from 1985 to 2011. The estimated total number of nests reflects the minimum number of breeding pairs in the population in a given year and does not include potential breeders that did not establish nests that year or nests that were destroyed or abandoned at an early stage

(Fischer et al. 2011). The total number of nests in 2011 was estimated at 3,608 (SE 448) spectacled eiders nests on the YKD, the second lowest estimate over the past 10 years. The average population growth rate based on these surveys was 1.049 (90% CI = 0.994–1.105) in 2002–2011 and 1.003 (90% CI = 0.991–1.015) in 1985–2011 (Fischer et al. 2011). Log-linear regression based solely on the long-term YKD aerial survey data indicate positive population growth rates of 1.073 (90% CI = 1.046–1.100) in 2001–2010 and 1.070 (90% CI = 1.058–1.081) in 1988–2010 (Platte and Stehn 2011). The 2010 population index based on these aerial surveys was 5362 birds (SE 527). Platte and Stehn (2011) estimated the YKD spectacled eider breeding population to be 12,601 (95% CI[2] = 10,173–15,028) in 2010.

Threats to spectacled eiders

Environmental contaminants. The deposition of lead shot in tundra or nearshore habitats used for foraging is considered a threat to spectacled eiders. Lead poisoning of spectacled eiders has been documented on the YKD (Franson et al. 1995, Grand et al. 1998) and Steller's eiders on the ACP (Trust et al. 1997; USFWS, unpublished data). Female Steller's eiders nesting at Barrow in 1999 had blood lead concentrations that reflected exposure to lead (>0.2 ppm lead; A. Matz, USFWS, unpublished data), and six of the seven tested had blood lead concentrations that indicated poisoning (>0.5 ppm lead; Franson and Pain 2011). Additional lead isotope tests confirmed the lead in the Steller's eider blood was of lead shot origin, rather than natural sources such as sediments (A. Matz, USFWS, unpublished data). Use of lead shot for hunting waterfowl is prohibited statewide, and for hunting all birds on the North Slope, and the Service reports good compliance in most areas with the lead shot prohibitions. Further, we expect the availability of lead shot in spectacled eider foraging habitat near within the Action Area to be substantially lower than in areas on the North Slope, that are used more frequently for waterfowl hunting.

Other contaminants, including petroleum hydrocarbons from local sources and globally distributed heavy metals, may also affect spectacled eiders. For example, Trust et al. (2000) reported high concentrations of metals and subtle biochemical changes in spectacled eiders wintering near St. Lawrence Island.

Climate change. Arctic landscapes are dominated by lakes and ponds (Quinlan et al. 2005), such as those used by spectacled eiders for feeding and brood rearing on Alaska's North Slope. Arctic regions are thought to be especially sensitive to the effects of climate change (Quinlan et al. 2005, Schindler and Smol 2006, and Smol et al. 2005). Productivity of some lakes and ponds appears to have increased as a result of nutrient inputs from thawing soil and increased annual degree days (Quinlan et al. 2005, Smol et al. 2005, Hinzman et al. 2005, and Chapin et al. 1995). Changes in water chemistry and temperature regimes have also altered the algal and invertebrate communities that form the basis of the food web in these systems (Smol et al. 2005, Quinlan et al. 2005) and

[2] Confidence intervals calculated based on information provided in Platte and Stehn (2011).

may have resulted in mismatched timing between migration and the availability of food in Arctic ponds (Callaghan et al. 2004).

Increased predator populations. There is some evidence that predator and scavenger populations have increased on the ACP near villages and industrial infrastructure (Eberhardt et al. 1983, Day 1998, Powell and Bakensto 2009). Researchers have proposed that reduced fox trapping, anthropogenic food sources in villages and oil fields, and nesting/denning sites on human-built structures have resulted in increased fox, gull, and raven numbers (e.g., Day 1998). Although we expect corresponding increases in predation rates have also occurred, studies to substantiate the influence of increased predation on spectacled eiders are lacking. However, studies of Steller's eiders near Barrow have suggested a relationship between predation rates and breeding success (Quakenbush et al. 1995, Obritschkewitsch et al. 2001, Rojek 2008, Safine 2011).

Spectacled eider recovery criteria

The Spectacled Eider Recovery Plan (USFWS 1996) presents research and management priorities with the objective of recovery and delisting so that protection under the ESA is no longer required. Although the cause or causes of the spectacled eider population decline is not known, factors that affect adult survival are likely to be the most influential on population growth rate. Factors that may have affected the species' status include lead poisoning from ingested spent shotgun pellets, which may have contributed to the rapid decline observed in the YKD (Franson et al. 1995, Grand et al. 1998), and other factors such as habitat loss, increased nest predation, over harvest, and disturbance and collisions caused by human infrastructure. Under the Recovery Plan, the species will be considered recovered when each of the three recognized populations (YKD, North Slope of Alaska, and Arctic Russia): 1) is stable or increasing over 10 or more years and the minimum estimated population size is at least 6,000 breeding pairs, or 2) number at least 10,000 breeding pairs over 3 or more years, or 3) number at least 25,000 breeding pairs in one year. Spectacled eiders do not currently meet these recovery criteria.

Polar Bear

The Service listed the polar bear (*Ursus maritimus*) as threatened throughout its range on May 15, 2008 (USFWS 2008a). Polar bears are widely distributed throughout the Arctic where the sea is ice-covered for large portions of the year. Sea ice provides a platform for hunting and feeding, for seeking mates and breeding, for denning, for resting, and for long-distance movement. Polar bears primarily hunt ringed seals, which also depend on sea ice for their survival, but also consume other marine mammals (USFWS 2008a). Because the principal habitat of polar bears is sea ice, it is considered a marine mammal, and is therefore protected under the Marine Mammal Protection Act of 1972 (MMPA).

Distribution and status

Polar bears are distributed throughout regions of arctic and subarctic waters where sea is ice covered for large portions of the year. The total number of polar bears worldwide is estimated to be 20,000–25,000 bears (Schliebe et al. 2006). Although movements of individual polar bears overlap extensively, telemetry studies have demonstrated spatial segregation among groups or stocks of polar bear in different regions of their circumpolar

range (Schweinsburg and Lee 1982, Amstrup 2000, Garner et al. 1990 and 1994, Messier et al. 1992, Amstrup and Gardner 1994, Ferguson et al. 1999, Carmack and Chapman 2003). Patterns in spatial segregation suggested by telemetry data, along with information from surveys, marking studies, and traditional knowledge, resulted in recognition of 19 partially discrete polar bear groups by the International Union for the Conservation of Nature (IUCN) Polar Bear Specialist Group (PBSG). These 19 groups have been described as management subpopulations (or stocks) in the scientific literature and regulatory actions (IUCN 2006).

Two stocks of polar bears occur in Alaska: the Chukchi/Bering seas (CBS) and Southern Beaufort Sea (SBS) stocks (Figure 6). Unlike polar bears in eastern Canada, the Alaskan stocks do not currently spend extended periods of time on land (Garner et al. 1990), with the exception of females that den on land rather than pack ice.

Movement patterns

Telemetry studies indicate polar bear movements are not random, nor do they passively follow ocean currents on the ice as previously thought (Mauritzen et al. 2003) Movement data come almost exclusively from adult female polar bears because male anatomy (their neck is larger than their skull) will not accommodate radio collars. The movements of seven male polar bears surgically implanted with transmitters in 1996 and 1997 were compared to movements of 104 females between 1985 and 1995 (Amstrup et al. 2001). The data indicated males and females had similar activity areas on a monthly basis, but males traveled farther each month (Amstrup et al. 2000). Activity areas have not been determined for many populations, and available information reflects movement data collected prior to recent changes wrought by retreating ice conditions. In the Beaufort Sea, annual activity areas for individual monitored female bears averaged 149,000 km^2 (range 13,000–597,000 km^2, Amstrup et al. 2000). Total annual movements by female bears in the Beaufort Sea averaged 3,415 km and ranged up to 6,200 km, with a movement rate of > 4 km/ hr sometimes sustained for long periods, and movements of > 50 km/day observed (Amstrup et al. 2000). Mean activity area in the Chukchi Sea, which is characterized by highly dynamic ice conditions, was 244,463 km^2 (Garner et al. 1990). Average annual distance moved by CBS female bears was 5,542 km.

Radio-collared females indicate some individuals occupy home ranges (multi-annual activity areas), which they seldom leave (Amstrup 2003). The size of a polar bear's home range is determined, in part, by the annual pattern of freeze-up and break-up of sea ice, and therefore by the distance a bear must travel to access prey (Stirling 1988, Durner et al. 2004). A bear with consistent access to ice, leads, and seals may have a relatively small home range, while bears in areas such as the Barents, Greenland, Chukchi, Bering or Baffin seas may have to move many hundreds of kilometers each year to remain in contact with sea ice from which to hunt (Born et al. 1997, Mauritzen et al. 2001, Ferguson et al. 2001, Amstrup 2003, Wiig et al. 2003).

The SBS population occurs between Icy Cape, Alaska on the western boundary and Pearce Point, NWT (Amstrup et al. 1986, Amstrup and DeMaster 1988, Stirling et al. 1988). It is thought that nearly all bears in the central coastal region of the Beaufort Sea

are from the SBS population, and that proportional representation of SBS bears decreases to both the west and east. For example, only 50% of polar bears occurring in Barrow, Alaska and Tuktoyaktuk, NWT are SBS bears, with the remainder being from the CBS and Northern Beaufort Sea populations.

Feeding

Polar bears derive essentially all their sustenance from marine mammal prey and have evolved a strategy that utilizes the high fat content of marine mammals (Best 1985, Amstrup et al. 2007). Over half the caloric content of a seal carcass occurs in the layer of fat between the skin and underlying muscle (Stirling and McEwan 1975) and polar bears quickly remove the fat layer from beneath the skin after they catch a seal. High fat intake from specializing on marine mammal prey allows polar bears to thrive in the harsh Arctic environment (Stirling and Derocher 1990, Amstrup 2003).

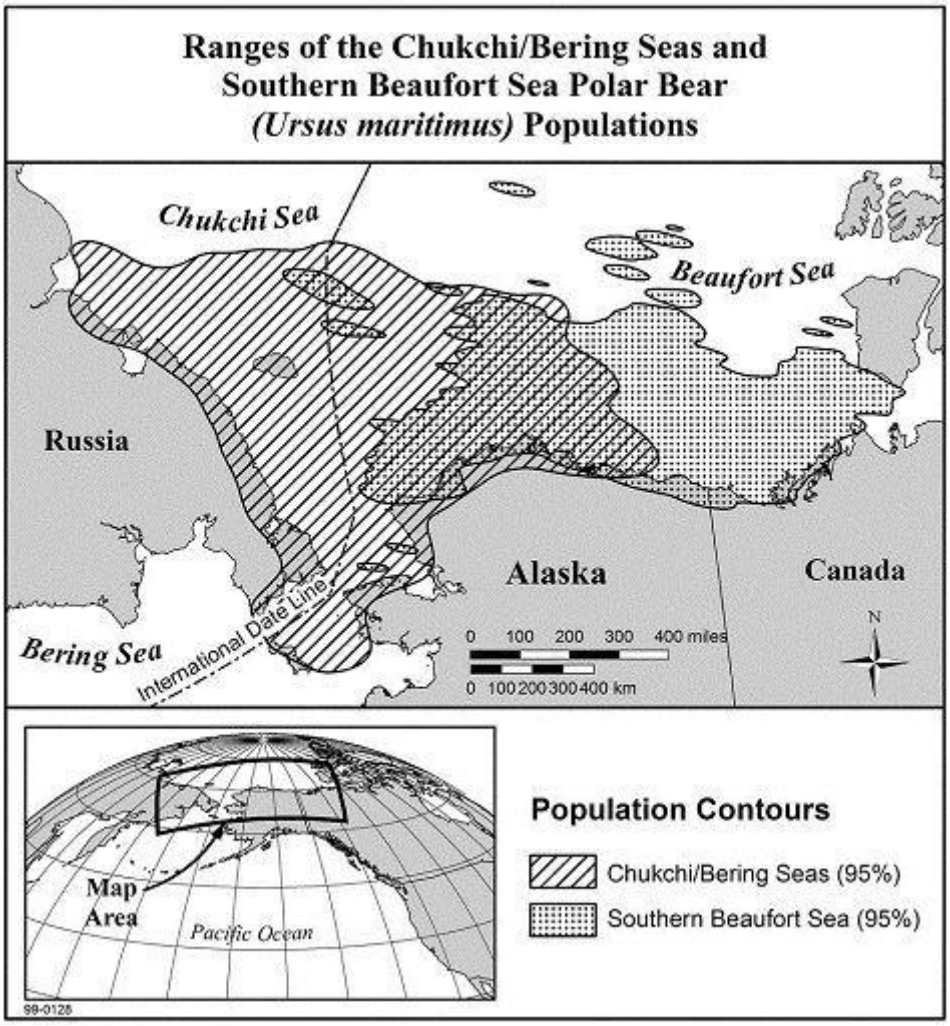

Figure 6. Ranges of polar bear stocks in Alaska (USFWS 2010a)

Over much of their range, polar bears are dependent on one species of seal, the ringed seal (*Phoca hispida*) (Smith and Stirling 1975, Smith 1980). The relationship between ringed seals and polar bears is so close that the abundance of ringed seals in some areas

appears to regulate the density of polar bears, while polar bear predation in turn regulates density and reproductive success of ringed seals (Hammill and Smith 1991, Stirling and Øritsland 1995). Polar bears occasionally catch belugas (*Delphinapterus leucas*), narwhals (*Monodon monoceros*), walrus (*Odobenus rosmarus divirgens*), and harbor seals (*Phoca vitulina*) (Smith 1985, Calvert and Stirling 1990, Smith and Sjare 1990, Stirling and Øritsland 1995, Derocher et al. 2002). Where common, bearded seals (*Erignathus barbatus*) can be a large part of polar bear diets, and are probably the second most common prey item (Derocher et al. 2002), and walrus can be seasonally important in some parts of the polar bear's range (Ovsyanikov 1996).

Polar bears rarely catch seals on land or in open water (Furnell and Oolooyuk 1980); rather they catch seals and other marine mammals at the air-ice-water interface, where aquatic mammals come to breathe (Amstrup et al. 2007). Although there are local exceptions (e.g., Bentzen et al. 2007, Schliebe et al. 2008), it appears that polar bears gain little overall benefit from alternate foods (Amstrup et al. 2007). Therefore, maintenance of polar bear populations is dependent upon marine prey, largely seals, and polar bears are tied to the surface of the ice for effective access to that prey (Amstrup et al. 2007).

While the main food source of polar bears is ice seals, bowhead whale carcasses have been available to polar bears as a food source on the North Slope since the early 1970s (Koski et al. 2005) and therefore may affect their distribution locally. As many as 65 polar bears have been observed feeding at a single bowhead whale carcass (Miller et al. 2006). Barter Island (near Kaktovik) has had the highest recorded concentration of polar bears on shore (17.0 $\pm$ 6.0 polar bears/100 km) followed by Barrow (2.2 $\pm$ 1.8) and Cross Island (2.0 $\pm$ 1.8). The high number of bears on/near Barter Island is thought to be due to the proximity to ice edge and higher ringed seal density at Barter Island (Schliebe et al. 2008), rather than the amount of whale harvest as the Kaktovik harvest is lower than that at Barrow or Cross Island.

Stable isotope analysis of polar bears in 2003 suggested that bowhead whale carcasses may have contributed 11-26% (95% CI) of the late winter (i.e., February through March) diet of the sampled population (Bentzen et al. 2007). In the winter of 2003-2004, the proportion was between 0-41% (Bentzen et al. 2007). A wide range of isotope values further suggested that consumption of bowhead whales varied widely among individual bears (Bentzen et al. 2007). Because most bears feed on bowhead whale during the fall harvest and sampling from this study represented only the late winter diet, consumption may differ from what was determined in this study.

Reproduction

Polar bears have an intrinsically low reproductive rate characterized by late age of sexual maturity, small litter sizes, and extended maternal investment in raising young. Female polar bears enter a prolonged estrus between March and June, when breeding occurs. Ovulation is thought to be induced by mating (Wimsatt 1963, Ramsay and Dunbrack 1986, Derocher and Stirling 1992). Implantation is delayed until autumn, and gestation is 195–265 days (Uspenski 1977), with active development of the fetus suspended for most of that time. The timing of implantation, and hence birth, is likely dependent upon body

condition of the female, which in turn is dependent upon a variety of environmental factors (Schliebe et al. 2006).

Throughout their range, most pregnant female polar bears excavate dens in snow located on land during September–November after drifts large enough to excavate a snow cave have formed (Harington 1968, Lentfer and Hensel 1980, Ramsay and Stirling 1990, Amstrup and Gardner 1994). In the southern Beaufort Sea a portion of the population dens in snow caves located on pack and shorefast ice. Successful denning by polar bears requires an accumulation of sufficient snow combined with winds to cause snow accumulation leeward of topographic features that create denning habitat (Harington 1968). The common characteristic of all denning habitat is topographic features that catch snow in autumn and early winter (Durner et al. 2003). Polar bear denning habitat in Alaska includes areas of low-relief topography characterized by tundra with riverine banks within approximately 50 km of the coast (Amstrup 1993, Amstrup and Gardner 1994, Durner et al. 2001, 2003), and offshore pack ice pressure ridge habitat. The northern Alaskan coast gets minimal snow fall, but the landscape is flat and snow is blown continuously throughout the winter, creating drifts in areas of relief.

Fidelity to denning habitat was investigated by Amstrup and Gardner (1994), who located 27 females at up to four successive maternity dens. Bears that denned once on pack ice were more likely to den on pack ice than on land in subsequent years. Similarly, bears were faithful to general geographic areas – those that denned once in the eastern half of the Alaska coast were more likely to den there than to the west in subsequent years. Annual variations in weather, ice conditions, prey availability, and the long-distance movements of polar bears (Amstrup et al. 1986, Garner et al. 1990) make recurrence of exact denning locations unlikely, however.

Satellite telemetry studies determined mean dates of den entry in the Beaufort Sea were 11 and 22 November for land (n = 20) and pack ice (n = 16), respectively; however, many pregnant females did not enter dens until late November or early December (Amstrup and Gardner 1994). Female bears foraged until den entry. Mean date of emergence was 26 March for packice dens (n = 10) and 5 April for land dens (n = 18). Messier et al. (1994) reported mean date of den entry and exit varied among years depending upon sea ice, snow and weather conditions. For bears denning on sea ice or moving from sea ice to land denning habitat, time of sea ice consolidation can alter the onset of denning. Seaice dens must be in ice stable enough to stay intact for up to 164 days while possibly moving hundreds of kilometers by currents (Amstrup 2003, Wiig 1998).

Data suggests that an increasing number of SBS females are denning on land. Sixty percent of radio-collared females denned on land from 1996–2006, compared to forty percent in the previous 15 years (Fishbach et al. 2007). The geographic distribution of terrestrial dens also appears to have shifted to the west (USFWS 2006).

Insufficient data exist to accurately quantify polar bear denning locations along the Alaskan Chukchi Sea coast; however, dens in the area are less concentrated than for other

areas in the Arctic. The majority of denning of Chukchi Sea polar bears occurs on Wrangel Island, Herald Island, and other locations on the northern Chukotka coast of Russia.

Polar bears give birth in the dens during mid-winter (Harington 1968, Ramsay and Dunbrack 1986). Survival and growth of the cubs depends on the warmth and stable environment within the maternal den (Blix and Lentfer 1979). Family groups emerge from dens in March and April when cubs are about three months old and able to survive outside weather conditions (Blix and Lentfer 1979, Amstrup 1995).

Newborn polar bears are very small, weighing approximately 0.6 kg (Blix and Lentfer 1979), and nurse from their hibernating mothers. Cubs grow quickly and may weigh 10-12 kg by the time they emerge from the den about three months later. Young bears stay with their mothers until weaned, which occurs most commonly in early spring when the cubs are 2.3 years of age. Female polar bears are available to breed again after cubs are weaned. Therefore, in most areas, the minimum successful reproductive interval for polar bears is 3 years (Schliebe et al. 2006).

Age of maturation of mammals is often associated with a threshold body mass (Sadleir 1969), and in polar bear populations it appears to be largely dependent on numbers and productivity of ringed seals. In the Beaufort Sea, ringed seal densities are lower in some areas of the Canadian High Arctic and Hudson Bay. As a possible consequence, female polar bears in the Beaufort Sea usually do not breed for the first time until they are 5 years of age (Lentfer and Hensel 1980), giving birth for the first time at 6 years of age.

Litter size and reproduction rates vary by geographic area and may change in response to hunting pressure, environmental factors, and other population perturbations. Litters of two cubs are common (Schliebe et al. 2006), with litters of three cubs occurring sporadically across the Arctic and most commonly reported in the Hudson Bay region (Stirling et al. 1977, Ramsay and Stirling 1988, Derocher and Stirling 1992). Average litter size across the species' range varied from 1.4 to 1.8 cubs (Schliebe et al. 2006), and several studies have linked reproduction to availability of seal prey, especially in the northern portion of their range. Body weights of mother polar bears and their cubs decreased markedly in the mid-1970s in the Beaufort Sea following a decline in ringed and bearded seal pup production (Stirling et al. 1976, 1977, Kingsley 1979, DeMaster et al. 1980, Stirling et al. 1982, Amstrup et al. 1986). Declines in reproductive parameters varied by region and year with ice conditions and the corresponding reduction in numbers and productivity of seals (Amstrup et al. 1986). In the Beaufort Sea, female polar bears produce a litter of cubs at an annual rate of 0.25 litters per adult female (Amstrup 1995).

Polar bear reproduction lends itself to early termination without extensive energetic investment by the female (Ramsay and Dunbrack 1986, Derocher and Stirling 1992). Female polar bears may defer reproduction in favor of survival when foraging conditions are difficult (Derocher et al. 1992). Repeated deferral of reproduction could cause a decline in populations with an intrinsically low rate of growth (Schliebe et al. 2006).

Life span and survivorship
Polar bears are long-lived animals; the oldest known female polar bear in the wild was 32 years and the oldest known male was 28, although few bears in the wild live beyond 20 years (Stirling 1990). Taylor and colleagues (unpublished data) described survival rates that generally increased by age class up to approximately 20 years of age (cubs-of-the-year, 35–75%; subadults 1–4 years, 63–98%; adults 5–20 years, 95–99%; and adults > 20 years 72–99%).

Survival of cubs is dependent upon their weight when they exit maternity dens (Derocher and Stirling 1992), and most cub mortality occurred early in the period immediately following emergence from the den (Amstrup and Durner 1995, Derocher and Stirling 1996), with early mortality generally associated with starvation (Derocher and Stirling 1996). Survival of cubs to the weaning stage (generally 27–28 months) is estimated to range from 15% to 56% of births (Schliebe et al. 2006). Subadult survival rates are poorly understood because telemetry collars cannot be used on rapidly growing individuals. Population age structure indicates subadults 2–5 years survive at lower rates than adults (Amstrup 1995), probably because their hunting and survival skills are not fully developed (Stirling and Latour 1978).

Eberhardt (1985) hypothesized adult survival rates must be in the upper 90% range to sustain polar bear populations. Studies using telemetry monitoring of individual animals (Amstrup and Durner 1995) estimated adult female survival in prime age groups may exceed 96%, and survival estimates are a reflection of the characteristics and qualities of an ecosystem to maintain the health of individual bears (Schliebe et al. 2006).

Abundance and trends – Alaska stocks
A reliable population estimate for the CBS stock currently does not exist (USFWS 2010b); however, the best available information at this time suggests a minimum population estimate of 2,000 (USFWS 2010b), based on extrapolation from multiple years of denning data for Wrangel Island in Russia and an assumed population denning rate (IUCN 2006 in USFWS 2010b). Reliable estimates of population size based upon mark and recapture studies are not available for this region. The combined Alaska–Chukotka polar bear harvest is currently believed to exceed sustainable levels, and the status of the CBS polar bear population is considered uncertain or declining (Schliebe et al. 2006).

Estimates of the population size of the SBS were 1,778 from 1972 to 1983 (Amstrup et al. 1986), 1,480 in 1992 (Amstrup 1995), and 2,272 in 2001 (Amstrup, USGS unpublished data). Most recently, Regehr et al. (2006) estimated the SBS to be 1,526 (95% CI = 1,211–1,841), the most current and valid estimate of the SBS population (USFWS 2010c). Declining survival, recruitment, and body size (Regehr et al. 2006, 2007), low growth rates during years of reduced summer and fall sea ice (2004 and 2005), and an overall declining growth rate of 3% per year from 2001–2005 (Hunter et al. 2007), indicate the SBS stock population is declining (USFWS 2010c).

Declines in sea ice have occurred in optimal polar bear habitat in the southern Beaufort and Chukchi seas between 1985 to 1995 and 1996 to 2006, and the greatest declines in 21st century optimal polar bear habitat are predicted to occur in these areas (Durner et al. 2009). These stocks are vulnerable to large-scale dramatic seasonal fluctuations in ice movements which result in decreased abundance and access to prey, and increased energetic costs of hunting. The CBS and the SBS stocks are currently experiencing the initial effects of changes in sea ice conditions (Rode et al. 2010, Regehr et al. 2010, and Hunter et al. 2007). Regehr et al. (2010) found that the vital rates of polar bear survival, breeding rates, and cub survival declined with an increasing number of ice-free days/year over the continental shelf, and suggested that declining sea ice affects these vital rates via increased nutritional stress.

Threats to the polar bear

Because the polar bear depends on sea ice for its survival, loss of sea ice due to climate change is its largest threat worldwide, although polar bear subpopulations face different combinations of human-induced threats (Obbard et al. 2010). The largest human-caused loss of polar bears is from subsistence hunting of the species, but for most subpopulations where subsistence hunting of polar bears occurs, it is a regulated and/or monitored activity (Obbard et al. 2010). Other threats include accumulation of persistent organic pollutants in polar bear tissue, tourism, human-bear conflict, and increased development in the Arctic (Obbard et al. 2010). Because uncertainty exists regarding the numbers of bears in some stocks and how human activities interact to ultimately affect the worldwide polar bear population, conservation and management of polar bears at the worldwide population level is challenging.

Polar Bear Critical Habitat

The Service designated polar bear critical habitat on December 7, 2010 (USFWS 2010a). The Primary Constituent Elements (PCEs) of critical habitat for the polar bear are:

1) Sea ice habitat used for feeding, breeding, denning, and movement, which is further defined as sea ice over waters 300 m (984.2 ft) or less in depth that occurs over the continental shelf with adequate prey resources (primarily ringed and bearded seals) to support polar bears.
2) Terrestrial denning habitat, which includes topographic features, such as coastal bluffs and river banks, with suitable macrohabitat characteristics. Suitable macrohabitat characteristics are:
    a) Steep, stable slopes (range 15.5–50.0°), with heights ranging from 1.3 to 34 m (4.3 to 111.6 ft), and with water or relatively level ground below the slope and relatively flat terrain above the slope;
    b) Unobstructed, undisturbed access between den sites and the coast;
    c) Sea ice in proximity to terrestrial denning habitat prior to the onset of denning during the fall to provide access to terrestrial den sites; and
    d) The absence of disturbance from humans and human activities that might attract other polar bears.

3) Barrier island habitat used for denning, refuge from human disturbance, and movements along the coast to access maternal den and optimal feeding habitat, including all barrier islands along the Alaska coast and their associated spits, within the range of the polar bear in the United States, and the water, ice, and terrestrial habitat within 1.6 km (1 mi) of these islands (no-disturbance zone).

The Service designated three polar bear critical habitat units, which correspond to each of the three PCEs described above. The Sea Ice Unit covers approximately 179,508 mi^2 of primarily marine habitat extending from the mean high tide line of the Alaska coast seaward to the 300 m depth contour, and spans west to the international date line, north to the Exclusive Economic Zone, east to the US–Canada border, and south to the known distribution of the CBS polar bear population. Sea ice is used by polar bears for the majority of their life cycle for activities such as hunting seals, breeding, denning, and traveling (USFWS 2010a).

The Terrestrial Denning Unit covers approximately 5,657 mi^2 of land along the northern coast of Alaska from near Point Barrow east to the Canadian border. It encompasses approximately 95% of the known historical terrestrial den sites from the Southern Beaufort Sea (SBS) population (Durner et al. 2009). The inland extent of denning distinctly varies between two longitudinal zones, with 95% of the dens between the Kavik River and the Canadian border occurring within 20 miles of the mainland coast, and 95% of the dens between the Kavik River and Barrow occurring within 5 miles of the mainland coast.

The Barrier Island Unit covers approximately 4,083 mi^2 of barrier islands and the associated complex of spits, water, ice, and terrestrial habitats within one mile of barrier islands. There is significant overlap between this unit and both the terrestrial denning and sea ice units. The Barrier Island Unit follows a similar coastal extent as the Sea Ice Unit, from near Hooper's Bay in southwestern Alaska to near the Canadian Border.

Critical habitat does not include manmade structures (e.g., houses, gravel roads, generator plants, sewage treatment plants, hotels, docks, seawalls, pipelines) and the land on which they are located existing within the boundaries of designated critical habitat on the effective date of this rule.

Sea ice, including ice designated as critical habitat, is rapidly diminishing. Terrestrial denning locations in Alaska do not appear to be a limiting factor. However, rain-on-snow events may decrease den quality, and later onset of freeze-up in the fall may limit sea ice in proximity and therefore access to terrestrial denning habitat (USFWS 2008a). Erosion of barrier islands and the Arctic shoreline, presumably caused by climate change (Mars and Houseknecht 2007), may be changing terrestrial denning habitat by creating or destroying bluffs.

Human activities such as ground-based vehicular traffic and low-flying aircraft occur in polar bear critical habitat. These activities may temporarily create disturbance between den sites and the coast (e.g., disturbance from ice roads), and may temporarily degrade

the ability of barrier island habitat from being a refuge from human disturbance. For example, vessels may need to use barrier islands to weather out a storm, and this may interfere with a polar bear's ability to use barrier islands for the same purpose. However, these activities are usually infrequent and have short-term effects.

7. ENVIRONMENTAL BASELINE

This section provides an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species or critical habitat within the Action Area.

Spectacled eiders

Status of spectacled eiders within the Action Area

Spectacled eiders are present in the Action Area from late May through late October. Most North Slope-breeding spectacled eiders nest in tundra wetlands west of the Point Thomson Project Area. While the USFWS estimates spectacled eider densities may be as high as up to 0.425 birds/km^2 in portions of the Action Area, the densities surrounding proposed new development are estimated to be much lower at 0–0.028 birds/km^2 (Figure 7.1; Larned et al. 2011). Results of several other aerial surveys in the Point Thomson Project Area from 1993, 1998–2001, and 2010 have estimated spectacled eider densities at 0–0.06 birds/km^2 (reviewed in Johnson et al. 2011).

Local distributions of spectacled eiders are influenced by the availability of preferred habitat. Although very limited data are available on pre-nesting spectacled eiders in the Point Thomson area, 4 of 7 eider groups observed in 1993 used shallow freshwater lakes and the remaining 3 used freshwater lakes with emergent vegetation (Byrne et al. 1994 in Johnson et al. 2011). On the Colville River Delta, approximately 80 miles (129 km) west of the Point Thomson project area, surveys indicated pre-nesting spectacled eiders showed a significant preference for brackish water, salt marsh, salt-killed tundra, deep open water with islands or polygonized margins, shallow open water with islands or polygonized margins, deep polygon complex, and grass (*Arctophyla fulva*) marsh habitats (Johnson et al. 2010a in Johnson et al. 2011). Information on preferred spectacled eider nesting habitat in the project area is not available. Preferred nesting habitat on the Colville River Delta included deep polygon complexes and patterned wet meadow (Johnson et al. 2008 in Johnson et al. 2011), while spectacled eiders nested primarily in non-patterned wet meadows within wetland complexes containing emergent grasses and sedges in the Kuparuk oilfield (Anderson and Cooper 1994, Anderson et al. 2009), approximately 40 miles (64 km) west of the Point Thomson project area.

Factors which have likely contributed to the current status of spectacled eiders in the Action Area include environmental contaminants, increased predation, collisions with structures, long-term habitat loss through development and disturbance, and climate change. These impacts are occurring throughout much of the species range, including

within the Action Area. However, we do not have enough information to separate out the extent of these effects within Action Area compared to the extent of these effects to the species outside of the Action Area.

Habitat loss through development and disturbance has also occurred in the Action Area. Although previous development in the Point Thomson Project Area has been limited, existing oil and gas industry developments in the Prudhoe Bay and Badami Units has resulted in long-term loss of spectacled eider breeding habitat in the western portion of the Action Area directly through gravel fill and indirectly through disturbance from oilfield activities. Given the extent of development in this area, it is likely that eiders have experienced some loss of production resulting from direct and indirect habitat loss. However, the degree to which spectacled eiders can reproduce in disturbed areas or move to other less disturbed areas to reproduce, and the potential population level consequences of previous development in the Action Area, are unknown.

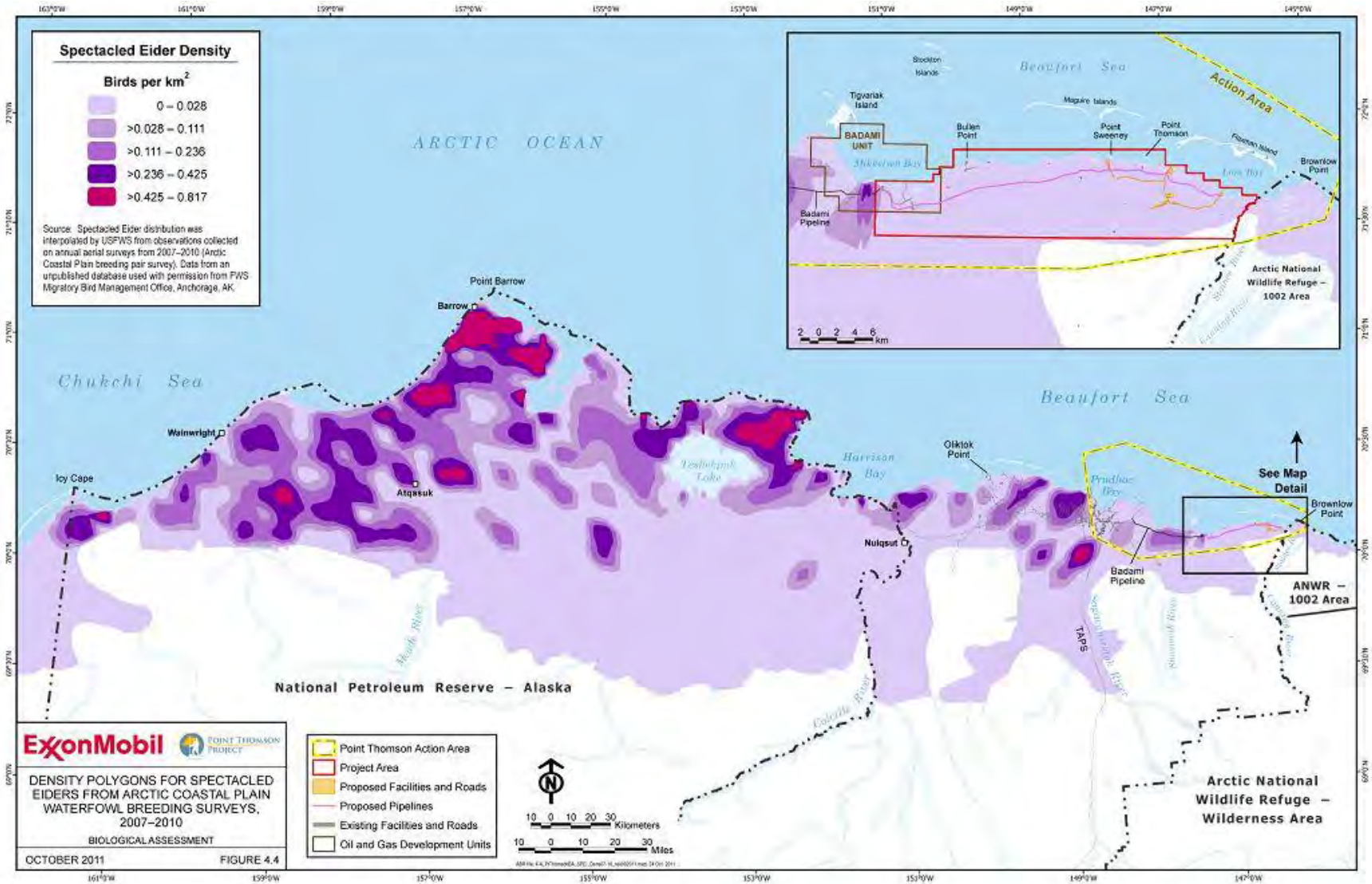

Figure 7. Estimated spectacled eider density on the Arctic Coastal Plain, Action Area, and in near project infrastructure (map detail). Density polygons are based on data collected during the 2007–2010 Arctic Coastal Plain aerial surveys (Larned et al. 2011). Figure 4.4 in the BA (Johnson et al. 2011)

Polar Bear

Status of polar bears in the Action Area

Polar bears spend the majority of their time on ice in waters over the productive continental shelf. Polar bears are generally widely and sparsely distributed across the Beaufort Sea. The SBS is distributed across the northern coasts of Alaska, and the Yukon and Northwest territories of Canada. Declining survival, recruitment, and body size (Regehr et al. 2006, Regehr et al. 2010, Rode et al. 2010), and low population growth rates during years of reduced sea ice (2004 and 2005), and an overall declining population growth rate of 3% per year from 2001 to 2005 (Hunter et al. 2007) suggest that the SBS is now declining. The status of this stock is listed as reduced by the IUCN (Obbard et al. 2010) and depleted under the MMPA.

Previously, the Alaskan stocks did not generally spend extended periods of time on land (Garner et al. 1990), with the exception of land-denning females. However, receding sea ice due to climate change is modifying polar bear behavior such that during the open-water months of August to October bears can be found along the coast awaiting freezeup. Land-denning females may use the coast during the ice-covered season, while other members of the population (males, solitary females, and females with older cubs) remain active throughout winter. Johnson et al. (2011) report 53 sightings of 96 polar bears occurred at existing Point Thomson facilities between 30 January 2009 and 28 October 2010 (23 females with 39 cubs plus 34 adults or subadults). Roughly a third of these sighting were thought to be repeated observations of the same individuals, so that the total number of individuals bears seen was more likely on the order of 65 animals (14 females with 26 cubs, plus 25 other bears) during the 21-month period. Observations occurred in the months of March, April, and June–November with the greatest number of sightings occurring in August–October (40 of 53 sightings). Forty-two sightings occurred at the Central Pad location and three involved two maternal dens discovered near the sea ice road in March 2009 and April 2010. The remaining records involved bears seen during barging operations. Appendix B of the Point Thomson BA (Johnson et al. 2011) provides additional information on polar bear observations in the project area.

The availability of suitable topography for denning in coastal terrestrial denning habitat in the Point Thomson Project Area is low relative to other areas of the central and eastern ACP (Figure 8; Durner et al. 2001, 2006). However, between 1989 and 2010, 45 maternal dens have been observed in the Action Area (Figure 8) and denning female polar bears occupy terrestrial denning habitat in the area at low densities. Known dens in the Action Area were located on land, including barrier islands, or landfast ice. The Point Thomson BA (Johnson et al. 2011) provides a more detailed description of maternal den observations in the Action Area.

Oil and gas development, hunting, environmental contaminants and climate change are the primary factors that have contributed to the environmental baseline for polar bears in the Action Area. These factors are discussed further below.

Oil and gas development

Extensive oil and gas development on Alaska's North Slope over the past several decades has likely altered polar bear use of these areas, including existing developments within the Prudhoe Bay and Badami Units which occur in the western portion of the Action Area. Assessing the magnitude of these effects is difficult. It is reasonable to assume that some bears have been excluded from habitat that they may have otherwise used for movements along the coast and denning. However, documented impacts on polar bears by the oil and gas industry in Alaska during the past 30 years have been minimal. Polar bears have been encountered at or near most coastal and offshore production facilities, or along roads and causeways that link these facilities to the mainland. Interactions in the Action Area (i.e., in the Prudhoe Bay area) have been minimized by implementation of Incidental Take Regulations (ITRs) for the Beaufort Sea (USFWS 2006, 2011) and the associated Letters of Authorization (LOAs) issued under the MMPA. The ITRs only authorize non-lethal incidental take. As part of the LOAs issued pursuant to these regulations, the oil and gas industry is required to report the number of polar bears observed, their response, and if deterrence activities were required (see below). Recent data from the region regulated under the Beaufort Sea ITRs indicate an average of 306 polar bears were observed annually by the oil and gas industry from 2006 to 2009 (range 170–420). About 81% of these bears showed no change in their behavior, 4% altered their behavior by moving away from (or towards) the industrial activity, while the remaining 15% were intentionally harassed (hazed) to actively deter the bears (described below).

Deterrence Activities and Intentional Take Authorization

Polar bear deterrence activities associated with non-Industry and Industry activities takes place in the Action Area. The Service previously consulted on a Final Rule regarding passive and preventative deterrence measures that any person can use when working in polar bear habitat (75 FR 61631). These methods are likely to cause at most only short-term changes in behavior, such as bears running away from the disturbance. However, intentional take LOAs allow trained individuals to use other mechanisms (e.g., use of projectiles) to deter polar bears away from human structures and activities. Industry-related intentional take authorizations are described further in the discussion of the Interdependent and Interrelated Actions in the effects section for polar bears.

Lethal Take

Lethal take associated with the oil and gas industry has occurred on only one occasion during the periods covered by the Chukchi Sea (1991–1996 and 2008–present) and Beaufort Sea (1993–present) ITRs, when a polar bear was accidentally killed in August 2011 due to the misuse of a crackershell round. Prior to issuance of these regulations, lethal takes of adults by industry in Alaska were also rare with only two known occurrences since 1968.

Formal section 7 consultations have been conducted for the Beaufort Sea ITRs in the action area; the ITRs authorize the incidental, unintentional taking of a small number of polar bears in these seas and the adjacent western and northern coasts of Alaska during oil and gas activities in arctic Alaska. These consultations and their conclusions were considered in the jeopardy analysis of this BO.

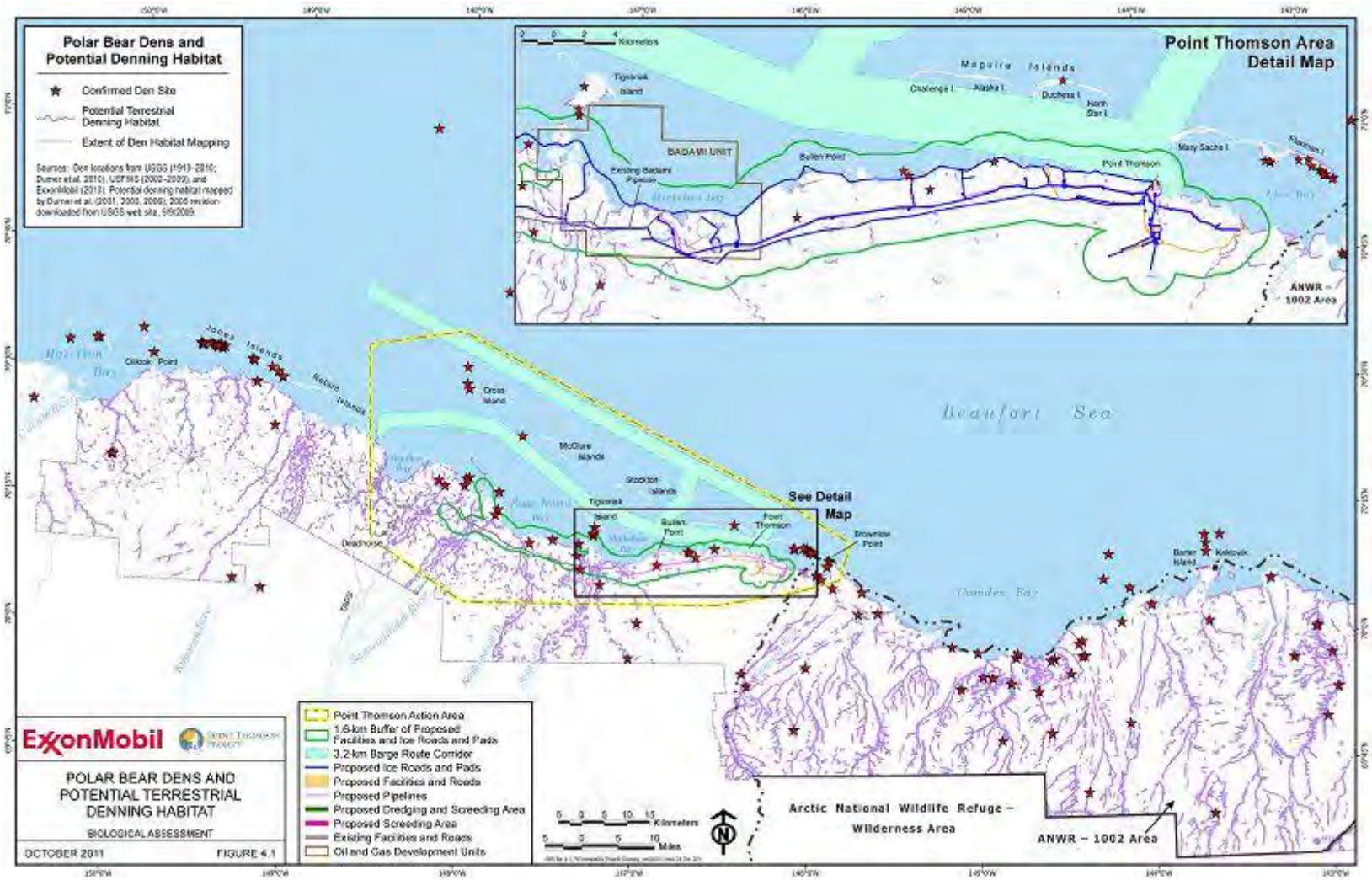

Figure 8. Polar bear dens and potential terrestrial denning habitat in the Point Thomson Action Area. Source: Point Thomson Project BA (Johnson et al. 2011).

Hunting
Prior to the 1950s, most hunting was by indigenous people for subsistence purposes. Increased sport hunting in the 1950s and 1960s resulted in population declines (Prestrud and Stirling 1994). International concern about the status of polar bears resulted in biologists from the five polar bear range nations forming the Polar Bear Specialist Group (PBSG) within the IUCN SSC (Servheen et al. 1999). The PBSG was largely responsible for the development and ratification of the 1973 International Agreement on the Conservation of Polar Bears (1973 Polar Bear Agreement), which called for international management of polar bear populations based on sound conservation practices. It prohibits polar bear hunting except by local people using traditional methods, calls for protection of females and denning bears, and bans use of aircraft and large motorized vessels to hunt polar bears. The PBSG meets every 3-5 years to review all aspects of polar bear science and management, including harvest management.

Additionally, since passage of the MMPA in 1972 (MMPA), the sport hunting of polar bears in the United States has ceased. However, the MMPA provides a special exemption to coastal dwelling Alaska Natives who may continue to take polar bears for subsistence or handicraft purposes. Currently, under the MMPA, there are no restrictions on the number, season, or age of polar bears that can be harvested by Alaska Natives. However, there is a more restrictive Native-to-Native agreement between Inupiat from Alaska and Inuvialuit in Canada that was developed in 1988. Regulation of this harvest, which is currently considered sustainable, is based upon a voluntary harvest agreement between the Inuvialuit of Canada and the Inupiat of Alaska, who share subsistence hunting traditions within the range of the SBS. The Inuvialuit-Inupiat Polar Bear Management Agreement established quotas and recommendations concerning protection of denning females, family groups, and methods of take. Commissioners for the Inuvialuit-Inupiat Agreement set the original quota at 76 bears in 1988, and it was later increased to 80. At the Inuvialuit-Inupiat Polar Bear Management Meeting in July 2010, the quota was reduced from 80 to 70 bears per year. The Native subsistence harvest from the SBS has averaged 36 bears removed per year (USFWS 2011b). During the period 2005–2009, 6 polar bears were harvested by residents of Nuiqsut and 11 by residents of Kaktovik (USFWS 2011b), which are the closest Alaska Native communities to the Action Area[3].

Environmental contaminants
Three main types of contaminants in the Arctic are thought to present the greatest potential threat to polar bears and other marine mammals: petroleum hydrocarbons, persistent organic pollutants (POPs), and heavy metals.

Potential exposure of polar bears to petroleum hydrocarbons comes from direct contact and ingestion of crude oil and refined products from acute and chronic oil spills. Polar bear range overlaps with many active and planned oil and gas operations within 40 km (25 mi) of the coast or offshore (Schliebe et al. 2006). Polar bears occurring in the

[3] Nuiqsut is located approximately 59 mi (95 km) west of the western boundary of the Action Area; Kaktovik is located approximately 57 mi (92 km) east of the eastern boundary of the Action Area.

Action Area may have been exposed to petroleum hydrocarbons associated with oil and gas industry operations in developed areas of the North Slope.

Contamination of the Arctic and sub-Arctic regions through long-range transport of pollutants has been recognized for over 30 years (Bowes and Jonkel 1975, Proshutinsky and Johnson 2001, Lie et al. 2003). The Arctic ecosystem is particularly sensitive to environmental contamination due to the slower rate of breakdown of POPs, including organochlorine compounds (OCs), relatively simple food chains, and the presence of long-lived organisms with low rates of reproduction and high lipid levels. The persistence and lipophilic nature of organochlorines increase the potential for bioaccumulation and biomagnification at higher trophic levels (Fisk et al. 2001). The highest concentrations of OCs have been found in species at the top of the marine food chains such as glaucous gulls, which scavenge on marine mammals, and polar bears, which feed primarily on seals (Braune et al. 2005). Consistent patterns between OC and mercury contamination and trophic status have been documented in Arctic marine food webs (Braune et al. 2005).

Climate change

Warming-induced habitat degradation and loss are negatively affecting some polar bear stocks, and unabated global warming will ultimately reduce the worldwide polar bear population (Obbard et al. 2010). Loss of sea ice habitat due to climate change is identified as the primary threat to polar bears (Schliebe et al. 2006, USFWS 2008a, Obbard et al. 2010). Patterns of increased temperatures, earlier spring thaw, later fall freeze-up, increased rain-on-snow events (which can cause dens to collapse), and potential reductions in snowfall are also occurring. In addition, positive feedback systems (i.e., sea-ice albedo) and naturally occurring events, such as warm water intrusion into the Arctic and changing atmospheric wind patterns, can amplify the effects of these phenomena. As a result, there is fragmentation of sea ice, reduction in the extent and area of sea ice in all seasons, retraction of sea ice away from productive continental shelf areas throughout the polar basin, reduction of the amount of heavier and more stable multi-year ice, and declining thickness and quality of shore-fast ice (Parkinson et al. 1999, Rothrock et al. 1999, Comiso 2003, Fowler et al. 2004, Lindsay and Zhang 2005, Holland et al. 2006, Comiso 2006, Serreze et al. 2007, Stroeve et al. 2008). These climatic phenomena may also affect seal abundances, the polar bear's main food source (Kingsley 1979, DeMaster et al. 1980, Amstrup et al. 1986, Stirling 2002). However, threats to polar bears will likely occur at different rates and times across their range, and uncertainty regarding their prediction makes management difficult (Obbard et al. 2010).

In 2007, a USGS science team released 9 reports[4] to the Service that included (1) new observational data on polar bears, including updated information on the current status of 3 of the world's 19 subpopulations of polar bears, and (2) projections of the future distribution and abundance of polar bears in the rest of the 21st century, given changes expected in future sea ice conditions. The overall conclusion of the USGS research effort was that if projected changes in future sea ice conditions are realized, approximately two-

[4] Reports are available at: http://www.usgs.gov/newsroom/special/polar_bears/.

thirds of the world's current polar bear population will be lost by the mid-21st century. Because the observed trajectory of Arctic sea ice decline appears to be underestimated by currently available models, this assessment of future polar bear status may be conservative (Amstrup et al. 2007).

While climate change will have the largest impact on polar bears in the marine environment, it may also lead to changes in use and vulnerability of polar bears in the terrestrial environment. Less than 60% of females from the SBS stock den on land, with the remaining bears denning on drifting pack ice (Fischbach et al. 2007). Durner et al. (2006) noted that ice must be stable for ice-denning females to be successful. As climate change continues, the quality of sea ice may decrease, forcing more females to den on land (Durner et al. 2006). However, if large areas of open water persist into late winter due to a decrease in the extent of pack ice, females may be unable to access land to den (Stirling and Andriashek 1992).

Climate change may affect the availability and quality of denning habitat on land. Durner et al. (2006) found that 65% of terrestrial dens found in Alaska between 1981 and 2005 were on coastal or island bluffs. These areas are suffering rapid erosion and slope failure as permafrost melts and wave action increases in duration and magnitude. In all areas, dens are constructed in autumn snowdrifts (Durner et al. 2003). Changes in autumn and winter precipitation or wind patterns (Hinzman et al. 2005) could significantly alter the availability and quality of denning habitat.

Polar bears' use of coastal habitats in the fall during open-water and freeze-up conditions has increased since 1992 (USFWS 2006). This may increase the number of human – polar bear interactions if bears occur close to human settlements or development. Amstrup (2000) observed that direct interactions between people and bears in Alaska have increased markedly in recent years. The number of bears lethally taken for safety reasons, based on three-year running averages, increased steadily from about 3-per-year in 1993, to about 12 in 1998, and has averaged about 10 in recent years. There are several plausible explanations for this increase. It may reflect increased reporting, or increased polar bear abundance and corresponding probability of interactions with humans. Alternatively, or in combination, polar bears from the SBS population typically move from the pack ice to the near shore environment in the fall to take advantage of the higher productivity of ice seals over the continental shelf. In the 1980s and early 1990s, the near shore environment froze by early or mid-October, allowing polar bears to effectively access seals in the area. Since the late 1990s, the timing of ice formation in the fall has occurred later in November or early December, resulting in an increased amount of time that the area was not accessible to polar bears. Consequently, bears spent a greater amount of time on land and less time feeding. The later formation of near-shore ice increases the probability of bear-human interactions occurring in coastal villages (Schliebe et al. 2006). Some experts predict the number of polar bear–human interactions will increase as climate change continues (Derocher et al. 2004).

Summary
Primary threats to polar bears in the Action Area relate to increased use of coastal habitats by non-denning bears and increased use of maternal denning habitat on land resulting from climate change, which exposes polar bears to the effects of human activities in these areas with greater frequency. While other stressors exist and are managed, they are not currently thought to be significant threats to polar bear populations; however, each of these factors could become more significant in combination with future effects of climate change and the resultant loss of sea ice.

Polar Bear Critical Habitat
Status of polar bear critical habitat in the Action Area
The Action Area encompasses portions of each of the three polar bear critical habitat PCEs/Units. Proposed activities would primarily occur within the Terrestrial Denning Unit Figure 9), including areas of overlap with the Barrier Island Unit. Barge corridors and sea ice roads would occur within the Sea Ice Unit. Localized effects to critical habitat in the Action Area have been small in scale and include potential disturbance from existing oil and gas infrastructure. At a larger spatial scale, globally distributed pollutants and climate change have diminished the quality of polar bear critical habitat; however, estimating the magnitude of these effects within the Action Area is difficult. These factors are discussed in further detail below.

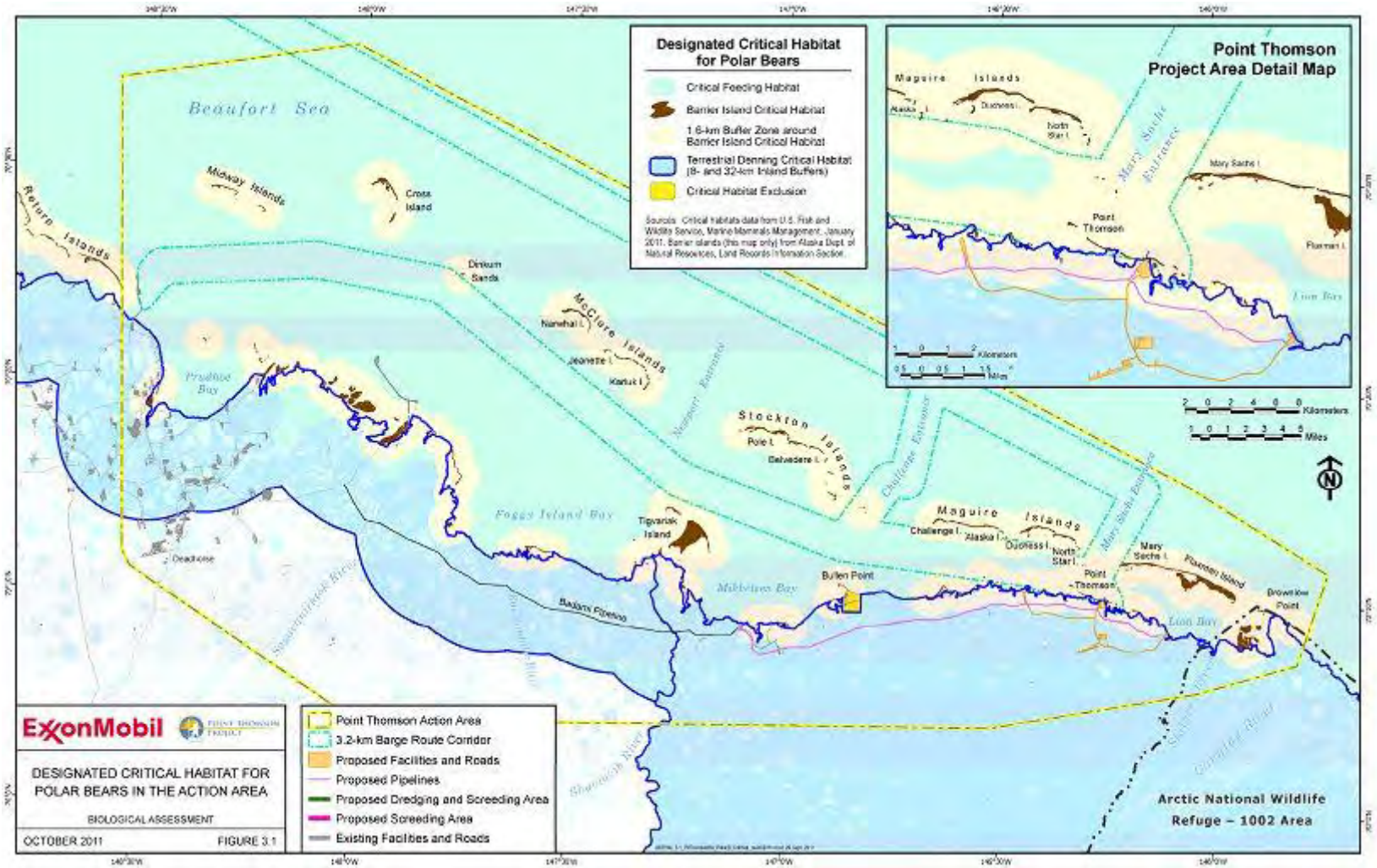

Figure 9. Polar bear critical habitat in the Action Area. The Terrestrial Denning Unit includes terrestrial habitat within 8 km (5 mi) inland from the Beaufort Sea coast east of the Kavik River and 32 km (20 mi) inland west of the Kavik River. The Barrier Island Unit includes barrier islands, spits, and a 1.6 km zone of adjacent aquatic and terrestrial habitats. These areas are identified as both barrier island critical habitat and a surrounding 1.6-km zone in the map above. The Sea Ice Unit is identified as critical feeding habitat in the map above. Source: Point Thomson Project BA (Johnson et al. 2011).

Habitat loss and disturbance from oil and gas development
Most of polar bear critical habitat has not been subject to oil and gas development; however, the Action Area has included development in recent decades. Manmade structures existing on the effective date of the final critical habitat rule, January 6, 2011, and the land on which they are located were excluded from critical habitat. However, human activities (e.g., noise produced by equipment and visual stimuli) at these facilities may interfere with the capability of critical habitat adjacent to facilities to provide their intended function. For example, polar bears may alter travel routes to avoid these facilities, and avoid denning, hunting, and resting near them. Interactions and adverse effects to polar bears from these existing oil and gas activities have been minimized by implementation of the Beaufort Sea ITRs (USFWS 2006, 2011) promulgated under the MMPA. We expect that measures implemented to minimize incidental take of polar bears under these MMPA authorizations have also minimized effects to the conservation role of polar bear critical habitat in the Action Area.

Environmental contaminants
Exposure to environmental contaminants may affect polar bear survival or reproduction. Thus, the presence of contaminants within polar bear critical habitat could affect the conservation value of the habitat. Three main types of contaminants in the Arctic are thought to pose the greatest potential threat to polar bears: petroleum hydrocarbons, persistent organic pollutants (POPs), and heavy metals.

Petroleum hydrocarbon contamination from oil and gas development has had a limited effect on the environmental baseline of polar bear critical habitat. A single large spill has been reported for the Chukchi and Beaufort seas. In August 1988, 68,000 gallons (1,619 barrels) of heating fuel were spilled 3–6 miles north of the barrier islands off Brownlow Point by a barge tanker enroute to Kaktovik. No large oil spills from oil and gas activities have occurred in arctic Alaska. Small spills have occurred in terrestrial areas, but have affected a limited area.

Contamination of the Arctic and sub-Arctic regions through long-range transport of pollutants has been recognized for over 30 years (Bowes and Jonkel 1975, Proshutinsky and Johnson 2001, Lie et al. 2003). Arctic ecosystems are particularly sensitive to environmental contamination due to the slower rate of breakdown of POPs, including organochlorine compounds (OCs), relatively simple food chains, and the presence of long-lived organisms with low rates of reproduction and high lipid levels that favor bioaccumulation and biomagnification. Consistent patterns between OC and mercury contamination and trophic status have been documented in Arctic marine food webs (Braune et al. 2005). Although polar bears in arctic Alaska and designated polar bear critical habitat in Alaska have unquestionably been affected by exposure to environmental contaminants, at this time we have no reason to believe the critical habitat's ability to support polar bears has been affected.

Climate change
Climate change is contributing to the rapid decline of sea ice throughout the arctic, and some of the largest declines are predicted to occur in the Chukchi and southern Beaufort

seas (Durner et al. 2009 *in* USFWS 2010a). This directly affects the sea ice PCE, which provides feeding, breeding, denning, and traveling habitat for polar bears. The decrease in the quality and quantity of sea ice may increase the importance of barrier island and terrestrial habitat for foraging, denning, and resting. For example, Schliebe et al. (2006) demonstrated an increasing trend in the number of observed polar bears using terrestrial habitats in the fall. Additionally, Fischbach et al. (2007) hypothesized that reduced availability of older, more stable sea ice is contributing to the observed decrease in the proportion of female polar bears denning on sea ice in northern Alaska.

Climate change may also affect the availability and quality of denning habitat on land. Durner et al. (2006) found that 65% of terrestrial dens found in Alaska between 1981 and 2005 were on coastal or island bluffs. These areas are suffering rapid erosion and slope failure as permafrost melts and wave action increases in duration and magnitude. In all areas, dens are constructed in autumn snowdrifts (Durner et al. 2003). Changes in autumn and winter precipitation or wind patterns (Hinzman et al. 2005) could significantly alter the availability and quality of snow drifts for denning.

8. EFFECTS OF THE ACTION ON LISTED SPECIES AND CRITICAL HABITAT

This section of the BO provides an analysis of the effects of the Action on listed species and, where appropriate, critical habitat. Both direct effects (effects immediately attributable to the action) and indirect effects (effects that are caused by or will result from the Proposed Action and are later in time, but are still reasonably certain to occur) are considered. Interrelated and interdependent effects of the Action are also discussed.

Our analyses of the effects of the Action on species listed under the ESA include consideration of ongoing and projected changes in climate. The terms “climate” and “climate change” are defined by the Intergovernmental Panel on Climate Change (IPCC). “Climate” refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007, p. 78). The term “climate change” thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007, p. 78). Various types of changes in climate can have direct or indirect effects on species. These effects may be positive, neutral, or negative and they may change over time, depending on the species and other relevant considerations, such as the effects of interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007, pp. 8–14, 18–19). In our analyses, we use our expert judgment to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

Spectacled Eiders
Adverse effects to spectacled eiders could occur through collisions with structures, increased predator populations, and long-term habitat loss; each of these factors is evaluated below.

Collisions with structures
Migratory birds suffer considerable mortality from collisions with man-made structures (Manville 2004). Birds are particularly at risk of collision when visibility is impaired by darkness or inclement weather (Weir 1976). There is also evidence that lights on structures increase collision risk (Reed et al., 1995, Russell, 2005, numerous authors cited by Manville 2000). Anderson and Murphy (1988) monitored bird behavior and strikes to a 12.5 km power line in the Lisburn area (the southern portion of the Prudhoe Bay oil fields) during 1986 and 1987. They observed 25 different species of birds including spectacled eiders. Results indicated that strike rate was related to flight behavior, in particular the height of flight. Johnson and Richardson (1982) in their study of migratory behavior along the Beaufort Sea coast reported that 88% of eiders flew below an estimated altitude of 10 m (32 ft) and well over half flew below 5 m (16 ft). This tendency to fly low puts eiders at risk of striking objects in their path. A literature review by Day et al. (2005) also suggested that eider species maybe particularly susceptible to collisions with offshore structures as they fly low and at relatively high speed (~45 mph).

Eiders migrating east during spring and west during summer/fall migration periods would be at risk of colliding with Point Thompson structures. These include buildings, communications towers, and the drill rig, which is estimated to be in operation for 3 years. However, we expect most eiders to remain offshore during spring migration because they are thought to follow open water leads in the pack ice during their spring migration to the breeding grounds (Woodby and Divoky 1982, Johnson and Richardson 1982, Oppel et al. 2009, M. Sexson, USGS, pers. comm.). During post-breeding migration in summer and fall, we anticipate that male eiders would have the greatest collision risk in the Action Area. Satellite telemetry studies from the eastern ACP indicated that male spectacled eiders departed early in the summer and generally remained close to shore, sometimes crossing overland, during westward migration (TERA 2002; see also Petersen et al. 1999). However, we anticipate that the collision risk for spectacled eiders migrating through the Action Area in early summer would be greatly reduced by the improved visibility of structures during the 24 hours of daylight in the project area from mid-May through late July. When females and juveniles migrate during late summer/fall, decreasing daylight and more frequent exposure to foggy weather conditions could increase collision risk. Longer nights increase the time that eiders are vulnerable to collision with unseen structures, and may increase susceptibility to attraction or disorientation from lights. However, we anticipate these birds are also more likely to migrate over open water in the Beaufort Sea (Petersen et al. 1999, TERA 2002), avoiding inland structures. Thus, we anticipate there would be a very low risk of spectacled eider mortality from collisions with project infrastructure. Additionally, data from USFWS aerial surveys of breeding waterfowl on the ACP from 1992-2010 indicates that <0.3% of the ACP-breeding spectacled eider population occur east of the Badami development. Based on recent population estimates, we would expect less than 125 adult

and juvenile spectacled eiders[5] to migrate through or past the Point Thompson Project Area between June and October each year.

In summary, we anticipate the likelihood of collisions of spectacled eiders with proposed structures would be very low given 1) improved visibility of structures in late-spring and early summer; 2) the tendency of migrating eiders to fly further offshore in late summer and fall when eiders would be more vulnerable to collisions than the proposed location of towers; 3) lighting of facility structures would be designed (e.g., light hoods) to minimize potential for disorienting migrating birds; and 4) very low densities of migrating eiders in the project area.

Increased predator populations

There is some evidence that predator and scavenger populations have increased near villages and industrial infrastructure on the ACP (Eberhardt et al. 1983, Day 1998, Powell and Bakensto 2009). Ravens nest on structures created by industry (e.g., towers, under raised walkways), and foxes den in gravel berms. Additionally, ravens use man-made material (e.g., tape, insulation, scrap metal) to construct nests. Researchers have proposed that reduced fox trapping, anthropogenic food sources in villages and oil fields, and nesting/denning sites on human-built structures have resulted in increased numbers of arctic foxes (*Vulpes lagopus*), common ravens (*Corvus corax*), and glaucous gulls (*Larus hyperboreus*) in developed areas of the ACP (e.g., Day 1998). Foxes are important predators of ground-nesting birds in the Prudhoe Bay Oilfield (Liebezeit and Zack 2008, 2010) and appear to occur at higher densities in the Prudhoe Bay region compared to adjacent areas outside of the oil fields (see review in Burgess 2000). Ravens appear to have expanded their breeding range on the North Slope by utilizing buildings and other manmade structures for nest sites (Day 1998). Day (1998) interviewed a number of biologists who work on the North Slope and many felt that ravens may be highly efficient egg predators. Ravens were observed depredating 5 Steller's eider nests near Barrow during 5 nesting years[6] between 1992 and 1999 (Quakenbush et al. 2004). In 2010, Liebezeit and Zack (2010) observed the highest number of ravens since their long-term studies of tundra-nesting birds in the Prudhoe Bay Oilfield began in 2003.

Estimating the effects of predators on spectacled eider production in the Action Area is extremely difficult. We expect structures associated with the Point Thomson Project would increase the number of potential nesting and perching sites for ravens in the local area and increased availability of anthropogenic food resources for predators may also occur in the project area. However, we anticipate that management of raven nest sites and potential food sources for ravens and foxes through the Wildlife Interaction and Waste Management Plans would potentially reduce increases in predator productivity and hence the potential depredation of spectacled eider nests. Provided these plans are

[5] 14,167 birds on the ACP × 0.003 = 43 breeding adults; 21 breeding pairs × 3.9 clutch size = 82 juvenile spectacled eiders. Population size (14,167) is the upper 90% CI discussed in the Conclusion section.

[6] Steller's eiders have highly variable nesting effort among years and nests are not detected near Barrow in about 50% of years.

followed, any adverse effects to spectacled eiders that may occur from increased predator populations could be reduced.

Oil spills
We expect a very low number of spectacled eiders could be potentially exposed to oil in the event of a spill because they occur at low densities in the Action Area (see subsequent discussion on long-term habitat loss) and risks to eiders associated with spills would be reduced by spill prevention and containment measures. Therefore, we anticipate potential adverse effects to spectacled eiders from oil spills would be minimal.

Long-term habitat loss
Direct habitat loss will result from the construction of gravel pads and roads. This area of gravel fill would be rendered permanently unavailable as breeding habitat for eiders.

We do not anticipate significant long-term habitat loss to result from ice road construction or operations. There have been several studies on impacts of ice road construction to different tundra types. Overall, these studies found impacts from ice roads are low, with occasional areas of moderate level impacts (Pullman et. al. 2003). In one survey, damage occurred on higher, drier sites with little or no damage observed in wet or moist tundra areas (Payne et al. 2003, cited by Pullman et. al. 2003). Jorgenson (1999) found impacts were limited to isolated patches of scuffed high microsites and crushed tussocks. McKendrick (2003) studied several riparian willow areas and found although branches were damaged the plants remained viable.

We also anticipate that indirect habitat loss will occur within a 200-m (656.17-ft) zone of influence surrounding new development through disturbance from on-pad activities, road operations, and pipeline maintenance.

The two principal mechanisms through which disturbance can adversely affect eiders on their breeding grounds are:

1. Displacing adults and/or broods from preferred habitats during pre-nesting, nesting, brood rearing, and migration; and
2. Displacing females from nests, exposing eggs or small young to inclement weather or predators.

In the discussion below, we provide an assessment of potential loss of spectacled eider production resulting from the Proposed Action. This assessment uses updated estimates of spectacled eider density in the Action Area based on recent waterfowl breeding population survey data from the region (Larned et al. 2011). These estimates were developed at a coarse, regional scale and are not site or habitat specific; however, they reflect the best available data on the density of breeding spectacled eiders in the Action Area. Distributions on a local scale may vary based on the availability of preferred habitats.

Direct loss of habitat would occur by placement of gravel onto approximately 1.08 km^2 (265 acres) of tundra during construction of the gravel pads and gravel roads. We expect

indirect habitat loss will occur through displacement of eiders within a 200-m zone of influence surrounding gravel pads, gravel roads, and pipelines. The area of total habitat loss is estimated to be 28.53 km^2 (7,072 acres). This area is the sum of the gravel footprint (1.08 km^2); the area within a 200-m zone of influence surrounding gravel pads, gravel roads, and the mine site (9.77 km^2; Johnson et al. 2011); and the 200-m zone of influence along each side of the 44.2 km of pipeline corridors (17.68 km^2). This estimate may be conservative because pipelines represent a substantial portion (62%) of the estimated area of habitat loss and we expect eiders nesting within 200 m of pipelines would be exposed to lower levels of human activity compared to those nesting near gravel roads and pads. However, spectacled eiders nesting near the pipeline corridors will experience disturbance from weekly aerial surveillance of the pipelines; the extent to which these overflights would increase the risk of nest abandonment or depredation is unknown.

Spectacled eider density polygons constructed from data collected during the 2007–2010 waterfowl breeding population survey of the ACP (Larned et al. 2011; Figure 7.1) provide our best estimate of spectacled eider nesting in the Action Area. These surveys were conducted at a broad spatial scale relative to the area of habitat loss. Eider counts were not corrected for visibility. Predicted spectacled eider density in the area of habitat loss ranged from 0 to 0.028 birds/km^2 (Figure 7). We multiplied the upper limit of this predicted density range (0.028 birds/km^2) by 0.5 (breeding pair/2) to estimate the potential number of spectacled eider pairs displaced by the Proposed Action per year. We assume the estimated number of pairs displaced is equivalent to the number of nests or young broods that may be affected by proposed activities. We also assume that spectacled eiders will be present and attempt to nest annually in the Action Area. Loss of production of 0.40 nests per year was estimated as follows:

$0.028 \text{ birds/km}^2 \times 0.5 \text{ nests/bird} \times 28.53 \text{ km}^2 = 0.40 \text{ nests per year}$

Loss of production of 14 nests or 55 eggs/ducklings over an assumed 33-year project life[7] was estimated as follows:

$0.028 \text{ birds/km}^2 \times 0.5 \text{ nests/bird} \times 28.53 \text{ km}^2 \times 33 \text{ y} = 13.22 \text{ nests over 33 years}$

The potential loss of production in terms of numbers of eggs or ducklings lost was based on an average clutch size of 3.9 for spectacled eiders in northern Alaska (Petersen et al. 2000, Bart and Earnst 2005, Johnson et al. 2008).

$14 \text{ nests} \times 3.9 \text{ eggs or ducklings per nest} = 54.6 \text{ eggs or ducklings over 33 years}$

To summarize, we estimate that the Proposed Action may result in the loss of up to 55 eggs or ducklings over an assumed 33-year project life through direct loss of breeding habitat and disturbance within a 200-m zone of influence surrounding the project infrastructure within the Action Area. These estimates are based on a series of

[7] Three years of construction plus an estimated 30-year facility life.

conservative assumptions and represent the worst case scenario or maximum potential impact to spectacled eiders.

Polar Bears

Adverse effects to polar bears could result from the Proposed Action primarily through disturbance, increased polar bear–human interactions, and habitat loss.

Denning polar bears

Female polar bears entering dens, or females in dens with cubs, are more sensitive than other age and sex groups to noise (USFWS 2011b). Females appear more likely to abandon their dens in the fall before cubs are born and relocate if disturbed (Lentfer and Hensel 1980, Amstrup 1993), than in the spring when young cubs may not survive if they leave the maternal den early (Amstrup and Gardner 1994). Industrial noise and activities that commence after a female has denned may cause a female to abandon the den site prematurely, before the cubs have developed enough to survive outside the den. Post-emergence, females and cubs spend an average of 8 days in the area before the den site is abandoned (USGS data cited by USFWS 2006). These family groups may be particularly susceptible to disturbance.

Behavioral responses of individual denning females and family groups to disturbance are variable. While observations of den abandonment associated with industry activities have been reported from northern Alaska (see review in USFWS 2011b), available data indicate such events have been infrequent and isolated (USFWS 2011b) and some studies have reported individual denning polar bears to be tolerant of human disturbance (e.g., Amstrup 1993, Smith et al. 2007). Additionally, USFWS (2011b) reported three examples (2006, 2009, and 2010) of pregnant bears establishing dens prior to the onset of oil industry activity within 400 m (1,312 ft) of the den site and remaining in the den through the normal denning cycle.

Available data indicate polar bears regularly den at low densities in the Action Area. However, use of terrestrial denning habitat, including the Action Area by the SBS stock may increase in the future in response to changes in sea ice habitat (Durner et al. 2006). Den abandonment would be most likely to occur during new construction activities because ongoing activities during routine operations would allow more sensitive bears to select an alternative den site. However, ExxonMobil has indicated they would conduct den detection surveys each winter in compliance with LOAs issued for the project under the Beaufort Sea ITRs and the project's polar bear interaction plan. These surveys would be planned in cooperation with USFWS MMM. If dens are detected within 1.6 km of the proposed locations of ice roads and pads, then the USFWS will be contacted for guidance.

If dens are discovered after ice roads and pads are built, then traffic restrictions and emergency closures would be instituted as determined in consultation with the USFWS MMM.

Disturbance to non-denning bears
Operations at the drill sites, associated structures, and along pipelines may disturb and displace individual polar bears from the immediate area. However, there is some evidence that polar bears exposed to routine industrial noises may acclimate to those noises and show less vigilance than bears not exposed to such stimuli (Smith et al. 2007).

The Service expects that potential adverse effects to polar bears will be reduced further by the applicant's compliance with existing and future authorizations issued under the MMPA, such as LOAs issued under the Beaufort Sea ITRs. Disturbance that disrupts behavioral patterns of polar bears is classified as take under the MMPA. The MMPA prohibits unpermitted incidental take of marine mammals. Under the MMPA, incidental take is only permitted provided the total of such taking will have no more than a negligible impact[8] on the marine mammal species (or stock in the case of the Beaufort Sea ITRs), and does not have an unmitigable adverse impact[9] on the availability of these species for subsistence uses. Additional information on possible minimization measures that would reduce effects to polar bears from oil and gas industry activities can be found in the BO for the 2011 Beaufort Sea ITRs (USFWS 2011c).

Disturbance from aircraft
Occasional aerial surveys of the project area by helicopter and fixed-wing aircraft are not anticipated to adversely affect polar bears in the Action Area. The inland flight route between Deadhorse and the Point Thomson airstrip and normal operational altitude of 457 m (1,500 ft) would also reduce potential effects to polar bears. Amstrup (1993) studied the response of denning bears to research aircraft (altitude 150–500 m) and found no detectable motion among collared bears in their dens when flights took place. In two of 40 observations, bears did abandon open dens in response to helicopters prior to capture by researchers (Amstrup 1993). Reactions of non-denning polar bears appear limited to short-term changes in behavior.

Increased polar bear–human interactions
Polar bear–human encounters can be dangerous for both the polar bear and human. For the bear, a human encounter may result in it being hazed from the area or, in the worst case, killed in defense of life and property. While loud noises may deter bears from entering an area of operation, polar bears are curious and commonly approach noise sources, such as industrial sites (Stirling 1988).

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[8] Negligible impact - 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.

[9] Unmitigable adverse impact - is an impact resulting from the specified activity (1) that is likely to reduce the availability of the species to a level insufficient for a harvest to meet subsistence needs by (i) causing the marine mammals to abandon or avoid hunting areas, (ii) directly displacing subsistence users, or (iii) placing physical barriers between the marine mammals and the subsistence hunters; and (2) that cannot be sufficiently mitigated by other measures to increase the availability of marine mammals to allow subsistence needs to be met.

Polar bear deterrence activities associated with oil and gas and other activities occur regularly in the Action Area. From August 2006 through July 2010, the oil and gas industry working in the Beaufort Sea or its adjacent coast reported the sightings of 1,414 polar bears, of which 209 (15%) were intentionally harassed, or deterred (C. Perham, pers. comm.). Annually, the percent of total bears sighted that were deterred ranged from ranged from 9% in 2010 to 43% in 2006, with an average of 15%. About 65 animals (14 females with 26 cubs, plus 25 other bears) were observed during the 21-month period between 30 January 2009 and 28 October 2010. Of the 32 polar bears that were incidentally taken from 30 January 2009 through 30 January 2010, 5 were taken using vehicles or acoustic methods and 2 were taken with projectiles (ExxonMobil Development 2012).

Authorization to harass (haze) polar bears may be requested under section 112(c), and/or 101(a)(4)(A) of the MMPA, which allows the Service to set up cooperative agreements with industry or other publics, and under sections 109(h) which states that a person may take a marine mammal in a humane manner if such taking is for: (a) protection or welfare of the mammal; (b) protection of public health and welfare; or (c) non-lethal removal of nuisance animals. This type of action is considered Level B Harassment[10]. Although hazing may have some short term adverse effects by displacing a bear, the safe removal of a bear to non-industrial areas may prevent more serious impacts to the bear, possibly including lethal take in defense of life and property. Since the implementation of ITRs, LOAs, and authorization of intentional take, only two polar bears are known to have been killed due to encounters with industry on the North Slope of Alaska. In contrast, 33 polar bears were killed in the Canadian Northwest Territories from 1976 to 1986 during encounters with industry (Stenhouse et al. 1988).

Given that the best data available indicates that about 65 polar bears were observed at Point Thomson, and the Action Area is larger than the Point Thomson area, we estimate that Industry is likely to observe 70 polar bears annually throughout the Action Area. Using Industry-reported data reported as required under the Beaufort Sea ITRs, an estimated 57 bears observed would likely exhibit no change in their behavior. An estimated 13 bears would likely exhibit some form of short-term behavioral response due to human activity in the Action Area. Of those animals exhibiting a behavioral response, an estimated 10 polar bears would likely be deterred (e.g., via noise, vehicles, helicopters, projectiles) throughout the Action Area. Some of these deterrence activities could result in injury to the bear; for example, deterrence could result in exhaustion of the bear (e.g., if a bear runs a long distance) or bruising (e.g., via projectiles such as beanbags).

[Given that about 19% (4% incidentally taken + 15% intentionally hazed, and all hazed bears are also incidentally taken) of bears could be incidentally taken (using the MMPA

[10] Level B Harassment - 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 but which does not have the potential to injure a marine mammal or marine mammal stock in the wild.

definition of take), we estimate that xx polar bears could be taken annually, of which xx could be intentionally hazed, with up to xx hazed annually using projectiles.

The Service also consulted previously on a Final Rule regarding passive and preventative deterrence measures that any person can use (e.g., acoustical and vehicular deterrence) when working in polar bear habitat (USFWS 2010d). The Service concluded that these methods are likely to cause, at most, short-term changes in behavior, such as bears running away from the disturbance (USFWS 2010d).

Habitat loss

Habitat loss would occur through the construction of gravel pads and roads and pipelines, impacting approximately 1.08 km^2 (267 acres) of tundra within the Action Area. The shoreline in the vicinity of Central Pad and its associated marine facilities may also be unavailable for use by polar bears if they are deterred or disturbed by human activity associated with the project. Polar bears use coastal areas for denning, hunting, and travel corridors, and we expect with changing ice patterns more polar bears would be encountered on land in the future. Oil infrastructure on the North Slope is not thought to significantly interfere with movements of non-denning bears.

Terrestrial dens in Alaska are sparsely distributed along a narrow coastal strip, with observations up to 61 km (37.9 mi) inland (Amstrup and Gardner 1994). Denning habitat includes coastal bluffs, along river banks, and bluffs where snow accumulates early (Durner et al. 2003). It is possible a small amount of potential denning habitat may be destroyed or altered by project activities; however, denning habitat is not limiting population size, and adverse effects from habitat loss are not anticipated (C. Perham, pers. comm. in USFWS 2008c).

Oil spills

Oil and toxic substance spills may result from the Proposed Action, and oil is known to be highly toxic to polar bears (St. Aubin 1990). Bears can be affected by contacting spilled oil or ingesting contaminated prey (Stirling 1990). The size, location, and timing of a spill will determine the number of polar bears affected. As far as is known, polar bears have not been affected by oil spilled as a result of North Slope industrial activities to date (USFWS 2011b).

Polar bears are sparsely distributed in terrestrial habitat in the Action Area. Thus, a small spill on the tundra is unlikely to contact polar bears, even if it entered lakes and tundra wetland complexes. A large spill that enters marine waters at Point Thomson coastal facilities or through streams and rivers in the Action Area or a spill from a marine vessel has the potential to contact, and kill, polar bears or their prey, but small numbers of polar bears would likely be affected due to their sparse distribution. Potential effects to polar bears from oil spills are discussed further in the Beaufort Sea ITRs (USFWS 2011b) under *Potential Impacts of Waste Product Discharge and Oil Spills on Pacific Walruses and Polar Bears*.

Because small spills are expected to be infrequent and affect only a small portion of the Action Area and given the low density of polar bears in the area, the Service does not anticipate adverse effects from small spills. However, large spills reaching marine waters or spills from vessels could potentially impact polar bears directly and indirectly through effects to their prey.

Polar Bear Critical Habitat

In our effects analysis, we analyzed how the PCEs are likely to be affected and how that is likely to influence the function and conservation role of each PCE at the unit scale. We assumed if the function of any one PCE at the individual critical habitat unit scale was not likely to be appreciably reduced, then it follows that adverse modification for the total polar bear critical habitat is not likely to occur.

Effects on sea ice habitat

Activities will primarily occur on land although the sea ice road route traverses several kilometers of nearshore sea ice habitat. However, changes to sea ice would be temporary and would not affect the intended conservation role of the Sea Ice Unit. Accordingly, we do not expect adverse effects to the Sea Ice Unit.

Effects on terrestrial denning habitat

The Proposed Action would adversely alter the physical features of 1.08 km^2 (267 acres) of terrestrial denning habitat through the construction of gravel pads and roads (Figure 9). Temporary effects to terrestrial denning habitat may also occur from construction of ice roads and pads in support of construction and operations. Additionally, activities that may occur in the Action Area could be a source for disturbances that may affect the conservation role of terrestrial denning habitat.

Topographic features – The terrestrial denning PCE is characterized by steep, stable slopes that accumulate snow. Certain areas such as barrier island, river banks, and coastal bluffs that occur at the interface of mainland and marine habitat receive proportionally greater use for denning (Durner et al. 2004, 2006), with coastal bluffs providing the most preferred topographic relief. For example, of 35 terrestrial dens found on the ACP in 2001, >80% were along coastal bluffs (Durner et al. 2003).

The Proposed Action could result in modifications of some slopes and limit their capability to catch snow. ExxonMobil estimates the total length of bank-habitat segments within the Action Area to be 566.9 km, including 173.6 km within a 1.6 km zone along the proposed sea ice road (66.7 km) and tundra ice road (106.9 km) routes (see Table 3.1 in the project BA [Johnson et al. 2011]). However, we expect only a small area containing suitable topographic features for denning would be affected permanently by project structures (Figure 9).

Features related to polar bear movement and absence of disturbance – Disturbance may adversely affect critical habitat if it persists and affects the critical habitat's conservation role. Features of the terrestrial denning habitat PCE that relate to disturbance include: 1) unobstructed, undisturbed access between den sites and the coast; and 2) the absence of

disturbance from humans and human activities that might attract other polar bears (i.e., non-denning polar bears which may kill females and cubs in dens).

Proposed structures and associated disturbance in their vicinity could interfere with the ability of polar bears to use critical habitat for its intended purpose, and thus adversely affect it. However, polar bears have frequently been observed crossing existing roads and causeways in the Prudhoe Bay oilfields suggesting that some structures associated with oil and gas development may not form a barrier to polar bear movements. Given the limited extent of development anticipated in polar bear critical habitat from the Proposed Actions, we expect effects from hindering movement between den sites and the coast through physical obstructions or disturbance to be limited.

Human activity could also reduce the quality of terrestrial denning habitat by providing attractants (such as food and scents) that could attract adult male bears, which may kill females and cubs, to nearby dens. Disturbance and attractants resulting from the Action would be most likely to occur where human presence is concentrated or prolonged, such as the drill sites and facilities at the Central Pad. However, we expect that these effects will be reduced by following protocols to minimize waste that may attract predators, as described in the Point Thomson Project BA, and the applicant's compliance with existing and future authorizations issued under the MMPA.

Summary of potential effects to the Terrestrial Denning Unit –While adverse effects may occur, they are not expected to substantially impact the conservation role of the Terrestrial Denning Unit because: 1) we expect development in areas where topographic relief produces optimal denning habitat, such as river and coastal bluffs to be very limited; 2) terms and conditions associated with authorizations under the MMPA, and measures in the Point Thomson Project Polar Bear and Wildlife Interaction plan would minimize the level of persistent disturbance that may result from the Action; and 3) the scale of the potentially affected area would be small relative to the extent of the Terrestrial Denning Unit such that the function of the unit as a whole would not be compromised.

Effects on barrier island habitat

Although no activities are proposed on barrier islands, the West and Central pads, most of the infield gathering lines, portions of the gravel access roads, the onshore disposal location of material produced by dredging and screeding, and barge route corridors and entrances would be located within barrier island habitat because they would occur in the water, ice, and terrestrial habitat within 1.6 km (1 mi) of barrier islands[11]. Thus, project activities could interfere with the conservation role of barrier island habitat including denning, refuge from human disturbance, and movements along the coast to access maternal den and optimal feeding habitat.

[11] The terrestrial portion of the affected barrier island habitat overlaps with the Terrestrial Denning Unit discussed in the previous section.

Effects to barrier island habitat would occur through direct fill and through disturbance. As discussed above, disturbance may affect critical habitat if it persists and affects the critical habitat's conservation role. The Service has identified refuge from human disturbance as a feature of the barrier island habitat PCE essential to the conservation of polar bears. Because human activities are expected to routinely occur within the footprint of the project during and after construction, we anticipate that the Proposed Action would result in persistent human disturbance that is likely to adversely affect the intended conservation role of the Barrier Island Unit. However, we anticipate that adverse effects related to disturbance from construction and operations would be minor because the spatial scale of the project is not large enough to substantially interfere with polar bear movements along the coast to access maternal den and optimal feeding habitat in the vicinity of Barter Island. Disturbance from barges would be intermittent and would not cause a persistent disturbance.

Summary of effects to the Barrier Island Unit – The Proposed Action will affect the Barrier Island Unit through long-term habitat loss and persistent human disturbance associated with construction and operation of the Central and West Pads. This disturbance, however, is not expected to substantially impact the conservation role of the Barrier Island Unit because the scale of the potentially affected area would be small relative to the extent of the Barrier Island Unit, such that effects to the function of the unit as a whole would be small.

Hazing of polar bears may interfere with the ability of polar bears to use a portion of all three critical habitat units within the Action Area. However, given the scale of these units compared to the potentially-affected area, we expect the lack of use of critical habitat in the Action Area attributed to hazing would be small relative to the extent of critical habitat, such that effects to its function as a whole would be small.

Interdependent and Interrelated Effects

An interrelated action depends on the Proposed Action for its justification; an interdependent action has no independent utility apart from the action under consultation. Implementation of the Proposed Action may facilitate the additional development related to extraction of hydrocarbon resources on the North Slope, such as future drill sites; however, the Service has not identified specific actions that are interdependent on or interrelated to the Proposed Action.

9. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the Action Area considered in this BO. Future Federal actions that are unrelated to the Proposed Action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. When analyzing cumulative effects of a Proposed Action, it is important to define both the spatial (geographic), and temporal (time) boundaries. Within these boundaries, the types of actions that are reasonably foreseeable are considered.

Future development by the State of Alaska or the North Slope Borough may occur in the area. However, the majority of the Action Area, and the undeveloped lands surrounding are wetlands, and are therefore subject to Section 404 permitting requirements by the USACE. This permitting process would serve as a Federal nexus, and hence trigger a review of any major state or borough construction project in the area.

10. CONCLUSION

Regulations (51 CFR 19958) that implement section 7(a)(2) of the ESA define "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 C.F.R. 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete our analysis with respect to critical habitat.

Spectacled Eiders

In evaluating the impacts of the proposed project to spectacled eiders, the Service identified direct and indirect adverse effects that could result from habitat loss and disturbance. Using methods and logic explained in the *Effects of the Action* section, the Service estimates up to 14 nests could be lost from long-term habitat loss over an assumed 33-year project life. Loss of production over the life of the project is estimated 55 spectacled eider eggs/ducklings, based on these 14 nests. However, we expect this loss of production will not have a significant effect at the population level because only a small proportion of spectacled eider eggs or ducklings on the North Slope would eventually survive to recruit into the breeding populations. Thus, the loss of eggs or ducklings is of much lower significance for survival and recovery of spectacled eiders than the death of an adult bird. For example, spectacled eider nest success recorded on the YKD ranged from 18-73% (Grand and Flint 1997). From the nests that survived to hatch, spectacled eider duckling survival to 30-days ranged from 25-47% on the YKD (Flint et al. 2000). Over-winter survival of one-year old spectacled eiders was estimated at 25% (P. Flint pers. comm.), with annual adult survival of 2-year old birds (that may enter the breeding population) of 80% (Grand et al. 1998). Combining these estimates, we estimate that 0.9–6.6% of eggs/ducklings would be expected to survive and recruit into the breeding population.

If we also apply these rates to the estimated loss of production for the Point Thomson Project, we would expect the project may preclude up to 0.5–3.6 adults (≤ 2 breeding pairs) from entering the North Slope population over a 33-year project life. The population of North Slope-breeding spectacled eiders was last estimated at 12,916 (10,942–14,890, 95% CI; Stehn et al. 2006) for the period of 2002–2006. Applying the methods of Stehn et al. (2006) to more recent aerial survey data from the North Slope results in an estimate of 11,254 (8,338–14,167, 95% CI) for the period of 2007–2010.

Given the potential loss of recruitment of ≤4 adult eiders is very small compared to the estimated population size and this loss would be distributed across 33 years, we believe the loss of production that may result from the Point Thomson Project will not significantly affect the likelihood of survival and recovery of spectacled eiders. Accordingly, it is the Service's biological opinion that the Proposed Action is not likely to jeopardize the continued existence of the spectacled eider or prevent its survival and recovery in the wild.

Polar Bears

We have assessed potential impacts to polar bears to ensure activities that may result from the Action do not jeopardize the continued existence of the species as required under section 7(a)(2) of the ESA. As described in the *Effects of the Action*, activities that may result from the Action could adversely affect polar bears through disturbance, an increase in polar bear-human interactions, and habitat loss. A small number of polar bears may also be adversely affected through disturbance or polar bear-human interactions which may include intentional take. These adverse effects are expected to impact only the SBS polar bear stock and lethal impacts are not anticipated. Given that we expect disturbance and polar bear-human interactions to be non-lethal and that habitat loss would be minor, we do not expect population-level impact to occur as a result of the Proposed Action. Therefore, we conclude that the Proposed Action is not likely to jeopardize the continued existence of the polar bear or prevent its survival and recovery in the wild.

Polar Bear Critical Habitat

After considering the status of polar bear critical habitat, the environmental baseline, cumulative effects, and effects of the Proposed Action on each PCE, we conclude the Proposed Action may adversely affect, but is not likely to destroy or adversely modify, polar bear critical habitat. This conclusion was based on the following factors:

Proposed activities will primarily occur in terrestrial habitats, but could also include a sea ice road in one or more winters that would temporarily alter sea ice habitat. Because the potentially affected area of the Sea Ice Unit is small and effects would not persist beyond the winters during which a sea ice road is constructed, we do not expect adverse effects to the Sea Ice Unit.

Adverse effects of the Proposed Action are not expected to substantially impact the conservation role of the Terrestrial Denning Unit because: 1) we expect development in areas where topographic relief produces optimal denning habitat, such as river and coastal bluffs to be limited; 2) terms and conditions associated with authorizations under the MMPA would minimize the level of persistent disturbance that may result from the Proposed Action; and 3) the scale of the potentially affected area would be small relative to the extent of the Terrestrial Denning Unit such that the function of the unit as a whole would not be compromised.

Although no activities are proposed on barrier islands, the Proposed Action will affect Barrier Island Unit through long-term habitat and persistent human disturbance

associated with construction and operation of the Central and West Pads. These adverse effects are not expected to substantially impact the conservation role of the Barrier Island Unit because the scale of the potentially affected area would be small relative to the extent of the Barrier Island Unit such that the function of the unit as a whole would not be compromised.

Future Consultation

These non-jeopardy and non-adverse modification conclusions are based on the assumption that the USACE and their agents will consult with the Service on future activities related to the Point Thomson Project that are not evaluated in this document.

In addition to listed eiders and polar bears, the area affected by the Point Thomson Project may now or hereafter contain plants, animals, or their habitats determined to be threatened or endangered. The Service, through future consultation may recommend alternatives to future developments within the project area to prevent activity that will contribute to a need to list such a species or their habitat. The Service may require alternatives to proposed activity that is likely to result in jeopardy to the continued existence of a proposed or listed threatened or endangered species or result in the destruction or adverse modification of designated or proposed critical habitat. The Federal action agencies should not authorize any activity that may affect such species or critical habitat until it completes its obligations under applicable requirements of the ESA as amended (16 U.S.C. 1531 et seq.), including completion of any required procedure for conference or consultation.

11. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. "Harm" is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action, is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement (ITS).

USACE has a continuing duty to regulate the activity covered by this Incidental Take Statement (ITS). If USACE (1) fails to assume and implement the terms and conditions or (2) fails to require any applicant to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the permit document, the protective coverage of section 7(o)(2) may lapse.

Polar Bears
The Service is not providing incidental take authorization for polar bears at this time because the incidental take has not been authorized under section 101(a)(5) of the Marine Mammal Protection Act and/or its 1994 Amendments. Following issuance of such regulations or authorizations, the Service may issue an incidental take statement for polar bears, as appropriate.

Similarly, this document cannot authorize incidental take for activities that may result in intentional take of polar bears authorized under sections 101(a)(4)(A), 109(h), and 112(c) of the MMPA. Authorization of intentional harassment will be subject to subsequent review under the ESA.

We anticipate authorization for incidental take under the MMPA will be available for the Proposed Action in the form of Letters of Authorization (LOAs) issued pursuant to the Beaufort Sea (76 FR 47010) Incidental Take Regulations (ITRs). We have estimated that approximately 57 bears observed would likely exhibit no change in their behavior. We estimated that 13 bears would likely exhibit some form of short-term behavioral response due to human activity in the Action Area. Of those animals exhibiting a behavioral response, we estimated 10 polar bears would likely be deterred throughout the Action Area.

Spectacled Eiders
As described in Section 5, *Effects of the Action*, the activities described and assessed in this BO may adversely affect spectacled eiders through direct and indirect long-term habitat loss. Long-term habitat loss would occur directly from placement of gravel fill and indirectly through disturbance associated with facility operations and pipeline maintenance. Methods used to estimate loss of spectacled eider production resulting from long-term habitat loss are described in the *Effects of the Action* section. Based on these estimates of loss of spectacled eider production, the Service anticipates that up to *55 spectacled eider eggs or ducklings* may be taken as a result of the Proposed Action through long-term direct and indirect habitat loss.

While the incidental take statement provided in this consultation satisfies the requirements of the ESA, it does not constitute an exemption from the prohibitions of take of listed migratory birds under the more restrictive provisions of the Migratory Bird Treaty Act. However, the Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703–712), if such take is in compliance with the terms and conditions specified herein.

12. REASONABLE AND PRUDENT MEASURES

These reasonable and prudent measures (RPMs) and their implementing terms and conditions (T&Cs) aim to minimize the incidental take anticipated from activities described in this BO.

Polar Bears
This Action may result in the incidental and intentional take of polar bears. The following RPM is provided to reduce the likelihood that polar bear movements will be affected; and reduce the likelihood of human-polar bear interactions, including hazing and the use of projectiles.

RPM 1 – The barge offloading area, which connects the Central Pad with the Bulkhead and Pier, will be kept free of material except while barges are being loaded or offloaded when this area may be used for short term (< 24 hour) storage of cargo. This area will not be used for long term storage of cargo, equipment, or materials. When large modules are offloaded it may be necessary to store material for longer than 24 hours, however, this will be infrequent and ExxonMobil will provide the FWS a report when this occurs.

Spectacled Eiders
As described in *Section 8 – Incidental Take Statement*, activities conducted by the USACE and their agents are anticipated to lead to incidental take of spectacled eiders through long-term habitat loss and disturbance of nesting females during the life of the project.

RPM 2 – Breeding spectacled eiders may remain on the tundra in the Action Area through late August, but are most vulnerable to disturbance through the early brood-rearing stage. Accordingly, off-pad activities such as pipeline maintenance within the Action Area should not be scheduled between June 1 and July 31. If off-pad activities must be conducted during this time period, ExxonMobil shall consult with USFWS to evaluate potential effects of these activities to spectacled eiders and determine whether additional incidental take authorization and RPMs are required.

13. TERMS AND CONDITIONS

To be exempt from the prohibitions of Section 9 of the ESA, the USACE must comply with the following terms and conditions, which implement the RPMs described above. These terms and conditions are non-discretionary.

T&C 1 – The barge offloading area, which connects the Central Pad with the Bulkhead and Pier, will be kept free of material except while barges are being loaded or offloaded when this area may be used for short term (< 24 hour) storage of cargo. This area will not be used for long term storage of cargo, equipment, or materials. When large modules are offloaded it may be necessary to store material for longer than 24 hours, however, this will be infrequent and ExxonMobil will provide the FWS a report when this occurs. The

report, which shall be included as part of the report of polar bear observations to the Service will briefly describe the type of materials stored, the length of time the offload area was used for storage, and any observations of polar bears which occurred during this time period.

T&C 2 – Off-pad/road activities within the Action Area shall not be scheduled between June 1 and July 31 to the extent practicable. If off-pad/road activities must be conducted during the June 1 – July 31 window, ExxonMobil shall consult with USFWS to evaluate potential effects of these activities to spectacled eiders and determine whether additional incidental take authorization and RPMs are required.

14. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a Proposed Action on listed species or critical habitat, to help implement recovery plans, or to develop information.

Polar Bears:

Because the Central Pad and associated structures are proposed to be located on the coast and will likely interrupt or displace natural polar bear movements, and increase the potential for polar bear-human interactions, and hence the need for hazing and the use of deterrents, we recommend the following actions be implemented:

1. A complete record of polar bear sightings, including the location and track of all bears seen, measures taken to reduce conflict, and other details relevant to quantifying and monitoring polar bear-human interactions, will be kept and provided to the Service's Marine Mammals Management Office in Anchorage by December 31 each year. This will facilitate the tracking of impacts and trends in impacts from disturbances, interactions, and hazing events to inform subsequent adaptive management if necessary.

2. ExxonMobil plans to install a camera surveillance system which aims to detect polar bears in the area and avoid surprise human – polar bear encounters. Monitoring information from this system and other measures will be collected. Therefore, at this time construction of a perimeter fence is not being included as a Reasonable and Prudent Measure. However, if information on polar bear interactions indicates significant impacts or conflict over time, re-initiation of Section 7 consultation may be requested. Additional measures, possibly including the construction and use of a perimeter fence or other methods to avoid significant human-polar bear interactions and hazing of polar bears, may be included as a condition of future LOAs under the MMPA and authorization of take of polar bears under the ESA.

Spectacled Eiders:

3. While no collisions between spectacled eiders and project structures are anticipated, the Service requests all sea duck collisions be reported to the Endangered Species Branch, Fairbanks Fish and Wildlife Field office to improve our understanding of collision risks to listed eiders in the project area.

4. Build all structures associated with the development in such a manner as to discourage nesting of avian predators such as gulls and ravens, and to discourage fox denning.

5. Develop a Predator Management Plan, including a waste management strategy, in collaboration with the Service and Corps.

15. REINITIATION NOTICE

This concludes formal consultation for the Point Thomson Project. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

1. The amount or extent of incidental take for spectacled eiders is exceeded;
2. RPMs and T&Cs are not implemented;
    a. If off-pad activities are proposed between June 1 and July 31st;
3. New information reveals effects of the action agency that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion;
    a. If the amount of incidental take or deterrence of polar bears exceeds levels estimated in this analysis;
    b. If observations collected at Point Thomson indicate that the level of interaction with polar bears, especially the need for hazing, is increasing significantly over time, or is resulting in chronic or repeated interference with normal behavior, in the Action area.
4. The agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat not considered in this opinion; or
5. A new species is listed or critical habitat is designated that may be affected by the action.

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