Alaska Outer Continental Shelf

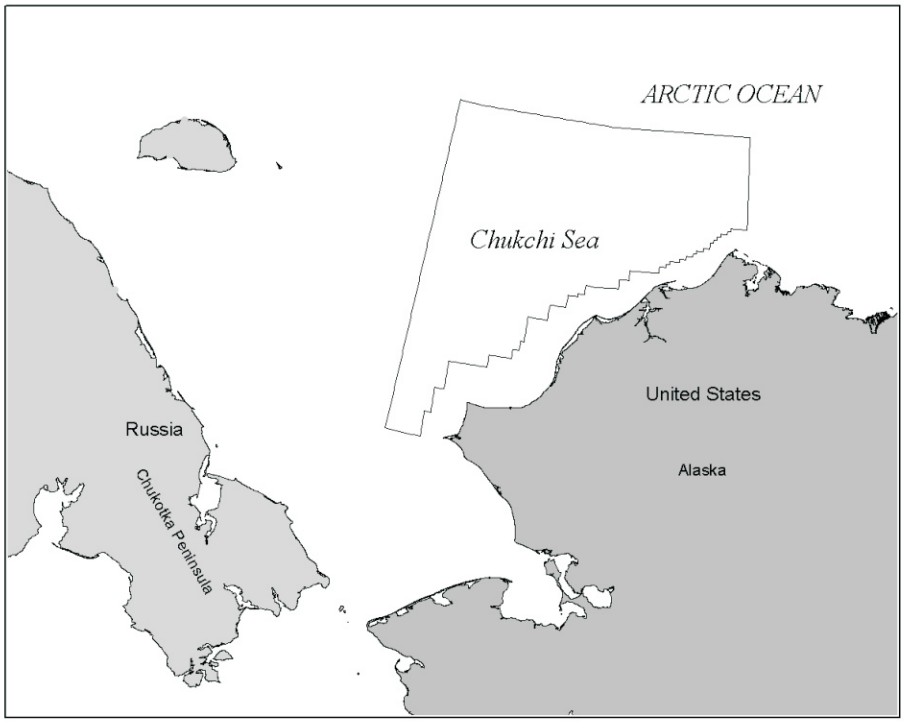
OCS EIS/EA
MMS 2007-026

# Chukchi Sea Planning Area

## Oil and Gas Lease Sale 193 and Seismic Surveying Activities in the Chukchi Sea

Final Environmental
Impact Statement

Volume III
Tables, Figures, Maps, Appendices, and Bibliography




MMS
U.S. Department of the Interior
Minerals Management Service
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## Volume III
(Tables, Figures, Maps, Appendices, and Bibliography)

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**Minerals Management Service**
**Alaska OCS Region**

May 2007

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# Tables, Figures, and Maps

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**Table III.A-1**
**Community Climate Data**

| Community | Temperature Range | Average Precipitation | Normal Snow Cover |
|---|---|---|---|
| **Point Hope** | -49 to 78 ºF | 10.0 inches | 36 inches |
| **Point Lay** | -55 to 78 ºF | 6.9 inches | 21 inches |
| **Wainwright** | -56 to 80 ºF | 5.0 inches | 12 inches |
| **Barrow** | -56 to 78 ºF | 5.0 inches | 20 inches |

**Source**:
Alaska Department of Commerce, Community Online Database

**Table III.A-2**
**Temperature Trend for Barrow and Kotzebue (1949-2004)**

| Station Location | Long-term mean, °F (1949 - 2004) | | | | | Total change, °F (1949 - 2004) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Annual | Spring | Summer | Autumn | Winter | Annual | Spring | Summer | Autumn | Winter |
| **Barrow** | 10.0 | 1.7 | 37.4 | 15.2 | -14.2 | 3.4 | 4.3 | 2.6 | 1.2 | 5.5 |
| **Kotzebue** | 21.8 | 15 | 50.0 | 24.7 | - 2.5 | 3.3 | 2.4 | 2.5 | 1.0 | 7.4 |

**Source:**
http://climate.gi.alaska.edu/ClimTrends/Change/4904Change.html.

**Notes** : Barrow is located at 71°17'N, 156°46' W at an elevation of 30.8 ft and Kotzebue is located at 66°53'N, 162°32' W at an elevation of 9.8 ft.

**Table III.A-3**
**Mean Occurrence Dates (1996-2004) for Landfast Ice Conditions**

| | Eicken et al., 2006 | | Barry et al., 1979 | | |
|---|---|---|---|---|---|
| | | Zone 1 | Central Chukchi Sea | Central Beaufort Sea | |
| **First Ice*** | **Mean** | Dec 01 | Early November | Mid-October | First continuous fast ice |
| | **σ'** | 31.8 | | | |
| **Stable Ice** | **Mean** | Feb 23 | February | January February | Stable ice inside of 15-m isobath |
| | **σ'** | 41.9 | | | |
| **Breakup** | **Mean** | Jun 04 | June 10 | June 30 | First openings and movement |
| | **σ'** | 13.9 | | | |
| **Ice Free** | **Mean** | Jun 18 | July 05 | August 01 | Nearshore largely free of fast ice |
| | **σ'** | 12.7 | | | |

**Source:**
Eicken et al. (2006); Barry et al. (1979).

**Table III.A-4**
**Mean and Maximum Polynya Widths**

| Year | Mean Polynya Width | | Maximum Polynya Width | |
|---|---|---|---|---|
| | SSMI/I, km | W/C, km | SSMI/I, km | W/C, km |
| 1990 | 33 | 8 | 94 | 37 |
| 1991 | 15 | 13 | 49 | 61 |
| 1992 | 29 | 11 | 151 | 39 |
| 1993 | 20 | 14 | 81 | 37 |
| 1994 | 39 | 12 | 138 | 50 |
| 1995 | 10 | 11 | 29 | 47 |
| 1996 | 22 | 12 | 128 | 42 |
| 1997 | 15 | 14 | 38 | 60 |
| 1998 | 15 | 15 | 54 | 47 |
| 1999 | 30 | — | 114 | — |
| 2000 | 20 | — | 72 | — |
| 2001 | 27 | — | 75 | — |
| 9-year mean | 21.9 | 12.2 | 84.6 | 46.7 |
| 9-year σ | ±9.8 | ±2.1 | ±45.8 | ±9.1 |
| 12-year mean | 22.9 | — | 85.2 | — |
| 12-year σ | ±8.8 | — | ±40.3 | — |

**Source:**
Martin et al., (2004).

**Table III.A-5**
**Ambient Air Quality Standards Relevant to the Chukchi Sea Planning Area**

| Ambient Air Quality Standards | | | | |
|---|---|---|---|---|
| **Pollutant** | **Averaging Period[1]** | **Alaska Standards** | **National Standards[2]** | **Standard Type** |
| **Carbon Monoxide** | 8-hour | 10 mg/m$^3$ | 9 ppm (10 mg/m$^3$) | Primary |
| | 1-hour | 40 mg/m$^3$ | 35 ppm(40 mg/m$^3$) | Primary |
| **Nitrogen Dioxide** | Annual | 100 µg/m$^3$ | .053 ppm (100 µg/m$^3$) | Primary & Secondary |
| **Ozone** | 1-hour | 235 µg/m$^3$ | — | — |
| | 8-hour | — | .08 ppm (157 µg/m$^3$) | Primary & Secondary |
| **Lead** | Quarterly | 1.5 µg/m$^3$ | 1.5 µg/m$^3$ | Primary & Secondary |
| **Particulate Matter (PM10)** | Annual | 50 µg/m$^3$ | 50 µg/m$^3$ | Primary & Secondary |
| | 24-hour | 150 µg/m$^3$ | 150 µg/m$^3$ | Primary & Secondary |
| **Particulate Matter (PM2.5)** | Annual | — | 15 µg/m$^3$ | Primary & Secondary |
| | 24-hour | — | 65 µg/m$^3$ | Primary & Secondary |
| **Sulfur Dioxide** | Annual | 80 µg/m$^3$ | .03 ppm (80 µg/m$^3$) | Primary |
| | 24-hour | 365 µg/m$^3$ | .014 ppm (365 µg/m$^3$) | Primary |
| | 3-hour | 1300 µg/m$^3$ | .5 ppm (1300 µg/m$^3$) | Secondary |
| **Reduced Sulfur Compounds** | 30-minute | 50 µg/m$^3$ | — | — |
| **Ammonia** | 8-hour | 2.1 µg/m$^3$ | — | — |

**Source:**
State of Alaska, Dept. of Environmental Conservation (2005), 18 AAC 50.010; U.S. Environmental Protection Agency (40 CFR Part 50)

**Notes:**
(a dash [—] indicates that no standards have been established)
mg/m$^3$ = milligrams per cubic meter
µg/m$^3$ = micrograms per cubic meter

**Footnotes:**
[1]National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth high 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. For $PM_{10,}$ the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m$^3$ is ≤1. For $PM_{2.5}$, the 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard.
[2]Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25 °C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25 °C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

**Table III.A-6**
**Measured Air-Pollutant Concentrations at Prudhoe Bay, Alaska 1986-1996**

| Pollutant[1] | Monitor Sites | | | | | |
|---|---|---|---|---|---|---|
| | A[2] | B[3] | C[4] | D[5] | National Standards[6] | Class II Increments[7] |
| **Ozone** | | | | | | |
| Annual Max. 1 hr | 115.8 | 180.3 | 115.6 | 100.0 | 235 | — |
| **Nitrogen Dioxide** | | | | | | |
| Annual | 26.3 | 11.9 | 16.0 | 4.9 | 100 | 25 |
| **Inhalable Particulate Matter ($PM_{10}$)** | | | | | | |
| Annual | — | — | 10.5 | — | 50 | 17 |
| Annual Max. 24 hr | 29.3 | — | 25.0 [8] | — | 150 | 30 |
| **Sulfur Dioxide** | | | | | | |
| Annual | 2.6 | — | 5.2 | 2.6 | 80 | 20 |
| Annual Max. 24 hr | 10.5 | — | 26.2[8] | 13.1 | 365 | 91 |
| Annual Max. 3 hr | 13.1 | — | 44.5 | 55.0 | 1,300 | 512 |
| **Carbon Monoxide** | | | | | | |
| Annual Max. 8 hr | — | — | 1,400 | — | 10,000 | — |
| Annual Max. 1 hr | — | — | 2,500 [8] | — | 40,000 | — |

**Sources:**
ERT Company, Inc. (1987); Environmental Science and Engineering (1987); ENSR, (1996), as cited in U.S. Army Corps of Engineers (1999)

**Note:**
(measured in micrograms per cubic meter; absence of data is indicated by a dash [—])

**Footnotes:**
[1]Lead was not monitored.
[2]Site CCP (Central Compressor Plant), Prudhoe Bay monitoring program, selected for maximum pollutant concentrations. All data are for years 1992-1996.
[3]Site Pad A (Drill Pad A), Prudhoe Bay monitoring program, site of previous monitoring, selected to be more representative of the general area or neighborhood.
All data are for years 1992-1996.
[4]Site CPF-1 (Central Processing Facility), Kuparuk monitoring program, selected for maximum pollutant concentrations. Ozone, nitrogen dioxide, and sulfur dioxide are for years 1990-1992; $PM_{10}$ and carbon monoxide data are for 1986-1987.
[5]Site DS-1F, Kuparuk monitoring program site selected to be representative of the general area or neighborhood. All data are for years 1990-1992.
[6]Applicable National Ambient Air Quality Standards. Please refer to Table III.A-5 for more specific definitions of air quality standards.
[7]Class II PSD Standard Increments.
[8]Second highest observed value (in accordance with approved procedures for determining ambient air quality).

**Table III.A-7**
**A Comparison of Most Common Sound Levels from Various Sources[1]**

| Source | Activity | dB at Source |
|---|---|---|
| **Vessel Activity** | | |
| | Tug Pulling Barge | 171 |
| | Fishing Boats | 151-158 |
| | Zodiac (outboard) | 156 |
| | Supply Ship | 181 |
| | Tankers | 169-180 |
| | Supertankers | 185-190 |
| | Freighter | 172 |
| **Ice Breaking** | | |
| | Ice-Management | 171-191 |
| | Ice-Breaking[2] | 193 |
| **Dredging** | | |
| | Clamshell Dredge | 150-162 |
| | Aquarius (cutter suction dredge) | 185 |
| | Beaver Mackenzie Dredge | 172 |
| **Drilling** | | |
| | Kulluk (conical drill ship) – drilling | 185 |
| | Explorer II (drill ship) - drilling | 174 |
| | Artificial Island – drilling | 125 |
| | Ice Island (in shallow water) – drilling | 86 |
| **Seismic and Acoustics** | | |
| | Airgun Arrays | 235-259 |
| | Single Airguns | 216-232 |
| | Vibroseis | 187-210 |
| | Water Guns | 217-245 |
| | Sparker | 221 |
| | Boomer | 212 |
| | Depth Sounder | 180 |
| | Sub-bottom Profiler | 200-230 |
| | Side-scan Sonar | 220-230 |
| | Military | 200-230 |
| **Ambient Noise** | | |
| | Ambient Noise[3] | 65-133 |

**Sources:**
[1] Richardson et.al, (1995).
[2] Robert Lemeur.
[3] Burgess and Green, (1999).

**Table III-B-1**
**Fish Resources of Arctic Alaska**

| Fish Species | | | | Distribution by Large Marine Ecosystem | |
|---|---|---|---|---|---|
| **Order** | **Family** | **Species Name** | **Common Name** | **Beaufort Sea** | **Chukchi Sea** |
| **Petromyzontiformes** | | | | | |
| | **Petromyzontidae (lampreys)** | *Lampetra tridentata* | Pacific lamprey | — | R |
| | | *Lampetra camtschatica* | Arctic lamprey | W | W |
| **Squaliformes** | | | | | |
| | **Dalatiidae (sleeper sharks)** | *Somniosus pacificus* | Pacific sleeper shark | — | W |
| | **Squalidae (dogfish sharks)** | *Squalus acanthias* | spiny dogfish | — | R |
| **Clupeoiformes** | | | | | |
| | **Clupeidae (herrings)** | *Clupea pallasii* | Pacific herring | W | W |
| **Osmeriformes** | | | | | |
| | **Osmeridae (smelts)** | *Mallotus villosus* | capelin | W | W |
| | | *Osmerus mordax* | rainbow smelt | W | W |
| **Salmoniformes** | | | | | |
| | **Salmonidae/Coregoninae (whitefishes)** | *Stenodus leucichthys* | inconnu | R | — |
| | | *Coregonus sardinella* | least cisco | W | W |
| | | *Coregonus autumnalis* | Arctic cisco | W | — |
| | | *Coregonus laurettae* | Bering cisco | W | W |
| | | *Coregonus nasus* | broad whitefish | W | W |
| | | *Coregonus pidschian* | humpback whitefish | W | W |
| | **Salmonidae/Salmoninae (trouts and salmons)** | *Salvelinus alpinus* | Arctic char | W | W |
| | | *Salvelinus malma* | Dolly Varden | W | W |
| | | *Oncorhynchus gorbuscha* | pink salmon | W | W |
| | | *Oncorhynchus kisutch* | coho salmon | R | W |
| | | *Oncorhynchus tshawytscha* | Chinook salmon | R | W |
| | | *Oncorhynchus keta* | chum salmon | W | W |
| | | *Oncorhynchus nerka* | sockeye salmon | R | W |
| **Myctophiformes** | | | | | |
| | **Myctophidae (lanternfishes)** | *Benthosema glaciale* | glacier lanternfish | R | — |
| **Gadiformes** | | | | | |
| | **Gadidae (cods)** | *Boreogadus saida* | Arctic cod | W | W |
| | | *Arctogadus glacialis* | polar cod | R | — |
| | | *Arctogadus borisovi* | toothed cod | R | — |
| | | *Eleginus gracilis* | saffron cod | W | W |
| | | *Theragra chalcogramma* | walleye pollock | — | W |
| | | *Gadus ogac* | ogac | W | — |

**Table III.B-1**
**Fish Resources of Arctic Alaska (continued)**

| Fish Species | | | | Distribution by Large Marine Ecosystem | |
|---|---|---|---|---|---|
| **Order** | **Family** | **Species Name** | **Common Name** | **Beaufort Sea** | **Chukchi Sea** |
| **Gasterosteiformes** | | | | | |
| | **Gasterosteidae (sticklebacks)** | *Gasterosteus aculeatus* | threespine stickleback | R | R |
| | | *Pungitius pungitius* | ninespine stickleback | W | W |
| **Scorpaeniformes** | | | | | |
| | **Hexagrammidae (greenlings)** | *Hexagrammos stelleri* | whitespotted greenling | U-R | W |
| | **Cottidae (sculpins)** | *Triglops pingelii* | ribbed sculpin | W | W |
| | | *Hemilepidotus papilio* | butterfly sculpin | — | W |
| | | *Hemilepidotus jordani* | yellow Irish lord | — | R |
| | | *Icelus spatula* | spatulate sculpin | W | W |
| | | *Icelus bicornis* | twohorn sculpin | R | — |
| | | *Gymnocanthus tricuspis* | Arctic staghorn sculpin | W | W |
| | | *Cottus aleuticus* | coastrange sculpin | — | LD |
| | | *Enophrys diceraus* | antlered sculpin | — | W |
| | | *Megalocottus platycephalus* | belligerent sculpin | — | W |
| | | *Myoxocephalus quadricornis* | fourhorn sculpin | W | W |
| | | *Myoxocephalus scorpius* | shorthorn sculpin | W | W |
| | | *Myoxocephalus scorpioides* | Arctic sculpin | W | W |
| | | *Myoxocephalus jaok* | plain sculpin | — | W |
| | | *Microcottus sellaris* | brightbelly sculpin | — | R |
| | | *Artediellus gomojunovi* | spinyhook sculpin | R | R |
| | | *Artediellus scaber* | hamecon | W | W |
| | | *Artediellus pacificus* | hookhorn sculpin | — | R |
| | | *Artediellus ochotensis* | Okhotsk hookear sculpin | — | R |
| | **Hemitripteridae (sailfin sculpins)** | *Blepsias bilobus* | crested sculpin | — | W |
| | | *Nautichthys pribilovius* | eyeshade sculpin | — | W |
| | **Psychrolutidae (fathead sculpins)** | *Eurymen gyrinus* | smoothcheek sculpin | — | R |
| | | *Cottunculus sadko* | Sadko sculpin | R | — |
| | **Agonidae (poachers)** | *Hypsagonus quadricornis* | fourhorn poacher | — | R |
| | | *Pallasina barbata* | tubenose poacher | — | R |
| | | *Occella dodecaedron* | Bering poacher | — | R |
| | | *Leptagonus decagonus* | Atlantic poacher | R | R |
| | | *Podothecus veternus* | veteran poacher | U-R | R/P |

**Table III.B-1**
**Fish Resources of Arctic Alaska (continued)**

| Fish Species | | | | Distribution by Large Marine Ecosystem | |
|---|---|---|---|---|---|
| **Order** | **Family** | **Species Name** | **Common Name** | **Beaufort Sea** | **Chukchi Sea** |
| **Scorpaeniformes (continued)** | | | | | |
| | **Agonidae (poachers) (continued)** | *Ulcina olrikii* | Arctic alligatorfish | W | W |
| | | *Aspidophoroides monopterygius* | alligatorfish | — | LD |
| | **Cyclopteridae (lumpsuckers)** | *Eumicrotremus derjugini* | leatherfin lumpsucker | R/P | — |
| | | *Eumicrotremus andriashevi* | pimpled lumpsucker | — | R |
| | **Liparidae (snailfishes)** | *Liparis gibbus* | variegated snailfish | W | W |
| | | *Liparis tunicatus* | kelp snailfish | W | W |
| | | *Liparis bristolensis* | Bristol snailfish | — | R |
| | | *Liparis fabricii* | gelatinous seasnail | R/P | — |
| | | *Liparis callyodon* | spotted snailfish | — | W |
| **Perciformes** | | | | | |
| | **Zoarcidae (eelpouts)** | *Gymnelus hemifasciatus* | halfbarred pout | R/P | R/P |
| | | *Gymnelus viridis* | fish doctor | R/P | R/P |
| | | *Lycodes seminudus* | longear eelpout | R | — |
| | | *Lycodes mucosus* | saddled eelpout | R | R |
| | | *Lycodes turneri* | estuarine eelpout | R | W |
| | | *Lycodes polaris* | polar eelpout | W | W |
| | | *Lycodes raridens* | marbled eelpout | — | W |
| | | *Lycodes rossi* | threespot eelpout | R | R |
| | | *Lycodes sagittarius* | archer eelpout | R | — |
| | | *Lycodes palearis* | wattled eelpout | — | W |
| | | *Lycodes pallidus* | pale eelpout | R | — |
| | | *Lycodes squamiventer* | scalebelly eelpout | R | — |
| | | *Lycodes eudipleurostictus* | doubleline eelpout | R | — |
| | | *Lycodes concolor* | ebony eelpout | — | R |
| | **Stichaeidae (pricklebacks)** | *Eumesogrammus praecisus* | fourline snakeblenny | W | W |
| | | *Stichaeus punctatus* | Arctic shanny | W | W |
| | | *Chirolophis snyderi* | bearded warbonnet | — | R |
| | | *Leptoclinus maculatus* | daubed shanny | R | R |
| | | *Anisarchus medius* | stout eelblenny | W | W |
| | | *Lumpenus fabricii* | slender eelblenny | W | W |
| | **Pholidae (gunnels)** | *Pholis fasciata* | banded gunnel | — | R |
| | **Anarhichadidae (wolffishes)** | *Anarhichas orientalis* | Bering wolffish | W | W |
| | **Ammodytidae (sand lances)** | *Ammodytes hexapterus* | Pacific sand lance | W | W |

**Table III.B-1**
**Fish Resources of Arctic Alaska (continued)**

| Fish Species | | | | Distribution by Large Marine Ecosystem | |
|---|---|---|---|---|---|
| **Order** | **Family** | **Species Name** | **Common Name** | **Beaufort Sea** | **Chukchi Sea** |
| **Pleuronectiformes** | | | | | |
| | **Pleuronectidae (righteye flounders)** | *Hippoglossus stenolepis* | Pacific halibut | — | U-R |
| | | *Hippoglossoides robustus* | Bering flounder | — | W |
| | | *Reinhardtius hippoglossoides* | Greenland halibut | R | U-P |
| | | *Platichthys stellatus* | starry flounder | W | W |
| | | *Pleuronectes quadrituberculatus* | Alaska plaice | — | W |
| | | *Pleuronectes glacialis* | Arctic flounder | W | W |
| | | *Limanda proboscidea* | longhead dab | — | W |
| | | *Limanda aspera* | yellowfin sole | — | W |
| | | *Limanda sakhalinensis* | Sakhalin sole | — | U-R |

**Sources:**
Mecklenburg, Mecklenburg, and Thorsteinson, (2002); Stevenson, et al., (2004).
.
**Notes:**
**Distribution Keys**

**LD** = Limited distribution relative to available biotope (e.g., continental slope)
**R** = Rare (<5 records) and disjunct
**E** = Rare and endemic species
**RS** = Rare species known occurring only in one LME
**R/P** = Rare and patchy
**U-R** = Unverified record-rare and disjunct
**U-P** = Unverified and patchy
**W** = Widespread
— = Undocumented, no verified records

**Table III.B-2**
**Arctic Fish Occurrence in Coastal and Marine Waters of the Alaskan Chukchi and Beaufort Seas**

| | | | Freshwater | | Brackish | | | Marine | | | | | | | | | Behavioral Stratification | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Nearshore | | | Neritic | | | | | | Oceanic | | | | | | | | | |
| Species | Common Name | Principle Environment | Fluvial | Lacustrine | Estuarine | Intertidal | 0-2m (Infralittoral Fringe) | 1-50m | 51-100m | 101-200m | 201-300m | 301-500m | 501-700m | 701-1000m | 1001-3000m | >3000m | Demersal | Bathydemersal | Bentho-Pelagic | 1-200m (epipelagic) | (mesopelagic) | >1000m (bathypelagic) | cryopelagic |
| *Lampetra tridentata* | Pacific lamprey | A | X | X | X | X | X | X | X | X | X | — | — | — | — | — | X | — | — | — | — | — | — |
| *Lampetra camtschatica* | Arctic lamprey | A | X | X | X | X | X | X | X | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Somniosus pacificus* | Pacific sleeper shark | M | — | — | — | — | X | X | X | X | X | X | X | X | X | X | — | X | — | — | — | — | — |
| *Squalus acanthias* | spiny dogfish | M | — | — | — | — | X | X | X | X | X | X | X | X | X | X | — | X | — | — | — | — | — |
| *Clupea pallasii* | Pacific herring | M | — | — | — | X | X | X | X | X | X | — | — | — | — | — | — | — | — | — | — | — | — |
| *Mallotus villosus* | capelin | M | — | — | — | X | X | X | X | X | X | — | — | — | — | — | — | — | — | — | — | — | — |
| *Osmerus mordax* | rainbow smelt | A | X | — | — | X | X | X | X | X | X | — | — | — | — | — | — | — | — | — | — | — | — |
| *Stenodus leucichthys* | inconnu | FW/A | X | X | X | X | X | X | X | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Coregonus sardinella* | least cisco | A | X | X | X | X | X | X | X | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| *Coregonus autumnalis* | Arctic cisco | A | X | X | X | X | X | X | X | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| *Coregonus laurettae* | Bering cisco | A | X | — | — | X | X | X | X | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| *Coregonus nasus* | broad whitefish | FW/A | X | X | X | X | X | X | — | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Coregonus pidschian* | humpback whitefish | A | X | — | — | X | X | X | — | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Salvelinus alpinus* | Arctic char | A/FW | X | X | X | X | X | X | X | — | — | — | — | — | — | — | — | X | — | — | — | — | — |
| *Salvelinus malma* | Dolly Varden | A | X | X | X | X | X | X | X | X | X | — | — | — | — | — | — | X | — | — | — | — | — |
| *Oncorhynchus gorbuscha* | pink salmon | A | X | — | — | X | X | X | X | X | X | X | — | — | — | — | — | X | — | — | — | — | — |
| *Oncorhynchus kisutch* | coho salmon | A | X | — | — | X | X | X | X | X | X | X | — | — | — | — | — | X | — | — | — | — | — |
| *Oncorhynchus tshawytscha* | Chinook salmon | A | X | — | — | X | X | X | X | X | X | X | — | — | — | — | — | X | — | — | — | — | — |
| *Oncorhynchus keta* | chum salmon | A | X | — | — | X | X | X | X | X | — | — | — | — | — | — | — | X | — | — | — | — | — |
| *Oncorhynchus nerka* | sockeye salmon | A | X | X | X | X | X | X | X | X | X | X | — | — | — | — | — | X | — | — | — | — | — |
| *Benthosema glaciale* | glacier lanternfish | M | — | — | — | — | — | — | — | — | — | X | X | X | X | X | — | — | — | — | — | — | — |
| *Boreogadus saida* | Arctic cod | M | — | — | — | X | — | — | X | X | X | X | X | X | X | — | — | X | — | — | — | — | — |
| *Arctogadus glacialis* | polar cod | M | — | — | — | — | — | — | X | X | X | X | X | X | X | — | — | X | — | — | — | — | — |
| *Arctogadus borisovi* | toothed cod | B/M | — | — | — | — | — | — | X | X | X | — | — | — | — | — | — | X | — | — | — | — | — |
| *Eleginus gracilis* | saffron cod | M | X | — | — | X | X | X | X | X | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Theragra chalcogramma* | walleye pollock | M | — | — | — | — | — | — | — | X | X | X | X | X | X | X | X | X | — | — | — | — | — |
| *Gadus ogac* | ogac | M | — | — | — | — | — | X | X | X | X | — | — | — | — | — | X | X | — | — | — | — | — |
| *Gasterosteus aculeatus* | threespine stickleback | A/FW | X | X | X | X | X | X | X | X | X | X | X | X | X | — | X | X | — | — | — | — | — |
| *Pungitius pungitius* | ninespine stickleback | A/FW | X | X | X | X | X | X | X | X | — | — | — | — | — | — | X | — | X | — | — | — | — |
| *Hexagrammos stelleri* | whitespotted greenling | M | — | — | — | X | X | X | X | X | X | — | — | — | — | — | X | — | — | — | — | — | — |
| *Triglops pingelii* | ribbed sculpin | M | – | – | – | – | – | X | X | X | X | X | – | – | – | – | X | – | – | – | – | – | – |
| *Hemilepidotus papilio* | butterfly sculpin | M | – | – | – | X | X | X | X | X | X | X | – | – | – | – | X | – | – | – | – | – | – |
| *Hemilepidotus jordani* | yellow Irish lord | M | – | – | – | – | – | X | X | X | X | X | – | – | – | – | X | – | – | – | – | – | – |
| *Icelus spatula* | spatulate sculpin | M | – | – | – | – | – | X | X | X | X | X | – | – | – | – | X | – | – | – | – | – | – |
| *Icelus bicornis* | twohorn sculpin | M | – | – | – | – | – | X | X | X | – | – | – | – | – | – | X | – | – | – | – | – | – |

**Table III.B-2**
**Arctic Fish Occurrence in Coastal and Marine Waters of the Alaskan Chukchi and Beaufort Seas. (continued)**

| | | | Freshwater | | Brackish | | | Marine | | | | | | | | | Behavioral Stratification | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Nearshore | | | Neritic | | | | | | Oceanic | | | | | | | | | |
| Species | Common Name | Principle Environment | Fluvial | Lacustrine | Estuarine | Intertidal | 0-2m (Infralittoral Fringe) | 1-50m | 51-100m | 101-200m | 201-300m | 301-500m | 501-700m | 701-1000m | 1001-3000m | >3000m | Demersal | Bathydemersal | Bentho-Pelagic | 1-200m (epipelagic) | 201-1000m (mesopelagic) | >1000m (bathypelagic) | cryopelagic |
| *Gymnocanthus tricuspis* | Arctic staghorn sculpin | M | — | — | — | — | — | X | X | X | X | — | — | — | — | — | X | — | — | — | — | — | — |
| *Cottus aleuticus* | coastrange sculpin | B/FW | X | X | X | X | X | — | — | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Enophrys diceraus* | antlered sculpin | M | — | — | — | — | — | X | X | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Megalocottus platycephalus* | belligerent sculpin | B | X | — | X | X | X | X | — | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Myoxocephalus quadricornis* | fourhorn sculpin | B/M/FW | X | — | X | X | X | X | — | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Myoxocephalus scorpius* | shorthorn sculpin | B/M | — | — | X | X | X | X | X | X | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Myoxocephalus scorpioides* | Arctic sculpin | B/M | — | — | X | X | X | X | — | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Myoxocephalus jaok* | plain sculpin | M | — | — | — | X | X | X | X | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Microcottus sellaris* | brightbelly sculpin | B/M | — | — | — | — | — | X | X | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Artediellus gomojunovi* | spinyhook sculpin | M | — | — | — | — | — | X | X | X | X | X | — | — | — | — | X | — | — | — | — | — | — |
| *Artediellus scaber* | hamecon | B/M | — | — | — | — | — | X | X | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Artediellus pacificus* | hookhorn sculpin | M | — | — | — | — | — | X | X | X | X | — | — | — | — | — | X | — | — | — | — | — | — |
| *Artediellus ochotensis* | Okhotsk hookear sculpin | M | — | — | — | — | — | X | X | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Blepsias bilobus* | crested sculpin | M | — | — | — | — | — | X | X | X | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Nautichthys pribilovius* | eyeshade sculpin | M | — | — | — | — | — | X | X | X | X | X | — | — | — | — | X | — | — | — | — | — | — |
| *Eurymen gyrinus* | smoothcheek sculpin | M | — | — | — | — | — | X | X | X | X | X | — | — | — | — | X | — | — | — | — | — | — |
| *Cottunculus sadko* | Sadko sculpin | M | — | — | — | — | — | — | — | — | X | X | X | X | — | — | X | — | — | — | — | — | — |
| *Hypsagonus quadricornis* | fourhorn poacher | M | — | — | — | — | — | X | X | X | X | X | — | — | — | — | X | — | — | — | — | — | — |
| *Pallasina barbata* | tubenose poacher | M | — | — | — | X | X | X | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| *Occella dodecaedron* | Bering poacher | M | — | — | — | — | — | X | — | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Leptagonus decagonus* | Atlantic poacher | M | — | — | — | — | — | X | X | X | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Podothecus veternus* | veteran poacher | M | — | — | — | — | — | X | X | X | X | — | — | — | — | — | X | — | — | — | — | — | — |
| *Ulcina olrikii* | Arctic alligatorfish | B/M | — | — | — | — | — | X | X | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Aspidophoroides monopterygius* | alligatorfish | M | — | — | — | — | — | X | X | X | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Eumicrotremus derjugini* | leatherfin lumpsucker | M | — | — | — | — | — | — | X | X | X | — | — | — | — | — | X | — | — | — | — | — | — |
| *Eumicrotremus andriashevi* | pimpled lumpsucker | M | — | — | — | — | — | X | X | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Liparis gibbus* | variegated snailfish | M | — | — | — | — | — | X | X | X | X | — | — | — | — | — | X | — | — | — | — | — | — |
| *Liparis tunicatus* | kelp snailfish | M | — | — | — | — | — | X | X | X | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Liparis bristolensis* | Bristol snailfish | M | — | — | — | — | — | X | X | — | — | — | — | — | — | — | X | — | — | — | — | — | — |
| *Gymnelus viridis* | fish doctor | M | – | – | – | X | X | X | X | X | X | – | – | – | – | – | X | – | – | – | – | – | – |
| *Lycodes seminudus* | longear eelpout | M | – | – | – | – | – | – | – | X | X | X | X | – | – | – | X | – | – | – | – | – | – |
| *Lycodes mucosus* | saddled eelpout | M | – | – | – | – | – | X | X | – | – | – | – | – | | – | X | – | – | – | – | – | – |
| *Lycodes turneri* | estuarine eelpout | M | – | – | – | – | – | X | X | X | – | – | – | – | – | – | X | – | – | – | – | – | – |
| *Lycodes polaris* | polar eelpout | M | – | – | – | – | – | X | X | X | – | – | – | – | – | – | X | – | – | – | – | – | – |

**Table III.B-2**

**Arctic Fish Occurrence in Coastal and Marine Waters of the Alaskan Chukchi and Beaufort Seas. (continued)**

| | | | Freshwater | | Brackish | | | Marine | | | | | | | | | Behavioral Stratification | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Nearshore | | | Neritic | | | | | | Oceanic | | | | | | | | | |
| **Species** | **Common Name** | **.Principle Environment** | **Fluvial** | **Lacustrine** | **Estuarine** | **Intertidal** | **0-2m (Infralittoral Fringe)** | **1-50m** | **51-100m** | **101-200m** | **201-300m** | **301-500m** | **501-700m** | **701-1000m** | **1001-3000m** | **>3000m** | **Demersal** | **Bathydemersal** | **Bentho-Pelagic** | **1-200m (epipelagic)** | **201-1000m (mesopelagic)** | **>1000m (bathypelagic)** | **cryopelagic** |
| *Lycodes raridens* | marbled eelpout | M | – | – | – | – | – | X | X | X | – | – | – | – | – | – | X | – | – | – | – | – | – |
| *Lycodes rossi* | threespot eelpout | M | – | – | – | – | – | X | X | X | X | X | – | – | – | – | X | – | – | – | – | – | – |
| *Lycodes sagittarius* | archer eelpout | M | – | – | – | – | – | – | – | – | – | X | X | – | – | – | X | – | – | – | – | – | – |
| *Lycodes palearis* | wattled eelpout | M | – | – | – | – | – | X | X | X | – | – | | – | – | – | X | – | – | – | – | – | – |
| *Lycodes pallidus* | pale eelpout | M | – | – | – | – | – | X | X | X | X | X | X | X | X | – | X | X | – | – | – | – | – |
| *Lycodes squamiventer* | scalebelly eelpout | M | – | – | – | – | – | – | – | – | – | X | X | X | X | – | X | X | – | – | – | – | – |
| *Lycodes eudipleurostictus* | doubleline eelpout | M | – | – | – | – | – | X | X | X | X | – | – | – | – | – | X | – | – | – | – | – | – |
| *Lycodes concolor* | ebony eelpout | M | – | – | – | – | – | X | X | X | X | X | X | X | X | – | X | X | – | – | – | – | – |
| *Eumesogrammus praecisus* | fourline snakeblenny | M | – | – | – | – | – | X | X | X | X | X | | – | – | – | X | – | – | – | – | – | – |
| *Stichaeus punctatus* | Arctic shanny | M | – | – | – | – | – | X | X | – | – | – | – | – | – | – | X | – | – | – | – | – | – |
| *Chirolophis snyderi* | bearded warbonnet | M | – | – | – | – | – | X | X | – | – | – | – | – | – | – | X | – | – | – | – | – | – |
| *Leptoclinus maculatus* | daubed shanny | M | – | – | – | – | – | X | X | X | X | X | – | – | – | – | X | – | – | – | – | – | – |
| *Anisarchus medius* | stout eelblenny | M | – | – | – | – | – | X | X | X | – | – | – | – | – | – | X | – | – | – | – | – | – |
| *Lumpenus fabricii* | slender eelblenny | M | – | – | – | X | X | X | X | – | – | – | | – | – | – | – | – | X | – | – | – | – |
| *Pholis fasciata* | banded gunnel | M | – | – | – | – | – | X | – | – | – | – | – | – | | – | X | – | – | – | – | – | – |
| *Anarhichas orientalis* | Bering wolffish | M | – | – | – | – | – | X | – | – | – | – | – | – | – | – | X | – | – | – | – | – | – |
| *Ammodytes hexapterus* | Pacific sand lance | M | – | – | – | X | X | X | X | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| *Hippoglossus stenolepis* | Pacific halibut | M | – | – | – | – | – | X | X | X | X | X | X | X | X | – | X | – | – | – | – | – | – |
| *Hippoglossoides robustus* | Bering flounder | M | – | – | – | – | – | X | X | X | X | X | – | – | – | – | X | – | – | – | – | – | – |
| *Reinhardtius hippoglossoides* | Greenland halibut | M | – | – | – | | – | X | X | X | X | X | X | X | X | – | X | – | – | – | – | – | – |
| *Platichthys stellatus* | starry flounder | M/B | X | – | X | X | X | X | X | X | X | X | – | – | – | – | X | – | – | – | – | – | – |
| *Pleuronectes quadrituberculatus* | Alaska plaice | M | – | – | – | – | – | X | X | X | X | X | – | – | – | – | X | – | – | – | – | – | – |
| *Pleuronectes glacialis* | Arctic flounder | B/M | X | – | X | – | X | X | – | – | – | – | – | – | – | – | X | – | – | – | – | – | – |
| *Limanda proboscidea* | longhead dab | M | X | – | X | – | X | X | – | – | – | – | – | – | – | – | X | – | – | – | – | – | – |
| *Limanda aspera* | yellowfin sole | M | X | – | X | – | X | X | X | X | X | X | X | – | – | – | X | – | – | – | – | – | – |
| *Limanda sakhalinensis* | Sakhalin sole | M | X | – | X | – | X | X | X | X | – | X | – | X | – | – | X | – | – | – | – | – | – |

**Sources:**

Moulton and George,(2000); Mecklenburg, Mecklenburg, and Thorsteinson, et al., (2002); Froese and Pauly, (2003).

**Notes:**

| | | |
|---|---|---|
| – = Absent | **B** = Brackish | **M** = Marine |
| **A** = Anadromous | **FW** = Freshwater | **X** = Present |

**Table III.C-1**
**Estimated Number of Jobs by Sector, North Slope Borough Residents Only**

| | 1980 | 1988 | 1993 | 1998 | 2003 |
|---|---|---|---|---|---|
| Federal Government | 100 | 83 | 37 | 39 | 61 |
| State Government | 12 | 20 | 25 | 35 | 26 |
| City Government | — | 71 | 61 | 57 | 66 |
| NSB Government | 642 | 1,087 | 893 | 989 | 777 |
| NSB School District | — | 419 | 345 | 289 | 409 |
| Private Construction | 201 | 95 | 21 | 66 | 43 |
| Regional/Village Corporation | | 311 | 304 | 407 | 383 |
| Transportation | 107 | 122 | 45 | 43 | 53 |
| Oil Industry | 30 | 46 | 21 | 16 | 23 |
| Service | 71 | 84 | 53 | 83 | 108 |
| Other | 176 | 168 | 138 | 368 | 242 |
| **Total** | **1,689** | **2,506** | **1,943** | **2,392** | **2,191** |

**Sources:**

1980 data from Alaska Consultants, Inc., (1981); 1988, 1993, 1998, and 2003 data are from North Slope Borough Economic Profile and Census Reports.

**Note:**

**NSB** = North Slope Borough

**Table III.C-2**
**Employment of Residents by Sector, North Slope Communities, 2003**

| Sector | Anaktuvuk Pass | Atqasuk | Barrow | Kaktovik | Nuiqsut | Point Hope | Point Lay | Wainwright |
|---|---|---|---|---|---|---|---|---|
| Federal Government | 1 | 0 | 45 | 1 | 0 | 10 | 2 | 2 |
| State Government | 2 | 0 | 22 | 0 | 1 | 0 | 1 | 0 |
| City Government | 12 | 1 | 21 | 3 | 5 | 14 | 2 | 8 |
| NSB Government | 51 | 20 | 464 | 27 | 29 | 44 | 24 | 48 |
| NSB School District | 30 | 20 | 194 | 21 | 27 | 62 | 29 | 44 |
| NSB CIP | 0 | 0 | 4 | 0 | 2 | 0 | 1 | 3 |
| Oil Industry | 3 | 0 | 14 | 1 | 3 | 2 | 0 | 0 |
| Private Construction | 4 | 0 | 23 | 5 | 3 | 1 | 4 | 4 |
| ASRC | 3 | 0 | 69 | 5 | 3 | 1 | 4 | 3 |
| Village Corporation | 19 | 27 | 87 | 18 | 37 | 60 | 9 | 38 |
| Finance | 0 | 0 | 5 | 0 | 0 | 0 | 1 | 0 |
| Transportation | 0 | 0 | 48 | 0 | 1 | 3 | 1 | 1 |
| Communication | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 |
| Trade | 0 | 1 | 27 | 0 | 0 | 2 | 0 | 1 |
| Service | 4 | 0 | 103 | 0 | 0 | 0 | 1 | 0 |
| Ilkisagvik College | 0 | 0 | 58 | 0 | 0 | 2 | 1 | 1 |
| Other | 2 | 3 | 132 | 3 | 10 | 25 | 5 | 18 |
| **Total** | **131** | **72** | **1,324** | **84** | **121** | **226** | **85** | **171** |

**Source:**

2003 Economic Profile and Census Report, Volume IX, Department of Planning and Community Service North Slope Borough.

**Table III.C-3**
**Employment Estimates (In thousands) (nonagricultural wage and salary employment)**

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2005 |
|---|---|---|---|---|---|---|---|
| Anchorage-Mat Su Region | 131 | 132 | 135 | 141 | 144 | 148 | 157 |
| Kenai Peninsula Borough | 16 | 16 | 16 | 17 | 17 | 17 | 16 |
| Fairbanks North Star Borough | 31 | 31 | 32 | 33 | 33 | 34 | 36 |
| Total for 3 Areas | 178 | 178 | 183 | 191 | 194 | 199 | 209 |
| **Alaska Total** | **261** | **261** | **269** | **275** | **278** | **284** | **292** |

**Source:**
Alaska Department of Labor and Workforce Development, Research and Analysis Section.

**Table III.C-4**
**Annual Bowhead Whale Subsistence Harvest for Chukchi Sea Villages, 1982-2005**

| Year | Barrow | Wainwright | Point Hope | Kivalina |
|---|---|---|---|---|
| 1982 | 0 | 2 | 1 | 0 |
| 1983 | 2 | 2 | 1 | 0 |
| 1984 | 4 | 2 | 2 | 1 |
| 1985 | 5 | 2 | 1 | 0 |
| 1986 | 8 | 3 | 2 | 0 |
| 1987 | 7 | 4 | 5 | 1 |
| 1988 | 11 | 4 | 5 | 0 |
| 1989 | 10 | 2 | 0 | 0 |
| 1990 | 11 | 5 | 3 | 0 |
| 1991 | 12 | 4 | 6 | 1 |
| 1992 | 22 | 0 | 2 | 1 |
| 1993 | 23 | 5 | 2 | 0 |
| 1994 | 16 | 4 | 5 | 2 |
| 1995 | 19 | 5 | 1 | 1 |
| 1996 | 24 | 3 | 3 | 0 |
| 1997 | 30 | 3 | 4 | 0 |
| 1998 | 25 | 3 | 3 | 0 |
| 1999 | 24 | 5 | 2 | 0 |
| 2000 | 18 | 5 | 3 | 0 |
| 2001 | 27 | 6 | 4 | 0 |
| 2002 | 22 | 1 | 0 | 0 |
| 2003 | 16 | 5 | 4 | 0 |
| 2004 | 21 | 4 | 3 | 0 |
| 2005 | 29 | 3 | 7 | 0 |

**Sources:**
S.R. Braund and Assocs. (1984); Stoker and Krupnik, (1993); AEWC, (1993), (1994), (1995); Philo et al., (1994); Suydam et al., (1995); S.R. Braund and Assocs. (2002); S.R. Braund and Assocs. and North Slope Borough Department of Wildlife Management, (2006).

**Table III.C-5**
**Annual Beluga Whale Harvest for Barrow, Wainwright, Point Lay, Point Hope, and Kivalina, 1980-2005**

| Year | Number of Whales | | | | |
|---|---|---|---|---|---|
| | Barrow | Wainwright | Point Lay | Point Hope | Kivalina |
| 1980 | 0 | 0 | 15-18 | 23-35 | 3-5 |
| 1981 | 5 | 0 | 29-38 | 4-7 | 10-15 |
| 1982 | 3-5 | 0 | 28-33 | 17 | 4-5 |
| 1983 | 3 | 0 | 18 | 20-31 | 24 |
| 1984 | 0 | 0 | 0 | 30 | 27 |
| 1985 | 0 | 0 | 18 | 30 | 120-200 |
| 1986 | 0 | 5 | 33 | 30 | 7 |
| 1987 | 0 | 47 | 22-35 | 40 | 4 |
| 1988 | 0 | 3 | 40 | 59 | 6 |
| 1989 | 1 | 0 | 16 | 17 | 0 |
| 1990 | 0 | 0 | 62 | 16 | 1 |
| 1991 | 1 | 5 | 35 | 39 | 1 |
| 1992 | 0 | 20 | 24 | 15 | 10 |
| 1993 | 2 | 0 | 77 | 79 | 3 |
| 1994 | 5 | 0 | 56 | 53 | 3 |
| 1995 | 0 | 0 | 31 | 40 | 3 |
| 1996 | 2 | 0 | 41 | 15 | 7 |
| 1997 | 8 | 4 | 3 | 32 | 1 |
| 1998 | 1 | 38 | 48 | 52 | 0 |
| 1999 | 1 | 3 | 47 | 33 | 1 |
| 2000 | 1 | 0 | 0 | 16 | 44 |
| 2001 | 1 | 23 | 34 | 24 | 0 |
| 2002 | 1 | 37 | 47 | 23 | 3 |
| 2003 | 2 | 38 | 36 | 34 | 0 |
| 2004 | 1 | 0 | 53 | 29 | 1 |
| 2005 | 7 | 1 | 41 | ? | 2 |

**Sources:**
Alaska Beluga Whale Committee [ABWC], (2002), (2006); Fuller and George, (1997); Lowry et al., (1989); Burns and Frost, (1989); Impact Assessment, (1989); Burns and Seaman, (1986); Braund and Burnham, (1984).

**Table III.C-6**
**Annual Walrus Harvest for Barrow, Wainwright, Point Lay, Point Hope, and Kivalina, 1985-2005**

| Harvest Season | Number of Walrus | | | | |
|---|---|---|---|---|---|
| | Barrow | Wainwright | Point Lay | Point Hope | Kivalina |
| 1985 | -- | -- | -- | -- | -- |
| 1986 | -- | -- | -- | -- | -- |
| 1987 | 54 | -- | 6 | -- | -- |
| 1988 | 1-62 | 0-59 | 0 | -- | -- |
| 1989 | 14 | 43 | 0 | 2 | 46 |
| 1990 | 7 | 0 | 0 | 5 | 0 |
| 1991 | 23 | 32 | 0 | 0 | 0 |
| 1992 | 26 | 48 | 0 | 5 | 1 |
| 1993 | 27 | 44 | 1 | 5 | 12 |
| 1994 | 16 | 68 | 1 | 6 | 16 |
| 1995 | 12 | 83 | 4 | 0 | 38 |
| 1996 | 13 | 24 | 4 | 0 | 13 |
| 1997 | 48 | 50 | 7 | 3 | 2 |
| 1998 | 24 | 69 | 8 | 5 | 0 |
| 1999 | 17 | 48 | 6 | 5 | 0 |
| 2000 | 19 | 36 | 6 | 6 | 0 |
| 2001 | 37 | 94 | 3 | 2 | 0 |
| 2002 | 39 | 119 | 11 | 16 | 0 |
| 2003 | 51 | 29 | 9 | 12 | 0 |
| 2004 | 52 | 47 | 5 | 20 | 0 |
| 2005 | 5 | 21 | 5 | 0 | 4 |

**Sources**:
USDOI, FWS, (1997), (2002); FWS, MTRP Tagging Database, 1989-2005; Braund, (1993); Braund and Burnham, (1984); CPDB, (1996); Fuller and George, (1997).

**Table III.C-7**
**Annual Polar Bear Harvest for Barrow, Wainwright, Point Lay, Point Hope, and Kivalina, 1983-2005**

| Harvest Season* | Number of Bears | | | | |
|---|---|---|---|---|---|
| | Barrow | Wainwright | Point Lay | Point Hope | Kivalina |
| 1983/84 | 27 | 34 | 8 | 30 | 3 |
| 1984/85 | 33 | 18 | 0 | 18 | 3 |
| 1985/86 | 14 | 8 | 6 | 17 | 2 |
| 1986/87 | 18 | 13 | 4 | 13 | 1 |
| 1987/88 | 15 | 9 | 2 | 9 | 5 |
| 1988/89** | 29 | 14 | 2 | 9 | 1 |
| 1989/90 | 14 | 9 | 1 | 23 | 5 |
| 1990/91 | 14 | 6 | 3 | 18 | 3 |
| 1991/92 | 22 | 3 | 0 | 9 | 2 |
| 1992/93 | 26 | 8 | 3 | 17 | 1 |
| 1993/94 | 30 | 10 | 1 | 8 | 1 |
| 1994/95 | 11 | 7 | 1 | 20 | 2 |
| 1995/96 | 18 | 14 | 1 | 7 | 0 |
| 1996/97 | 40 | 9 | 6 | 14 | 0 |
| 1997/98 | 18 | 6 | 3 | 12 | 0 |
| 1998/99 | 16 | 2 | 0 | 18 | 3 |
| 1999/00 | 17 | 5 | 4 | 10 | 0 |
| 2000/01 | 28 | 10 | 1 | 15 | 1 |
| 2001/02 | 25 | 2 | 1 | 9 | 0 |
| 2002/03 | 20 | 5 | 1 | 12 | 1 |
| 2003/04 | 10 | 13 | 3 | 10 | 0 |
| 2004/05 | 2 | 5 | 4 | 9 | 2 |
| 2005/06*** | ? | ? | ? | ? | ? |

**Source:**
Schliebe, Amstrup, and Garner, (1995); Schliebe, (2006).

**Notes:**
* Harvest runs from 1 July to 30 June.
** Atqasuk harvested 2 bears during the 1988/89 season.
*** Harvest season incomplete.

**Table III.C-8**
**Breakdown of Total Harvest by Subsistence-Harvest Category for Point Hope, Alaska, 1992.**
**The 1993 Population of Point Hope was 699; The Total Number of Households was 156**

| Subsistence Harvest Category | Total Weight | Pounds Per Household | Pounds Per Capita |
|---|---|---|---|
| Birds | 9,429 | 60 | 13 |
| Fish | 30,589 | 196 | 44 |
| Invertebrates | 88 | 1 | 0 |
| Marine Mammals | 262,009 | 1,680 | 375 |
| Plants | 2,720 | 17 | 4 |
| Terrestrial Mammals | 35,548 | 228 | 51 |
| Total | 340,383 | 2,182 | 487 |

**Source:**
Fuller and George, (1997).

**Table III.C-9**
**Top Five Species Harvested at Point Hope, Alaska during Calendar Year, 1992**

| Top Five Species Harvested | Edible Pounds Harvested | Number Harvested | Pounds Per Household | Pounds Per Capita | Percent of Total Harvest |
|---|---|---|---|---|---|
| Beluga | 137,172 | 98 | 879 | 196 | 40.3% |
| Walrus | 55,797 | 72 | 358 | 80 | 16.4% |
| Bearded Seal | 28,242 | 160 | 181 | 40 | 8.3% |
| Caribou | 26,303 | 225 | 169 | 38 | 7.7% |
| Bowhead | 23,365 | 3 | 150 | 33 | 6.9% |

**Source:**
Fuller and George, (1997).

**Table III.C-10**
**Participation in Subsistence Harvest Activities, Point Hope Alaska, 1992, of 156 Households, 142 Households Participated in This Survey**

| | Number of Households | | | | Percent of Households | | | |
|---|---|---|---|---|---|---|---|---|
| **Activity** | **Often** | **Sometimes** | **Vacation** | **Not at All** | **Often** | **Sometimes** | **Vacation** | **Not at All** |
| Fall Whaling | 4 | 5 | 0 | 133 | 3% | 4% | 0% | 94% |
| Fish | 86 | 29 | 1 | 26 | 61% | 20% | 1% | 18% |
| Helped Whaling Crew | 92 | 27 | 2 | 21 | 55% | 19% | 1% | 15% |
| Hunt Caribou | 71 | 27 | 1 | 43 | 50% | 19% | 1% | 30% |
| Hunt Moose, Bear, or Sheep | 35 | 27 | 2 | 78 | 25% | 19% | 1% | 55% |
| Hunt Seal | 78 | 29 | 0 | 35 | 55% | 20% | 0% | 25% |
| Hunt Walrus | 70 | 33 | 0 | 39 | 49% | 23% | 0% | 27% |
| Hunt Waterfowl and Eggs | 81 | 27 | 1 | 33 | 57% | 19% | 1% | 23% |
| Make Sleds or Boats | 53 | 26 | 0 | 63 | 37% | 18% | 0% | 44% |
| Pick Berries | 81 | 39 | 1 | 21 | 57% | 27% | 1% | 15% |
| Sew Skins, Make Parkas | 49 | 35 | 0 | 58 | 35% | 25% | 0% | 41% |
| Spring Whaling | 98 | 16 | 4 | 24 | 69% | 11% | 3% | 17% |
| Trap | 14 | 22 | 0 | 106 | 10% | 15% | 0% | 75% |

**Source:**
Fuller and George, (1997).

**Table III.C-11**
**Point Hope, Amount of Food Consumed Harvested from Local Sources[1]**

| Amount | 1998 | | 2003 | |
|---|---|---|---|---|
| | **Number** | **Percent** | **Number** | **Percent** |
| None | 4 | 2.9% | 10 | 7.0% |
| Very Little | 11 | 8.2% | 16 | 11.3% |
| Less Than Half | 23 | 17.2% | 23 | 16.2% |
| Half | 34 | 25.4% | 28 | 19.7% |
| More Than Half | 34 | 25.4% | 30 | 21.1% |
| Nearly All | 19 | 14.2% | 15 | 10.6% |
| All | 9 | 6.7% | 20 | 14.1% |
| Total | 134 | 100% | 142 | 100% |

**Source:**
Fuller and George, (1997).
**Note:**
[1] Results include only those households responding to the census survey and the query about the amount of subsistence harvested by the household.

**Table III.C-12**
**Point Hope Money Spent on Subsistence Activities, 2003[1]**

| Amount | Number | Percent |
|---|---|---|
| $0 to $100 | 27 | 22.5% |
| $200 to $400 | 9 | 7.5% |
| $500 to $700 | 10 | 8.3% |
| $800 to $1,200 | 11 | 9.2% |
| $1,200 to $3,000 | 22 | 18.3% |
| $3,100 to $9,500 | 22 | 18.3% |
| $9,600 to $20,000 | 18 | 15.1% |
| $21,000+ | 1 | 0.8% |
| **Total** | **120** | 100% |

**Source:**
Fuller and George, (1997).
**Note:**
[1] Results include only those households responding to the census and the questions about money spent on subsistence activities.

**Table III.C-13a**
**Kivalina Marine Mammal Subsistence Harvests for 1964-1965, 1965-1966, 1982-1983, 1983-1984, and 1991-1992**

| Resource | Number Taken | | | | |
|---|---|---|---|---|---|
| | 1964-1965 | 1965-1966 | 1982-1983 | 1983-1984 | 1991-1992 |
| Bearded seal | 153 | 119 | 134 | 60 | 139 |
| Spotted seal | 4 | 1 | 1 | 1 | 30 |
| Ringed seal | 908 | 467 | 172 | 109 | 110 |
| Ribbon seal | NR | NR | 1 | NR | 8 |
| Walrus | 0 | 3 | 51 | 4 | 28 |
| Beluga | 6 | 12 | 27 | 28 | 10 |
| Bowhead whale [a] | 0 | 0 | 0 | 1 | 1 |
| Gray whale | 0 | 0 | 0 | part of carcass | 0 |
| Polar bear | NR | 1 | NR | 2 | 8 |

**Notes:**
[a] Two additional bowhead whales were taken in 1994.
**NR** None reported

**Table III.C-13b**
**Kivalina Land Mammal Subsistence Harvests for 1964-1965, 1965-1966, 1982-1983, 1983-1984, and 1991-1992**

| Resource | Number Taken | | | | |
|---|---|---|---|---|---|
| | 1964-1965 | 1965-1966 | 1982-1983 | 1983-1984 | 1991-1992 |
| Caribou | 256 | 1,010 | 346 | 564 | 351 |
| Moose | NR | 4 | 6 | 6 | 17 |
| Grizzly | 1 | 2 | NR | 2 | 3 |
| Fox | 6 | 19 | 47 | 58 | 21 |
| Sheep | NR | NR | 2 | NR | U |
| Wolf | 1 | 1 | NR | 1 | 9 |
| Wolverine | 17 | 21 | 12 | 10 | 23 |
| Lynx | NR | 6 | 1 | NR | 0 |
| Porcupine | 1 | 1 | 1 | NR | 0 |
| Mink | NR | 1 | NR | NR | 2 |
| Otter | NR | NR | 1 | NR | 2 |
| Hare | NR | NR | NR | NR | 0 |
| Squirrel | NR | NR | 3 | 53 | 10 |

**Notes:**
**NR** None reported

**Table III.C-13c**
**Kivalina Fish Subsistence Harvests for 1964-1965, 1965-1966, 1982-1983, 1983-1984, and 1991-1992**

| Resource | Pounds Taken | | | | |
|---|---|---|---|---|---|
| | 1964-1965 | 1965-1966 | 1982-1983 | 1983-1984 | 1991-1992 |
| Char | 93,995 | 28,140 | 69,059 | 68,467 | 69,792 |
| Cod | NR | 6,955 | 9 | 4,299 | 6,095 |
| Burbot | NR | 2 | 2 | 2 | 516 |
| Grayling | NR | 40 | 290 | 968 | 644 |
| Salmon | 1,425 | 116 | 464 | 2,107 | 5,081 |
| Whitefish | 2,500 | 13 | 100 | 1,608 | 4,662 |
| Sculpin | ND | ND | 9 | 9 | ND |
| Smelt | ND | ND | ND | 20 | 22 |

**Notes:**
**NR** None reported
**ND** No data collected

**Table III.C-13d**
**Kivalina Bird Subsistence Harvests for 1964-1965, 1965-1966, 1982-1983, 1983-1984, and 1991-1992**

| Resource | 1964-1965 Number Taken | 1965-1966 Number Taken | 1982-1983 Number Taken | 1983-1984 Number Taken | 1991-1992 Number Taken |
|---|---|---|---|---|---|
| Geese | ND | ND | 215 | 387 | 944 |
| Ducks | ND | ND | 134 | 210 | 609 |
| Ptarmigan | ND | 16 | 46 | 242 | 637 |
| Cranes | ND | ND | 4 | 4 | 12 |
| Snowy Owls | ND | ND | 15 | 26 | 29 |
| Swans | ND | ND | 1 | NR | 0 |
| Murres | ND | 10 | ND | 18 | ND |

**Notes:**
**ND** No data collected.
**NR** None reported.

**Table III.C-13e**
**Kivalina Plant Subsistence Harvests for 1964-1965, 1984, 1965-1966. 1982-1983, 1983-1984, and 1991-1992**

| Resource | 1964-1965 lbs taken | 1965-1966 lbs taken | 1982-1983 lbs taken | 1983-1984 lbs taken | 1991-1992 lbs taken |
|---|---|---|---|---|---|
| Blackberries | 550 | 181 | 457 | 591 | See mixed |
| Sourdock | 260 | 213 | 85 | NR | See mixed |
| Eskimo Potato | ND | ND | 40 | NR | See mixed |
| Salmonberries | ND | ND | 1,721 | 14 | See mixed |
| Blueberries | ND | ND | 461 | 488 | See mixed |
| Mixed | 370 (salmonberries, blackberries, sourdock) | 283 (berries) | ND | ND | 4,615 (recorded as berries, not as type) |

**Notes:**
**ND** No data collected.
**NR** None reported.

**Sources of data for Tables III.C-13a-13e:**
Burch, (1985); Alaska Department of Fish and Game Community Profile Database.

**Table III.C-14**
**Importance of Subsistence Foods to Households in NANA Region (Indicated by:**
***"How Much of Your Own Food Did Your Family Catch, Hunt. Or Fish for This Year?"***

| Response | Kivalina | Noatak | Kotzebue |
|---|---|---|---|
| "All of our food" | 5.6% | — | 5.6% |
| "Most of our food" | L6.7% | 57.1% | 14.9% |
| Half of our food" | 38.9% | 28.6% | 16.1% |
| "Some of our food" | 38.9% | 14.3% | 49.1% |
| "None of our food" | — | — | 14.3% |
| **Total** | 100.0% | 100.0% | 100.0% |

**Sources:**
NANA Regional Strategy, Community Survey, 1978, as reported in Red Dog Mine Project EIS, February, 1984; Draft EIS Navigation Improvements Delong Mountain Terminal, Alaska.

**Table III.C-15**
**Ethnic Composition of Barrow, Atqasuk, Wainwright, Point Lay, and Point Hope—Percent by Race**

| | State of Alaska | | Barrow | | Atqasuk | | Wainwright | | Point Lay | | Point Hope | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Population | Percent | Population | Percent | Population | Percent | Population | Percent | Population | Percent | Population | Percent |
| Total | 626,932 | | 4,581 | | 228 | | 546 | | 247 | | 757 | |
| Hispanic or Latino | 25,852 | 4.1 | 153 | 3.3 | 0 | 0.0 | 0 | 0.0 | 6 | 2.4 | 13 | 1.7 |
| Not Hispanic or Latino | 601,080 | 95.9 | 4,428 | 96.7 | 228 | 100 | 546 | 100 | 241 | 97.5 | 744 | 98.2 |
| Population of one race | 570,626 | 91.0 | 4,063 | 88.7 | 227 | 99.6 | 531 | 97.2 | 233 | 94.3 | 728 | 96.1 |
| White | 423,788 | 67.6 | 972 | 21.2 | 11 | 4.8 | 37 | 6.7 | 28 | 11.3 | 66 | 8.7 |
| Black or African-American | 21,073 | 3.4 | 44 | 1.0 | 0 | 0.0 | 1 | 0.2 | 0 | 0.0 | 1 | 0.1 |
| American Indian or Alaska Native | 96,505 | 15.4 | 2,558 | 55.8 | 215 | 94.3 | 493 | 90.2 | 204 | 82.5 | 659 | 87.0 |
| Asian | 24,741 | 3.9 | 429 | 9.4 | 1 | 0.4 | 0 | 0.0 | 1 | 0.4 | 1 | 0.1 |
| Native Hawaiian and Pacific Islander | 3,181 | 0.5 | 59 | 1.3 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| Some other race | 1,388 | 0.2 | 1 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.1 |
| Two or more races | 30,454 | 4.9 | 365 | 8.0 | 1 | 0.4 | 15 | 2.7 | 14 | 5.6 | 29 | 3.8 |

**Source:**
Census Table SF-1, http://146.63.75.45/census2000/Census_Iv2.asp.

**Table III.C-16**
**Population Counts for Native Subsistence-Based Communities in the Arctic Ecoregion; Total American Indian and Alaskan Native Population Percentages**

| Community` | Total Residents | Percent American Indian/Alaska Native |
|---|---|---|
| North Slope Borough | 7,385 | 68.4% |
| Kaktovik | 293 | 74.4 |
| Nuiqsut | 433 | 88.2 |
| Barrow | 4,581 | 57.2 |
| Wainwright | 546 | 90.3 |
| Point Lay | 247 | 82.6 |
| Point Hope | 757 | 87.1 |
| **Northwest Arctic Borough** | 7,208 | 82.5 |
| Kivalina | 377 | 96.6 |
| Kotzebue | 3,082 | 71.2 |
| Noorvik | 634 | 90.1 |
| Buckland | 406 | 95.8 |
| Deering | 136 | 93.4 |
| **Nome Census Area** | 9,196 | 75.2 |
| Diomede | 146 | 92.5 |
| Shismaref | 562 | 93.2 |
| Wales | 152 | 83.6 |

**Source:**
USDOC, Bureau of the Census, (2000).

**Table III.C-17**
**Median Household, Median Family, Per-Capita Incomes; Number of People in Poverty; Percent of the Total Borough or Native Subsistence-based Community Population**

| Community | Median Household Income | Median Family Income | Per-Capita Income | Number of People in Poverty (Percent of Community Population) |
|---|---|---|---|---|
| **North Slope Borough** | $63,173 | $63,810 | $20,540 | 663 (9.1%) |
| Kaktovik | 55,625 | 60,417 | 22,031 | 18 (6.6) |
| Nuiqsut | 48,036 | 46,875 | 14,876 | 10 (2.4) |
| Barrow | 67,097 | 68,203 | 22,902 | 390 (8.6) |
| Wainwright | 54,722 | 58,125 | 16,710 | 70 (12.5) |
| Point Lay | 68,750 | 75,833 | 18,003 | 18 (7.4) |
| Point Hope | 63,125 | 66,250 | 16,641 | 112 (14.8) |
| **Northwest Arctic Borough** | 45,796 | 45,230 | 15,286 | 1,243 (17.4) |
| Kivalina | 30,833 | 30,179 | 8,360 | 99 (26.4) |
| Kotzebue | 57,163 | 58,068 | 18,289 | 401 (13.1) |
| Noorvik | 51,964 | 52,708 | 12,020 | 51 (7.6) |
| Buckland | 38,333 | 40,000 | 9,624 | 49 (11.9) |
| Deering | 33,333 | 43,438 | 11,000 | 8 (5.8) |
| **Nome Census Area** | 41,250 | 44,189 | 15,476 | 1,569 (17.4) |
| Diomede | 23,750 | 24,583 | 9,944 | 56 (35.4) |
| Shishmaref | 30,714 | 29,306 | 10,487 | 89 (16.3) |
| Wales | 33,333 | 39,583 | 14,877 | 28 (18.3) |

**Source**:
USDOC, Bureau of the Census, (2000).

**Table III.C.18**
**Shipwrecks in the Chukchi Sea Planning Area**

| Vessel Name | Type | Tons | Date Wrecked | Location | Cause of Wreck |
|---|---|---|---|---|---|
| ***Caulaincourt*** | French whaling ship | 657 | 9/5/1861 | At Point Belcher | Stove by ice; was quickly full of water and lost. |
| ***Henry Kneeland*** | Whaling ship | 304 | 6/22/1864 | In the Chukchi Sea | Struck an ice cake, filled instantly, and lost. |
| ***Gratitude*** | Whaling bark | 337 | 7/2/1865 | 40 mi from Cape Lisburne | Stove by ice and sank while trying to escape the *C.S.S. Shenandoah* and get into the protection of grounded ice. |
| ***Ontario*** | Whaling bark | 489 | 9/27/1866 | In the Chukchi Sea | Abandoned after colliding with the *Helen Mar* in a gale on September 27, 1866. With the vessel in this damaged condition, the crew refused duty, and she was abandoned with 1,050 barrels of whale oil aboard. |
| ***Hae Hawaii*** | Whaling bark | 368 | 9/22/1868 | In the Seahorse Islands, off Point Franklin | Anchors dragged in a gale and the vessel went ashore and was lost. |
| ***Eagle*** | Whaling bark | 336 | 9/30/1869 | On Seahorse Shoal, off Point Franklin | Grounded and lost; crew rescued by the vessel *John Carver*. |
| ***Almira*** | Whaling ship | 310 | 8/26/1870 | Near Point Barrow | Stove by ice and lost. |
| ***Hibernia*** | Whaling ship | 256 | 8/28/1870 | About 2 mi SW of Point Barrow | Ice stove hole in bow and vessel ran aground. Sold at auction for $150. |
| ***Comet*** | Whaling brig | 255 | 9/2/1871 | Between Point Franklin and Seahorse Islands | Crushed between grounded floe and moving pack ice and lost. |
| ***Roman*** | Whaling bark | 358 | 9/7/1871 | In the Seahorse Islands, off Point Franklin | Crushed between grounded floe and moving pack ice. Vessel sank less than an hour after being carried off by the ice. Crew escaped over the ice. |
| ***Awashonks*** | Whaling bark | 380 | 9/8/1871 | S of Wainwright Inlet | Crushed and lost after being pushed partly onto ice. Wreck was still visible in 1872. |
| ***Julian*** | Whaling ship | 356 | 9/8/1871 | S of Wainwright Inlet | Crushed in ice and abandoned. |
| ***Kohola*** | Whaling brig | 270 | 9/9/1871 | 2 mi NE of Wainwright Inlet | Abandoned after trapped in ice. In 1872, found high and dry S of Point Belcher. |
| ***Carlotta*** | Whaling bark | 480 | 9/12/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. |
| ***Fanny*** | Whaling bark | 391 | 9/13/1871 | 6 mi S of Point Belcher, ¼ mi from shore | Abandoned after trapped in ice and crushed. |
| ***Monticello*** | Whaling bark | 356 | 9/13/1871 | 4 mi S of Point Belcher | Trapped in ice and abandoned. In 1872, hull of vessel was identified; bow and stern were ½ mi apart. |
| ***Champion*** | Whaling ship | 367 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. |
| ***Concordia*** | Whaling bark | 368 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice; burned by Inupiaq Eskimos. |

**Table III.C.18**
**Shipwrecks in the Chukchi Sea Planning Area (continued)**

| Vessel Name | Type | Tons | Date Wrecked | Location | Cause of Wreck |
|---|---|---|---|---|---|
| ***Contest*** | Whaling bark | 341 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. |
| ***Elizabeth Swift*** | Whaling bark | 327 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. |
| ***Emily Morgan*** | Whaling bark | 365 | 9/14/1871 | 1 mi N of Point Belcher | Abandoned after trapped in ice and crushed. By 1872, wreck had drifted 1 mi N of Point Belcher, and in 1873 the wreck was still visible. |
| ***Eugenia*** | Whaling bark | 315 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Ice snapped rudder and vessel was abandoned after it became trapped in ice; it was later crushed. |
| ***Florida*** | Whaling ship | 470 | 9/14/1871 | In the Seahorse Islands, off Point Franklin | Abandoned after trapped in ice and forced ashore by ice. In 1872, the vessel was found ashore at Seahorse Islands and was burned to water's edge by Inupiaq Eskimos. Somme accounts have the vessel drifting N to Barrow. |
| ***Gay Head*** | Whaling ship | 300 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice; in 1872, found burned by Inupiaq Eskimos. |
| ***George*** | Whaling bark | 259 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice and crushed. |
| ***George Howland*** | Whaling bark | 361 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. |
| ***Henry Taber*** | Whaling bark | 296 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. |
| ***James D. Thompson*** | Whaling bark | 432 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. |
| ***John Wells*** | Whaling bark | 357 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. |
| ***Mary*** | Whaling ship | 373 | 9/14/1871 | S of Wainwright Inlet | Abandoned after trapped in ice and crushed. |
| ***Massachusetts*** | Whaling bark | 356 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. In 1872, hull had been carried around Point Barrow by ice. |
| ***Navy*** | Whaling bark | 385 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. |
| ***Oliver Crocker*** | Whaling bark | 305 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. |
| ***Paiea*** | Whaling bark | 386 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. |
| ***Reindeer*** | Whaling ship | 332 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned after trapped in ice. In 1872, found 5 mi S of Point Belcher. |
| ***Seneca*** | Whaling bark | 328 | 9/14/1871 | Point Belcher, near Wainwright Inlet | Abandoned and lost after trapped in ice. Vessel survived the crush of 1871 and was taken in tow by the bark Florence in July 1872. Later, it was cut adrift in bad weather, ran aground, and was lost. |

**Table III.C.18**
**Shipwrecks in the Chukchi Sea Planning Area (continued)**

| Vessel Name | Type | Tons | Date Wrecked | Location | Cause of Wreck |
|---|---|---|---|---|---|
| ***Thomas Dickason*** | Whaling bark | 461 | 9/14/1871 | N of Wainwright Inlet | Abandoned and lost after trapped in ice. In 1872, vessel was found 2 mi N of Wainwright Inlet with water flowing in and out of her. |
| ***Victoria*** | Trading brig | 149 | 9/14/1871 | S of Wainwright Inlet | Abandoned and lost after trapped in ice. |
| ***William Rotch*** | Whaling ship | 290 | 9/14/1871 | S of Wainwright Inlet | Forced ashore by ice and abandoned. |
| ***Roscoe*** | Whaling bark | 313 | 8/19/1872 | Off Point Barrow | Stove while at anchor and abandoned. |
| ***Arctic*** | Whaling bark | 431 | 7/7/1876 | 18 mi from the "Bend" (Point Belcher) | Crushed in ice and abandoned. Crew reached shore and was rescued by the vessel *Onward*. |
| ***Three Brothers*** | Whaling bark | 357 | 9/11/1877 | Off Point Barrow | Abandoned in ice and lost; whale catch saved. |
| ***W.A. Farnsworth*** | Whaling bark | 432 | 9/15/1877 | Near Point Barrow | Stove by ice, filled with water, capsized, and sank. |
| ***William H. Allen*** | Trading brig | 157 | 8/2/1878 | Off Cape Smyth | Stove by ice and sank. |
| ***Florence*** | Whaling bark | 245 | 8/8/1878 | 4 mi S of Point Barrow | Stove by ice and sank. |
| ***Daniel Webster*** | Whaling bark | 327 | 7/12/1881 | 5 mi S of Point Barrow | Crushed by ice and sank rapidly. Crew escaped to Point Barrow and some walked to Icy Cape and sailed in the bark *Coral*. |
| ***North Star*** | Steam whaling bark | 489 | 7/8/1882 | Off Point Barrow, 2 ½ mi from shore | Crushed in ice on her maiden voyage under command of L.C. Owen and the "force of ice was so great that the cracking of her timbers could be heard on shore." Crew made way over ice to U.S. Army Signal Service Station. |
| ***John Howland*** | Whaling bark | 384 | 7/17/1883 | S of Point Hope | Stove by ice and condemned. Boat burned on July 20 and sank on July 21. |
| ***Cyane*** | Whaling bark | 295 | 8/23/1883 | 5 mi NE of Point Belcher | Vessel stranded in fog and heavy SW gale and went to pieces. |
| ***Louisa*** | Whaling bark | 304 | 9/24/1883 | Off Point Hope | Struck ice in a gale and sank. |
| ***Bowhead*** | Steam whaling bark | 533 | 8/11/1884 | Blossom Shoals, near Icy Cape | Made fast to grounded ice to clean boilers. She was truck and holed by a piece of drifting ice and sank quickly. Crew was rescued by the nearby steam whalers *Narwhal* and *Balaena*. |
| ***George and Susan*** | Whaling bark | 343 | 8/10/1885 | 9 mi N of Wainwright Inlet | Driven ashore and wrecked in SW gale after parting anchor chain and colliding with the bark *Mabel*. All crew but 3 rescued by the revenue cutter *Corwin*. |
| ***Mabel*** | Whaling bark | 188 | 8/10/1885 | At Wainwright Inlet | After being fouled by the whaler *George and Susan* in a gale, the vessel went ashore and stranded. It became a total wreck. The revenue cutter *Corwin* tried to get a hawser on board but failed. The *Corwin* was able to rescue the crew. Hulk still on beach in 1886. |

**Table III.C.18**
**Shipwrecks in the Chukchi Sea Planning Area (continued)**

| Vessel Name | Type | Tons | Date Wrecked | Location | Cause of Wreck |
|---|---|---|---|---|---|
| ***Clara Light*** | Whaling schooner/tender | 179 | 8/31/1886 | 15 mi N of Point Franklin | Abandoned in ice and lost. |
| ***Fleetwing*** | Whaling bark | 328 | 8/3/1888 | 1 mi NE of Point Barrow | Chain cable parted in heavy SW gale and vessel went ashore on shoal. Ship was abandoned by crew, sold at auction, and gear salvaged. Remains were burned by Inupiaq Eskimos on August 15. |
| ***Mary and Susan*** | Whaling bark | 327 | 8/3/1888 | 4 mi S of Point Barrow | Lost on outlying reef in a gale. Crew rescued by the cutter *Bear* the same day. Vessel burned on August 4. |
| ***Ino*** | Schooner | 98 | 8/8/1888 | At Cape Smyth | Driven ashore in sudden SW gale and stranded when anchors dragged. |
| ***Ohio*** | Whaling bark | 206 | 10/3/1888 | At Point Hope | The *Ohio* was driven onto the beach in a heavy gale and snowstorm and grounded. The vessel broke up and was a total loss. After 8 months, some of the crew were rescued; 25 were lost. |
| ***Thomas Pope*** | Whaling bark/tender | 226 | 7/28/1890 | Off Point Hope | Masts were cut away in a gale. Vessel was stove by ice and stranded. Crew and cargo were taken off by steamer *William Lewis* and brig *F.A. Barstow*. |
| ***Spy*** | Sloop | 17 | 11/25/1890 | At Point Barrow | Caught in ice and crushed while heading for winter quarters. |
| ***William Lewis*** | Steam bark | 463 | 10/3/1891 | At Point Barrow | Ran ashore in gale and snowstorm and piled up on a snow covered sand spit at Point Barrow when captain mistook it for slush ice. Crew and cargo rescued by steamer *Navarch.* On March 20, 1892, the wreck was accidentally burned by salvers. |
| ***Emily Schroeder*** | Schooner | ? | 10/13/1893 | Marryatt Inlet, Point Hope Lagoon | Dragged anchor and driven ashore in storm. Seen hard aground as late as 1896. |
| ***Hidalgo*** | Brig | 174 | 7/24/1896 | 8 mi W of Cape Thompson, within 1 mi of Jabbertown | Forced ashore by ice and broken up by sea and ice. Cutter *Bear* took crew to Unalaska. |
| ***Navarch*** | Steam whaling bark | 494 | 8/12/1897 | Off Blossom Shoals, near Icy Cape | Lost off Blossom Shoals but later drifted in ice to Point Barrow. |
| ***Orca*** | Steam whaling bark | 628 | 9/21/1897 | N of Seahorse Islands, off Point Franklin | Ice tore away propeller and rudder and part of the stern was crushed between two immense ice floes. At the time, the Orca was the world's largest steam whaler. The steam whaler *Belvedere* rescued all hands and the crew later walked 100 mi to Barrow to overwinter. |
| ***Jessie H. Freeman*** | Steam whaling bark | 516 | 9/22/1897 | N of Seahorse Islands, off Point Franklin | Crushed in ice and abandoned on September 24. Vessel was later burned accidentally by Inupiaq Eskimos and sank. The crew escaped to the steam whaler *Belvedere* and later walked to Point Barrow to overwinter. |
| ***Rosario*** | Schooner | 141 | 7/2/1898 | ¾ mi SW of Point Barrow | Crushed in pack ice near Point Barrow. Crew rescued by the revenue cutter *Bear.* |
| ***Grampus*** | Steam whaling bark | 326 | 7/18/1901 | Near Point Barrow | Nipped in ice. Vessel was beached and condemned; all hands were saved. |
| ***Laura Madsen*** | Whaling schooner | 345 | 10/14/1905 | At anchorage off Point Barrow | Caught in ice and crushed. |

**Table III.C.18**
**Shipwrecks in the Chukchi Sea Planning Area (continued)**

| Vessel Name | Type | Tons | Date Wrecked | Location | Cause of Wreck |
|---|---|---|---|---|---|
| ***Ivy*** | Schooner | 142 | 9/1/1908 | At Point Barrow | Driven ashore by ice pack. Crew took passage to Seattle on schooner *Volante*. Vessel was salvaged but it sank the next year near Barrow. |
| ***Helen Johnston*** | Gas schooner | 39 | 7/29/1910 | 7 mi E of Point Hope | Pounded to pieces by ice in a strong SE gale. The crew was rescued by the cutter *Bear*. |
| ***Transit*** | Schooner | 547 | 8/25/1913 | 5 mi SW of Cape Smyth | Wrecked when ice pushed it ashore. On July 30, 1914, vessel was located on the beach 10 mi S of Cape Smyth. Captain and crew escaped over the ice to Barrow and returned S on the schooner *Hetty B*. |
| ***Arctic*** | Auxiliary gas schooner | 669 | 8/10/1924 | 16 mi S of Point Barrow | Crushed in ice while on a trading and whaling voyage. The crew was rescued by the vessel *Boxer*. The *Arctic* was the former *H.D. Bendixsen*. |
| ***Lady Kindersly*** | Canadian power schooner | ? | 8/31/1924 | Off Point Barrow | Caught in ice and crushed. Crew rescued by vessel *Boxer*. The ship carried cargo of machinery and stores for northern outposts. |
| ***Lettie*** | Gas screw | 33 | 9/9/1924 | ½ mi NE of Wainwright Inlet and ½ mi from shore | Vessel got out of channel, stranded and was lost. |
| ***Baychimo*** | Canadian trading/supply steamer | 1,322 | 11/24/1931 | Just S of Point Barrow | Caught in ice and abandoned. Vessel drifted for years in Arctic ice, was sighted and even boarded a number of times, but finally disappeared and considered a ghost ship. It was officially listed as lost in 1934. |
| ***Arnold Liebes*** | Gas boat | ? | 1/1/1934 | Off Point Barrow | Wrecked. |
| ***C.B. Brower*** | Gas boat | ? | 1/1/1934 | Off Point Barrow | Wrecked. |
| ***Eli-Yuk*** | Oil screw | 35 | 9/2/1963 | Off Wainwright | Foundered. |
| ***Basil*** | Diesel boat | 28 | 9/7/1950 | At Cape Lisburne | Stranded on the beach and lost. |

**Source:**
USDOI, MMS, Alaska OCS Region, Alaska Shipwreck Database (2007).

**Table IV.A-1**
**Exploration and Development Scenario, Chukchi Sea OCS**

| Scenario Element | Range | Comments |
|---|---|---|
| Oil production (billion barrels) | 1 | First development project only |
| Natural gas production | 0 | Delayed for North Slope gas line; reinjected |
| Exploration wells | 3-6 | 2-5 wells are dry holes or subcommercial shows |
| Delineation wells | 4-8 | Confirm and define the commercial discovery |
| Production platforms | 1 | Central platform with processing facility; supports 4-20 subsea satellite templates |
| Production wells | 80-120 | Total includes 20-80 subsea production wells |
| Service wells | 20-40 | All service wells are on platform |
| In-field flowlines (miles) | 10-50 | Gathering system from subsea wells |
| Offshore sales pipeline (miles) | 30-150 | Possible distance to landfall |
| Onshore sales pipeline (miles) | Up to 300 | Connecting to existing/future North Slope pipelines |
| Peak production (thousand barrels per day) | 200-250 | Oil production only; associated gas is reinjected |
| New landfall | 1 | Point Belcher near Wainwright |
| New support shore base | 1 | Point Belcher near Wainwright |
| New processing facility | 1 | Collocated with shore base |
| New waste facility | 1 | Collocated with shore base |
| Drilling-fluid discharge by exploration wells (tons) | 665-1330 | 475 tons/well with 80% recycled for all exploration and delineation wells (95 tons discharged for 7-14 wells) |
| Rock-cutting discharge by exploration wells (tons) | 4200-8400 | 600 tons/well (7-14 wells total) |
| Discharges during development drilling | 0 | 80% of drilling fluids are recycled; remaining waste fluids and rock cuttings for on-platform wells will be disposed of in service wells. Drilling wastes from subsea wells will be barged to an onshore disposal facility. |
| Years of activity | 30-40 | Period from lease sale to end of oil production |

**Source:**
USDOI, MMS, Alaska OCS Region (2006).

**Table IV.A-2a**
**Possible Timetable for Development**

| Year | Seismic Surveys | Exploration Wells | Delineation Wells | Exploration Drilling Rigs | Production Platforms | Production Wells | Subsea Wells | Service Wells | Production Drilling Rigs | In-Field Flowlines | Offshore Pipelines (miles) | New Shorebases | Annual Oil Production (MMbbl) | Daily Oil Production (Bopd) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2005 | | | | | | | | | | | | | | |
| 2006 | 4 | | | | | | | | | | | | | |
| 2007 | 4 | | | | | | | | | | | | | |
| 2008 | 4 | | | | | | | | | | | | | |
| 2009 | 3 | 1 | | 1 | | | | | | | | | | |
| 2010 | 3 | 1 | | 1 | | | | | | | | | | |
| 2011 | 2 | | 2 | 1 | | | | | | | | | | |
| 2012 | 1 | | 2 | 1 | | | | | | | | | | |
| 2013 | 1 | | 2 | 1 | | | | | | | | | | |
| 2014 | 1 | 1 | | 1 | | | | | | | | 1 | | |
| 2015 | 1 | 1 | | 1 | | | | | | | | | | |
| 2016 | 1 | | | | | | | | | | | | | |
| 2017 | | | | | | | | | | | 30 | | | |
| 2018 | | | | | | | | | | | 30 | | | |
| 2019 | | | | | | | 8 | | 2 | 5 | 30 | | | |
| 2020 | | | | | 1 | 6 | 8 | 3 | 3 | 5 | | | 54.0 | 147,945 |
| 2021 | | | | | | 18 | 8 | 5 | 4 | 5 | | | 70.0 | 191,781 |
| 2022 | | | | | | 18 | 8 | 5 | 4 | 5 | | | 82.0 | 224,658 |
| 2023 | | | | | | 18 | 8 | 5 | 3 | 5 | | | 82.0 | 224,658 |
| 2024 | | | | | | 10 | 8 | 6 | | | | | 82.0 | 224,658 |
| 2025 | | | | | | 10 | | 4 | | | | | 82.0 | 224,658 |
| 2026 | | | | | | | | | | | | | 72.2 | 197,808 |
| 2027 | | | | | | | | | | | | | 63.5 | 173,973 |
| 2028 | | | | | | | | | | | | | 55.9 | 153,151 |
| 2029 | | | | | | | | | | | | | 49.2 | 134,795 |
| 2030 | | | | | | | | | | | | | 43.3 | 118,630 |
| 2031 | | | | | | | | | | | | | 38.1 | 104,384 |
| 2032 | | | | | | | | | | | | | 33.5 | 91,781 |
| 2033 | | | | | | | | | | | | | 29.5 | 80,822 |
| 2034 | | | | | | | | | | | | | 26.0 | 71,233 |
| 2035 | | | | | | | | | | | | | 22.8 | 62,466 |
| 2036 | | | | | | | | | | | | | 20.1 | 55,068 |
| 2037 | | | | | | | | | | | | | 17.7 | 48,493 |
| 2038 | | | | | | | | | | | | | 15.6 | 42,740 |
| 2039 | | | | | | | | | | | | | 13.7 | 37,534 |
| 2040 | | | | | | | | | | | | | 12.1 | 33,151 |
| 2041 | | | | | | | | | | | | | 10.6 | 29,041 |
| 2042 | | | | | | | | | | | | | 9.8 | 26,849 |
| 2043 | | | | | | | | | | | | | 8.2 | 22,466 |
| 2044 | | | | | | | | | | | | | 6.2 | 16,986 |
| 2045 | | | | | | | | | | | | | | |
| 2046 | | | | | | | | | | | | | | |
| 2047 | | | | | | | | | | | | | | |
| | **25** | **4** | **6** | **7** | **1** | **80** | **48** | **28** | **20** | **30** | **60** | | **1000** | |
| Notes: | (1 mo/yr) | | (4 mo/yr) | | (30 inj wells) | | | (rig/years) | | | | | | |

**Table IV.A-2b. Possible Timetable for Production**

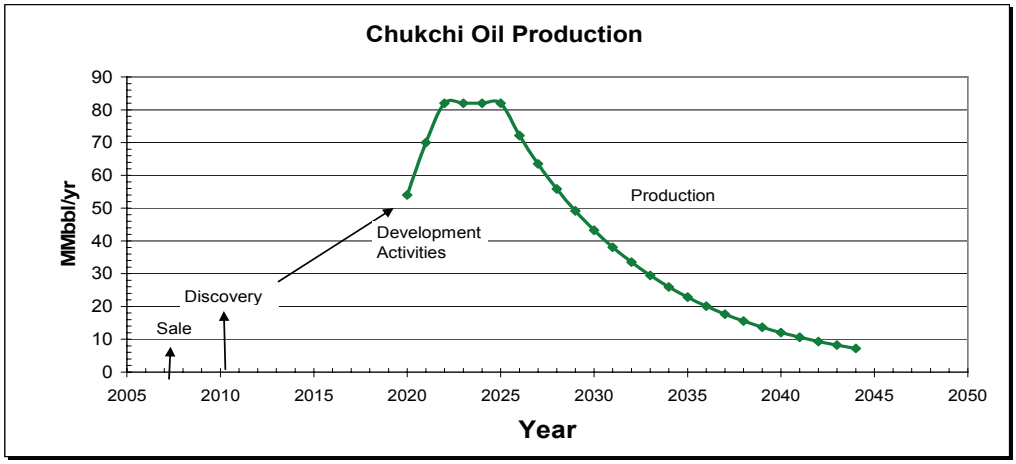



**Table IV.A-3**
**Commercial Development Potential for Sale 193 Alternatives**

| Chukchi Sea, Sale 193 Alternatives | Opportunity Index (Commercial Chance) |
|---|---|
| Alternative 1 (Full Program Area Proposal) | 1.0 |
| Alternative 2 (No Lease Sale) | 0.0 |
| Alternative 3 (Corridor I Deferral) | 0.64 |
| Alternative 4 (Corridor II Deferral) | 0.85 |

**Source:**
USDOI, MMS, Alaska OCS Region (2006).

**Table IV.A-4**
**Large and Small Spill Sizes, Source of Spill, Type of Oil, Number and Size of Spill and Receiving Environment We Assume for Analysis in this EIS by Section**

| EIS Section | Source of Spill | Type of Oil | Number and Size of Spill(s) | Receiving Environment |
|---|---|---|---|---|
| **Large Spills (≥1,000 barrels)** | | | | |
| **IV.C** | **Offshore**<br>Pipeline<br>Platform/Storage Tank | Crude<br>Or<br>Diesel | 1 spill<br>4,600<br>Or 1,500 barrels | Open Water<br>Under Ice<br>On Top of Sea Ice<br>Broken Ice<br>Coastal Shoreline |
| **Small Spills[1] (< 1,000 barrels)** | | | | |
| **IV.C** | **Offshore and/or Onshore**<br>Operational Spills from All Sources | Diesel or Crude | 133 spills <1 barrel<br>43 spills ≥1 barrel but <25 barrels<br>2 spills ≥25 and <500 barrels<br>1 spill ≥500 and <1,000 barrels | Open Water<br>On Top of Sea Ice<br>Broken Sea Ice<br>Snow/Ice<br>Tundra<br>Coastal Shoreline |
| | **Onshore and/or Offshore** | | | |
| | Operational Spills from All Sources | Refined | 440 spills of 0.7 barrels each | |

**Source:**
USDOI, MMS, Alaska OCS Region (2006).

**Table IV.A-5**
**Small Crude Oil Spills: Assumed Spills over the Production Life of Chukchi Sea Sale 193**

| Sale 193 Alternative | Assumed Small Crude-Oil Spills <500 barrels | | | | |
|---|---|---|---|---|---|
| | Resources (Bbbl)[1] | Spill Rate (Spills/Bbbl) | Assumed Spill Size (bbl) | Estimated Number of Spills | Estimated Total Spill Volume (bbl) |
| I Proposed Action | 1 | 178 | 3 | 178 | 534 |
| II No Lease Sale | 0 | 178 | 3 | 0 | 0 |
| III Corridor I | 0.64 | 178 | 3 | 114 | 342 |
| IV Corridor II | 0.85 | 178 | 3 | 152 | 453 |
| **Alternative** | **Assumed Small Crude-Oil Spills ≥ 500 and ≤1,000 barrels** | | | | |
| I Proposed Action | 1 | 0.64 | 680 | 0.64 | 680 |
| II No Sale | 0 | 0.64 | 680 | 0 | 0 |
| III Corridor I | 0.64 | 0.64 | 680 | 0.41 | 680 |
| IV Corridor II | 0.85 | 0.64 | 680 | 0.54 | 680 |

**Source:**
USDOI, MMS, Alaska OCS Region (2006).

**Note:**
[1]The estimation of oil spills is based on the estimated resources. If these resources are not produced then no oil spills occur.

**Table IV.A-6**
**Small Refined Oil Spills: Assumed Spills over the Production Life of Chukchi Sea Sale 193**

| Sale193 and its Alternatives | Resource Range (Bbbl) | Spill Rate (Spills/Bbbl) | Average Spill Size (bbl) | Estimated Number of Spills[1] | Estimated Total Spill Volume (bbl)[1] |
|---|---|---|---|---|---|
| I Proposed Action | 1 | 440 | 0.7 (29 gal) | 440 | 308 |
| II No Sale | 0 | 440 | 0.7 (29 gal) | 0 | 0 |
| III Corridor I | 0.6402 | 440 | 0.7 (29 gal) | 282 | 197 |
| IV Corridor II | 0.8457 | 440 | 0.7 (29 gal) | 373 | 250 |

**Source:**
USDOI, MMS, Alaska OCS Region (2006).

**Note:**
[1] The fractional estimated mean spill number and volume is rounded to the nearest whole number.

**Table IV.C-1**
**Sale 193 Employment and Personal Income Effects**

| Area of Residence// Phase of OCS Activity | Employment Annual Average Jobs | | | Total Personal Income Annual Average in 100,000's of Constant 2006 $ | | |
|---|---|---|---|---|---|---|
| | Direct | Indirect and Induced | Total | For Direct Workers | For Indirect and Induced Workers | Total |
| **North Slope Borough (a)** | | | | | | |
| Exploration | 2 | 1 | 3 | 2 | 1 | 3 |
| Development | 22 | 8 | 30 | 14 | 5 | 19 |
| Production | 8 | 3 | 11 | 6 | 2 | 8 |
| **South Central Alaska and Fairbanks (b)** | | | | | | |
| Exploration | 215 | 108 | 323 | 94 | 19 | 113 |
| Development | 1,054 | 527 | 1,581 | 108 | 22 | 130 |
| Production | 502 | 251 | 753 | 43 | 9 | 52 |

**Sources:**
Jack Faucett Associates, Inc. (2000); USDOI, MMS (2006).

**Table IV.C-2**
**Sociocultural Effects from Routine Activities**

| Characteristic | Phase of Project | | | |
|---|---|---|---|---|
| | Seismic Survey | Exploration | Development and Production | Decommissioning |
| **Social Organization**<br>Households, families, and also wider networks of kinship and friends, which in turn are embedded in groups that are responsible for acquiring, distributing, and consuming subsistence resources. | | | | |
| **Employment/Income Characteristics** | Measurable but little effect. See Section IV.C.1.k, Economy. Indirect and negligible effect to extent that project revenues accrue to Alaska Permanent Fund (APF) which is an important source of income to households in North Slope Borough (NSB) communities or are allocated to the Capital Improvement Program (CIP), which has been an important source of employment in NSB communities. See Section V.C-13, Cumulative Effects for further discussion. | | | |
| **Demographics**<br>Change in population size, density, and rate of change<br>Ethnic and racial composition<br>Residential Stability | Negligible effect in Point Lay and Point Hope, as no project-related activity is anticipated for these locations. Negligible effect in Barrow, as it has a large population and few newcomers are expected from project-related employment. Could be measurable in Wainwright because of proximity to supply base, with an increase in residential stability if employment reverses recent trend of outmigration of residents looking for work. | | | |
| **Workforce Changes**<br><br>Influx and outflow of temporary workers<br><br>Changes to age structure of community due to outmigration of adults to project-related employment<br><br>Outmigration of higher trained or skilled labor force<br><br>Removal of adults and especially harvesters from community for employment in remote project areas<br><br>Removal of trained individuals from community to work in project-related employment | Some employment opportunities for Alaskan Native as observers on seismic-survey vessels and during other activities.<br><br>Temporary workers should see a negligible effect in Point Lay and Point Hope , as no project-related activity is anticipated for these locations. Negligible effect in Barrow, as it has a large population and few newcomers are expected from project-related employment. Could be measurable in Wainwright because of proximity to supply base and use of airport as transfer point.<br><br>Use of construction enclaves should minimize the movement of temporary workers through the communities. Communities have experienced influx of and outmigration of temporary and resident workers as a result construction.<br><br>Workforce changes could be measurable in Wainwright because of proximity to supply base to the extent that residents seek and secure employment. Petroleum employment generally has not translated to employment for Native residents. Programs and policies are in place to provide the opportunities. | | | |
| **Employment/Income Characteristics** | Measurable but little effect. See Section IV.C.1.k, Economy. Indirect and negligible effect to extent that project revenues accrue to APF, which is an important source of income to households in NSB communities or are allocated to NSB CIP, which has been an important source of employment in NSB communities. | | | |
| **Social Well Being**<br><br>Risk, safety and health<br><br>Displacement/relocation concerns<br><br>The ability of future Alaskan Native to care for themselves in either traditional way or cash economy<br><br>Community leadership, family, and/or kinship networks destabilized | Perception about potential deflection of subsistence resources which cause harvest to occur farther offshore, leading to greater risk for hunters; change pattern of onshore distribution, leading to displacement from traditional subsistence areas and decline in the availability of wild foods; and induce health concerns from ingesting food contaminated from oil spill and discharges. Effects would be most pronounced in the Wainwright area because of the presence of onshore infrastructure.<br><br>Indirect effects proportional to effects of project-related activities on subsistence harvest, with effects realized beyond the immediately affected area. For example, disruption of sharing networks and task groups could occur if a community was not successful in the bowhead whale harvest or food was perceived to be contaminated. | | | |

**Table IV.C-2**
**Sociocultural Effects from Routine Activities (continued)**

| | | |
|---|---|---|
| **Cultural Values**<br>Close relationship with natural resources, emphasis on kinship, maintenance of the community, cooperation, and sharing. Subsistence is a central activity that embodies these values, with bowhead whale hunting the paramount subsistence activity. | | |
| **Subsistence Values**<br><br>Loss or damage to property or equipment used in wildlife harvesting<br><br>Present or future loss of income and/or income-in-kind from wildlife harvesting | Potential effects directly related to effects on subsistence harvest. See Section IV.C.1.l. Highest potential for change is in Wainwright area.<br><br>Conflict avoidance agreement should eliminate the potential loss or damage to property. Indirect effects could be realized, if disturbance or displacement of subsistence resources requires traveling farther distances or greater times.<br><br>Indirect effects proportional to effects of project-related activities on subsistence-distribution network. For example, disruption of sharing networks from disturbance would reflect a loss of income-in-kind from wildlife harvesting. | |
| **Known Cultural, Historical, and Archaeological Resources** | None. Operations do not disturb sites. | Potential effects to sites from disturbance are mitigated. |
| **Cultural Continuity**<br><br>Language, spiritual teachings, knowledge transfer<br><br>Conflicts with newcomers with different values | No adverse impacts to language, spiritual teachings, or knowledge transfer are anticipated.<br><br>Conflicts with values of newcomers should negligible at Point Lay and Point Hope, as no project-related activity is anticipated for these locations and in Barrow as it has a diverse population and few newcomers are expected from project-related employment. Could be measurable in Wainwright because of proximity to supply base. Wainwright's previous experience with newcomers as part of the CIP and Industry Orientation Program should moderate the effects. | |
| **Institutional Organization**<br>Structure of Borough, City, and Tribal government, and the Native Alaskan Regional and various village for-profit and not-for-profit corporations, and nongovernmental organizations. | | |
| **Governmental Functions**<br><br>Size, structure, and functions of local government<br><br>Land use, planning, zoning and permitting<br><br>Community infrastructure and services | None. Short-term activity with no onshore industrial activity or service demands. | Negligible at the NSB level as this is a continuation of primary industrial activity.<br><br>Significant change near Wainwright from presence of nearby supply base—new industrial infrastructure for the area.<br><br>Considerable planning and zoning actions for Wainwright/Peard Bay area from placement onshore of industrial facilities such as the new supply base and onshore pipeline, similar to other projects that are routinely considered by NSB departments.<br><br>For other services, effect is negligible as the onshore industrial activity is not expected to generate service demands. Stress caused by project could marginally increase demand for public mental health services. |

**Table IV.C-2**
**Sociocultural Effects from Routine Activities (continued)**

| | |
|---|---|
| **Non-Governmental Organizations**<br><br>Organizational capability and characteristics<br><br>Distribution of power and authority<br><br>Interorganizational cooperation | Considerable effort expended by existing organizations, such as Alaska Eskimo Whaling Commission effort in conflict avoidance negotiations. Once project construction completed, the agreement and monitoring will become routine as in the Northstar annual-open-water meeting.<br><br>Opportunities for participation structured under NEPA and other statutes should not change.<br><br>Capacity and characteristics of other organizations could be affected to the extent that the activity represents a new activity for them to consider and they must develop the expertise and financial resources to participate which could cause organizational stress.<br><br>High level of interorganizational cooperation and integration currently exists at the regional level, although this may need to accommodate organizations for which the activity represents a new activity. Cooperative management policies implemented by the Department of the Interior should moderate these effects. |

**Source:**
Characteristics derived from "Principles and guidelines for social impact assessment in the USA" in Impact Assessment and Project Appraisal, v. 21, no. 3, pp 231-250, (September 2003); Determining Significance of Environmental Effects: An Aboriginal Perspective. Canadian Environmental Assessment Agency's Research and Development Program, Research and Development Monograph Series, 2000 (http://www.ceaa-acee.gc.ca) and Socioeconomic and Resource Use Considerations in The Norton Basin Environment and Possible Consequences of Planned Offshore Oil Development. 1984. Outer Continental Shelf Environmental Assessment Program.

**Table V-1**
**Alaska North Slope Oil and Gas Discoveries as of March 2006**

| | Name | Location of Field or Pool | Production Oil, Gas | Location of Production Facility | Discovery | Production Began | Category | Ranking Criteria |
|---|---|---|---|---|---|---|---|---|
| **Past Development And Production** | | | | | | | | |
| **1** | South Barrow | Onshore | Gas | Onshore | 1949 | 1950 | Field | — |
| **2** | Prudhoe Bay | Onshore | Oil | Onshore | 1967 | 1977 | Field | — |
| **3** | Lisburne | Onshore | Oil | Onshore | 1967 | 1981 | Field | — |
| **4** | Kuparuk | Onshore | Oil | Onshore | 1969 | 1981 | Field | — |
| **5** | East Barrow | Onshore | Gas | Onshore | 1974 | 1981 | Field | — |
| **6** | Milne Point | Onshore | Oil | Onshore | 1969 | 1985 | Field | — |
| **7** | Endicott | Offshore | Oil | Offshore | 1978 | 1986 | Field | — |
| **8** | Sag Delta | Offshore | Oil | Onshore | 1976 | 1989 | Field | — |
| **9** | Sag Delta North | Offshore | Oil | Offshore | 1982 | 1989 | Satellite[1] | — |
| **10** | Schrader Bluff | Onshore | Oil | Onshore | 1969 | 1991 | Satellite[2] | **When** |
| **11** | Walakpa | Onshore | Gas | Onshore | 1980 | 1992 | Field | **Production** |
| **12** | Point McIntyre | Offshore | Oil | Onshore | 1988 | 1993 | Field | **Began** |
| **13** | North Prudhoe Bay | Onshore | Oil | Onshore | 1970 | 1993 | Field | — |
| **14** | Niakuk | Offshore | Oil | Onshore | 1985 | 1994 | Field | — |
| **15** | Sag River | Onshore | Oil | Onshore | 1969 | 1994 | Satellite[3] | — |
| **16** | West Beach | Onshore | Oil | Onshore | 1976 | 1994 | Field | — |
| **17** | Cascade | Onshore | Oil | Onshore | 1993 | 1996 | Field | — |
| **18** | West Sak | Onshore | Oil | Onshore | 1969 | 1997 | Satellite[2] | — |
| **19** | Badami | Offshore | Oil | Onshore | 1990 | 1998 | Field | — |
| **20** | Eider | Offshore | Oil | Offshore | 1998 | 1998 | Satellite[1] | — |
| **21** | Tarn | Onshore | Oil | Onshore | 1991 | 1998 | Field | — |
| **22** | Tabasco | Onshore | Oil | Onshore | 1992 | 1998 | Satellite[2] | — |
| **23** | Midnight Sun | Onshore | Oil | Onshore | 1998 | 1999 | Satellite[4] | — |
| **24** | Alpine | Onshore | Oil | Onshore | 1994 | 2000 | Field | — |
| **25** | Northstar | Offshore | Oil | Offshore | 1984 | 2001 | Field | — |
| **26** | Aurora | Onshore | Oil | Onshore | 1999 | 2001 | Satellite[4] | — |
| **27** | NW Eileen/Borealis | Onshore | Oil | Onshore | 1999 | 2001 | Field | — |
| **28** | Polaris | Onshore | Oil | Onshore | 1999 | 2001 | Satellite | — |
| **29** | Meltwater | Onshore | Oil | Onshore | 2000 | 2001 | Pool | — |
| **30** | Palm | Onshore | Oil | Onshore | 2001 | 2002 | Pool | — |
| **31** | Orion | Onshore | Oil | Onshore | 2000 | 2003 | Satellite | |
| **32** | Raven | Onshore | Oil | Onshore | ? | 2006 | Pool | |
| **Present Development** | | | | | | | | |
| **33** | Fiord (CD 3) | Onshore | Oil | Onshore | 1992 | (2006) | Pool | **When** |
| **34** | Nanuq (CD 4) | Onshore | Oil | Onshore | 1996 | (2006) | Pool | **Production** |
| **35** | Oooguruk | Offshore | Oil | Offshore | 2003 | **(2008)** | Pool | **Is Expected** |
| **Reasonably Foreseeable Future Development** | | | | | | | | |
| **36** | Nikaitchuq | Offshore | Oil | Offshore | 2004 | — | Pool | |
| **37** | Alpine West (CD 5) | Onshore | Oil | Onshore | 1998 | — | Pool | |
| **38** | Lookout (CD 6) | Onshore | Oil | Onshore | 2001 | — | Pool | **Ranked in order of** |
| **39** | Tuvaaq | Offshore | Oil | Offshore | 2005 | — | Prospect | **the chance and** |
| **40** | Liberty | Offshore | Oil | Offshore | 1983 | — | Pool | **timing of** |
| **41** | Spark (CD 7) | Onshore | Gas & Oil | Onshore | 2000 | — | Pool | **future development** |
| **42** | Carbon | Onshore | Oil & Gas | Onshore | 2004 | — | Prospect | |
| **43** | Moose's Tooth | Onshore | Gas & Oil | Onshore | 2001 | — | Prospect | **(highest = first)** |
| **44** | Rendezvous | Onshore | Gas & Oil | Onshore | 2000 | — | Pool | |
| **45** | Kalubik | Offshore | Oil | Onshore | 1992 | — | Prospect | |
| **46** | Thetis Island | Offshore | Oil | Offshore | 1993 | — | Prospect | |
| **47** | Sikulik | Onshore | Gas | Onshore | 1988 | — | Pool | |
| **48** | Gwydyr Bay | Offshore | Oil | Onshore | 1969 | — | Pool | |
| **49** | Pete's Wicked | Onshore | Oil | Onshore | 1997 | — | Prospect | |
| **50** | Point Thomson | Onshore | Gas & Oil | Onshore | 1977 | — | Pool | |
| **51** | Sandpiper | Offshore | Gas & Oil | Offshore | 1986 | — | Pool | |
| **52** | Mikkelson | Onshore | Oil | Onshore | 1978 | — | Prospect | |
| **53** | Sivuliiq (Hammerhead) | Offshore | Oil | Offshore | 1985 | — | Pool | |
| **54** | Sourdough | Onshore | Oil | Onshore | 1994 | — | Show | |
| **55** | Yukon Gold | Onshore | Oil | Onshore | 1994 | — | Show | |
| **56** | Flaxman Island | Offshore | Oil | Offshore | 1975 | — | Prospect | |
| **57** | Stinson | Offshore | Oil | Offshore | 1990 | — | Prospect | |
| **58** | Kuvlum | Offshore | Oil | Offshore | 1987 | — | Prospect | |

**Table V-1**
**Alaska North Slope Oil and Gas Discoveries as of March 2006 (continued)**

| | Name | Location of Field or Pool | Production Oil, Gas | Location of Production Facility | Discovery | Production Began | Category | Ranking Criteria |
|---|---|---|---|---|---|---|---|---|
| **Speculative Future Development** | | | | | | | | |
| **59** | Hemi Springs | Onshore | Oil | Onshore | 1984 | — | Pool | — |
| **60** | Ugnu | Onshore | Oil | Onshore | 1984 | — | Pool | — |
| **61** | Umiat | Onshore | Oil | Onshore | 1946 | — | Pool | — |
| **62** | Fish Creek | Onshore | Oil | Onshore | 1949 | — | Show | — |
| **63** | Simpson | Onshore | Oil | Onshore | 1950 | — | Prospect | — |
| **64** | East Kurupa | Onshore | Gas | Onshore | 1976 | — | Show | **Insufficient** |
| **65** | Meade | Onshore | Gas | Onshore | 1950 | — | Prospect | **Information to** |
| **66** | Wolf Creek | Onshore | Gas | Onshore | 1951 | — | Show | **Estimate Chance** |
| **67** | Gubik | Onshore | Gas | Onshore | 1951 | — | Pool | **of Development** |
| **68** | Square Lake | Onshore | Gas | Onshore | 1952 | — | Show | — |
| **69** | East Umiat | Onshore | Gas | Onshore | 1964 | — | Prospect | — |
| **70** | Kavik | Onshore | Gas | Onshore | 1969 | — | Show | — |
| **71** | Kemik | Onshore | Gas | Onshore | 1972 | — | Show | — |

**Notes:**
Field information is taken from State of Alaska, Dept. of Natural Resources Annual Report December, 2004 and Petroleum News
**Footnotes** for Satellites identify the associated production unit:
[1]Duck Island Unit;
[2]Kuparuk River Unit;
[3]Milne Point Unit;
[4]Prudhoe Bay Unit.
**Parentheses** indicate when production startup is expected.
**Definitions:** Field—infrastructure (pads/wells/facilities) installed to produce one or more pools.
Satellite—a pool developed from an existing pad.
Pool—petroleum accumulation with defined limits.
Prospect—a discovery tested by several wells.
Show—a one-well discovery with poorly defined limits and production capacity.

**Table V-2**
**Past Development: 2005 Production and Reserve Data**

| | | | | Produced | | | | Reserves[2] | |
|---|---|---|---|---|---|---|---|---|---|
| **Unit or *Area*** | **Field** | **Type (Oil or Gas)** | **Discovery** | **Began** | **Gas (Bcf)** | **2005 Oil (MMbbl)[1]** | **Production to** | **Oil (MMbbl)[1]** | **Gas (Bcf)** |
| **Duck Island** | | | | | | | | | |
| — | Endicott | O | 1973 | 1987 | – | 454.988710 | Endicott | – | – |
| — | Sag Delta North[2] | O | 1989 | 1989 | – | " | Endicott | – | – |
| — | Sag Delta[2] | O | 1976 | 1989 | – | " | Endicott | – | – |
| — | Eider | O | 1998 | 1998 | – | 2.718,616 | Endicott | – | – |
| — | Ivishak | O | – | – | – | 8.102,357 | Endicott | "l | "l |
| Duck Island Unit | – | – | – | – | – | – | – | 131 | 843 |
| **Prudhoe Bay** | | | | | | | | | |
| — | Prudhoe Bay | O | 1967 | 1977 | – | 283.684.252 | Prudhoe | " | " |
| — | Lisburne | O | 1968 | 1981 | – | 156.991045 | Lisburne | 41 | " |
| — | Niakuk | O | 1985 | 1994 | – | 83.893006 | Lisburne | 41 | – |
| — | West Beach | O | 1976 | 1994 | – | 3.581710 | Lisburne | – | – |
| — | N. Prudhoe Bay | O | 1970 | 1993 | – | 2.070780 | Lisburne | – | – |
| — | Point McIntyre | O | 1988 | 1993 | – | 396.736189 | Lisburne | 211 | – |
| — | Prudhoe Bay IPA's | O | – | – | – | – | – | 2,839 | 23,000 |
| — | Midnight Sun | O | 1998 | 1999 | – | 13.474471 | Prudhoe | – | – |
| — | Aurora | O | 1999 | 2001 | – | 14.849654 | Prudhoe | – | – |
| — | NW Eileen/Borealis | O | 1999 | 2001 | – | 37.925608 | Prudhoe | – | – |
| — | Polaris | O | 1999 | 2001 | – | 4.786145 | Prudhoe | – | – |
| — | Orion | O | 1968 | 2003 | – | 5.206855 | Prudhoe | – | – |
| — | P. Bay Satellites | O | – | – | – | – " | Prudhoe | 473 | – |
| **Kuparuk River** | | | | | | | | | |
| — | Kuparuk River | O | 1969 | 1981 | – | 2,024.989583 | Kuparuk | 956 | 1,000 |
| — | Tabasco | O | 1992 | 1998 | – | 11.264871 | Kuparuk | 15 | – |
| — | Tarn | O | 1992 | 1998 | – | 72.680379 | Kuparuk | 71 | 50 |
| — | West Sak | O | 1969 | 1998 | – | – | Kuparuk | 528 | 100 |
| — | Meltwater | O | — | 2001 | – | 9.757986 | Kuparuk | – | – |
| — | Palm | O | — | 2002 | | – | Kuparuk | – | – |
| **Milne Point** | | | | | | | | | |
| — | Milne Point | O | 1969 | 1985 | – | 18.9794041 | Milne Point | – | – |
| — | Cascade[4] | O | 1993 | 1996 | – | – | Milne Point | – | – |
| — | Schrader Bluff | O | 1969 | 1991 | – | 44.534458 | Milne Point | – | – |
| — | Sag River | O | 1968 | 1994 | – | 1.677089 | Milne Point | – | – |
| Milne Point Unit | – | – | – | – | – | – | – | 479 | 14 |
| | | | | | | | | | |
| **Badami** | Badami | O&G | 1990 | 1998 | – | 4.498862 | TAPS | 2 | – |
| **Colville River** | Alpine | O | 1994 | 2000 | – | 184.716137 | Kuparuk | 450 | 400 |
| **Northstar** | Northstar | O | 1984 | 2001 | – | 89.636187 | TAPS | 152 | 450 |
| ***NPR-A[1]*** | East Barrow | G | 1974 | 1981 | 0.081 | – | Barrow | – | 5 |
| — | South Barrow | G | 1949 | 1950 | 0.2.25 | – | Barrow | – | 4 |
| — | Walakpa | G | 1980 | 1993 | 1.5167 | – | Barrow | – | 25 |
| ***All Units or Areas Total*** | | – | – | – | – | – | – | **6.4** | **33** |

**Notes:**

[1] Production information is from State of Alaska, Oil and Gas Conservation Commission (2005)
[2] Reserves were estimated by subtracting 2005 production from State of Alaska, Oil and Gas Conservation Commission (2005) from the Reserve Data in ADNR (2006a).
[3] Endicott includes Endicott, Sag Delta and Sag Delta North. Prudhoe Bay satellites include Midnight Sun, Aurora, Borealis, Polaris and Orion
[4] Cascade is included in Milne Point.

**Table V-3**
**Present Development: Estimated Reserve Data**

| Unit or Area | Field | Type (Oil, Gas) | Discovery | Status | Oil Reserves (MMbbl) |
|---|---|---|---|---|---|
| Colville River | CD 3 Fiord | Oil | 1992 | Present Development | 50 |
| Colville River | CD 4 Nanuq | Oil | 1996 | Present Development | 38 |
| Oooguruk | Oooguruk | Oil | – | Present Development | 50-90 |
| Total for All Units or Areas | | – | – | – | 158 |

**Table V-4**
**Future Lease Sales**

| Sale | Proposed Sale Date(s) | Area/Description | Resources or *Hydrocarbon Potential* |
|---|---|---|---|
| **Federal** | | | |
| **2002-2007 Beaufort Sea OCS Sale 202** | April 2007 | As much as 8.7 million acres from the Canadian border on the east to Barrow on the west in the Beaufort Sea (*Federal Register,* 2007). | 340-557 mmbbl Oil (Estimated) |
| **2007-2012 Beaufort Sea OCS Sales 209 and 217** | 2009 and 2011, respectively | As much as 33.29 million acres from the Canadian border on the east to Barrow on the west | 0.5-1.0 BBO |
| **2007-2012 Chukchi Sea OCS Sales 193, 212, and 221** | November 2007, 2010, and 2012, respectively | As much as 46.75 million acres from Barrow on the east to Point Hope on the south | 1.0 BBO |
| **Northeast NPR-A** | September 2006 | As much as 3 million acres of the Northeast NPR-A Planning Area (USDOI, BLM, 2005). | 0.50-2.2 Bbbl Oil (Estimated) |
| **Northwest NPR-A** | September 2006 | As much as 9.98 million acres of the Northwest NPR-A Planning Area (*USDOI, BLM and MMS 2003)*. | 0.00-0.735 Bbbl Oil Estimated |
| **South NPRA** | To Be Determined | | |
| **State Of Alaska** | | | |
| **North Slope Areawide** | March 2006[1] October 2006-2010 | As much as 5,100,000 acres of State-owned lands between the Canning and Colville rivers and north of the Umiat Baseline (about 69° 20' N.). | *Moderate to High* |
| **Beaufort Sea Areawide** | March 2006[1] October 2006-2010 | Unleased State-owned tide- and submerged lands between the Canadian border and Point Barrow and some coastal uplands acreage located along the Beaufort Sea between the Staines and Colville rivers. The gross proposed sale area is in excess of 2,000,000 acres and is divided into 576 tracts.. | *Moderate to High* |
| **North Slope Foothills Areawide** | May 2006 February 2007-2010[1] | State-owned lands lying between the National Petroleum Reserve-Alaska and the Arctic National Wildlife Refuge south of the Umiat Baseline and north of the Gates of the Arctic National Park and Preserve. The gross proposed sale area is in excess of 7,000,000 acres. | *Moderate* |
| **Canada** | | | |
| **Beaufort Sea** | May 2006 | Petroleum exploration rights on a total of two (2) parcels of land in the Beaufort Sea/Mackenzie Delta region of the Northwest Territories covering 156,348 hectares, more or less. | *?* |

**Source:**
ADNR (2006b) Five Year Oil and Gas Leasing Program; USDOI, MMS (2006).

**Note:**
1 Other than the April 2007 202 Sale, no decision has been made on whether these OCS sales will be held
**Bbbl** = billion barrels.

**Table V-5**
**Detailed Reserve and Resource Estimates for the Cumulative Analysis**

| Activity | Oil (billions of barrels) | Gas (trillions of cubic feet) |
|---|---|---|
| **Production of remaining reserves (Past and Present)** | **6.6** | — |
| Onshore–past (Prudhoe Bay and surrounding fields on State lands) | 6.15 | — |
| Offshore–past (Duck Island Unit and Northstar) | 0.28 | — |
| Onshore Present (CD3, CD4,) | 0.08 | — |
| Offshore Present (Oooguruk) | 0.07 | — |
| **Reasonably Foreseeable Future Production (resources total)** | **3.5** | **32.0** |
| Onshore discovered gas | — | 32.0 |
| Onshore discovered, satellites, heavy oil, and reserve growth | 2.0 | — |
| Offshore discovered (Beaufort) | 0.5 | — |
| Undiscovered Offshore (Chukchi Sale 193) | 1.0 | |
| **Speculative Production (resources total)** | **7.7** | **13.3** |
| Onshore | 5.7 | 9.0 |
| Offshore | 2.0 | 4.3 |

**Notes:**

1. Reserves are proven and economically recoverable oil or gas produced through existing infrastructure.
2. Resources are unproven (undiscovered) oil and gas that could be produced with new infrastructure.
3. Reasonably foreseeable gas production includes gas from stranded reserves in Prudhoe Bay area fields. We subtract the gas consumed for field use (300 Bcf per year) from reserves (35 Tcf) until the expected startup of a North Slope gas pipeline in 2015.
4. Speculative production is entirely from undiscovered oil and gas resources with development delayed several decades in the future. Onshore gas resources are from NPRA as associated and non-associated pools. Offshore gas resources are from associated gas reinjected during oil production. Offshore gas would then be recovered through existing oil field infrastructure. Associated gas estimates assume a GOR of 1000 cf/bbl.

**Table V-6**
**Trans-Alaska Pipeline System and Proposed Future Natural Gas Projects**

| Name | Estimated Pipeline Length (miles) | Project Description and Route |
|---|---|---|
| | | **Active Project** |
| **Trans-Alaska Pipeline (TAPS)** | 800 | The TAPS is the key transportation link for all North Slope oil fields. It has been in operation since 1977 and to date, has carried nearly 15 billion barrels of oil. Approximately 16.3 square miles are contained in the pipeline corridor that runs between Prudhoe Bay and Valdez. The Dalton Highway (or Haul Road) was constructed parallel to the pipeline between Prudhoe Bay and Fairbanks. The pipeline design capacity is 2 million barrels per day, and it reached near peak capacity in 1988. The TAPS 2005 year to date average barrels of oil pumped through pump station 1 was just under 900,000 barrels. The lower operational limit generally is thought to be between 200,000 and 400,000 barrels per day. If oil production from northern Alaska cannot be sustained above this minimum rate, the TAPS will become non-operational, and all oil production is likely to be shut in. Alyeska Pipeline Service Company is planning pipeline reconfiguration efforts between 2005 and 2011 to extend the economic life of the TAPS and North Slope oil fields. |
| | | **Future Natural Gas Projects** |
| **All-Alaska Gas Pipeline** | 800 | The "All Alaska Gas Pipeline" is similar to the old "Trans-Alaska Gas System" project. The route would originate in the Prudhoe Bay Unit and run parallel to the Trans-Alaska oil pipeline to Valdez, then jog to the east to Anderson Bay to an LNG plant. There are "variations" on this project depending on whether it is standalone or is connected, at Delta Junction, to a transportation pipeline coming from Prudhoe Bay that goes into Canada. |
| **Alaska Natural Gas Transportation System (ANGTS)**[1] | 2,102 | The ANGTS plan is a pipeline system connecting Alaska North Slope gas production through Canada to the lower 48. The new pipeline would run parallel to the TAPS from the North Slope to interior Alaska and then cross the Yukon Territory to connect to existing pipelines in Alberta. The primary market would be consumers in the U.S. Numerous permits, rights-of-way, and approvals have been obtained for the proposed pipeline route through Alaska and Canada. Downward revisions to construction costs and the recent increase in gas prices into the $3-$4-million/cubic-foot range make this project more appealing today. Currently, several variations to routes are being considered for the overland gas-pipeline system. |
| **Natural Gas to Liquids Conversion**[2] | Will use existing TAPS pipeline | Atlantic Richfield Co. (ARCO) and Syntroleum Corp constructed a pilot-scale, natural gas to liquids (GTL) conversion facility in Puget Sound, Washington. BP began production at the GTL pilot project on the Kenai Peninsula in Alaska in July 2003. This plant is expected to operate at least through 2006[3]. All of the major North Slope gas owners (BP-Amoco, Exxon-Mobil, and Connoco-Phillips-Alaska) are studying the feasibility of various gas-commercialization projects. GTL is an attractive option because it will use the existing TAPS pipeline (extending its life and lowering future tariffs) and produce clean-burning fuels to meet more stringent Environmental Protection Agency emission standards for vehicles. At the present time, the overall cost of a full-scale gas to liquids project is comparable to a similar sized LNG project. As an emerging technology, new cost-reduction breakthroughs are expected for gas to liquids processing, improving the economic potential for future gas to liquid projects. |
| **Mackenzie Gas Pipeline** | 1,300 | The Mackenzie Gas Project is a proposed 1220-kilometre natural gas pipeline system along the Mackenzie Valley of Canada's Northwest Territories to connect northern onshore gas fields with North American markets.. The industries goal is to have natural gas moving through the pipeline by 2010. |

**Notes:**
[1] Thomas et al. (1996).
[2] Alaska Report (1997).
3 Hult, J. (2006)

**Table V-7a**
**Oil and Gas Production 1969 to December 2005 on the North Slope of Alaska**

| Production To Date | Oil (billions of barrels) | Gas (trillions of cubic feet) | Reference |
|---|---|---|---|
| Onshore | 14.5 | — | State of Alaska,Alaska Oil and Gas Conservation Commission (2005) State of Alaska, DNR (2005) |
| Offshore | 0.5 | — | |
| **Total** | **15.0** | **51.6** | |

**Notes:**

1. Oil production includes both crude oil and natural gas liquids that are blended into the stream carried by TAPS.
2. Large volumes of associated natural gas has been recovered with oil production, however 90% of it has been reinjected to increase oil recovery. In 2003, North Slope gas production was 3.3 Tcf (average 9.1 Bcf per day) and a total of 297 Bcf was consumed as fuel for facilities. Small amounts of natural gas have been produced fields in the Barrow area since the mid-1940's largely to supply energy for the village of Barrow.

**Table V-7b**
**Summary of Reserve and Resource Estimates for the Cumulative Analysis**

| Production Activity | Oil (billions of barrels) | Contribution of by Volume of OCS Oil (%) | Gas (trillions of cubic feet) | Contribution of by Volume of OCS Gas (%) |
|---|---|---|---|---|
| Low End of the Range (Past and Present) | 6.6 | 15% | 0 | 0 |
| Middle Portion (Past, Present, and Reasonably Foreseeable) | 10.1 | 10% | 32.0 | 0 |
| High End (Past, Present, Reasonably Foreseeable, and Speculative) | 17.8 | 5.6% | 45.3 | 9.5 |

**Source:**
USDOI, MMS, Alaska OCS Region (2006).

**Table V-7c**
**Detailed Reserve and Resource Estimates for the Cumulative Analysis**

| Activity | Oil (billions of barrels) | Gas (trillions of cubic feet) |
|---|---|---|
| **Production of remaining reserves (Past and Present)** | **6.6** | — |
| Onshore–past (Prudhoe Bay and surrounding fields on State lands) | 6.15 | — |
| Offshore–past (Duck Island Unit and Northstar) | 0.28 | — |
| Onshore Present (CD3, CD4,) | 0.08 | — |
| Offshore Present (Oooguruk) | 0.07 | — |
| **Reasonably Foreseeable Future Production (resources total)** | **3.5** | **32.0** |
| Onshore discovered gas | — | 32.0 |
| Onshore discovered, satellites, heavy oil, and reserve growth | 2.0 | — |
| Offshore discovered (Beaufort) | 0.5 | — |
| Undiscovered Offshore (Chukchi Sale 193) | 1.0 | — |
| **Speculative Production (resources total)** | **7.7** | **13.3** |
| Onshore | 5.7 | 9.0 |
| Offshore | 2.0 | 4.3 |

**Notes:**

5. Reserves are proven and economically recoverable oil or gas produced through existing infrastructure.
6. Resources are unproven (undiscovered) oil and gas that could be produced with new infrastructure.
7. Reasonably foreseeable gas production includes gas from stranded reserves in Prudhoe Bay area fields. We subtract the gas consumed for field use (300 Bcf per year) from reserves (35 Tcf) until the expected startup of a North Slope gas pipeline in 2015. Speculative production is entirely from undiscovered oil and gas resources with development delayed several decades in the future. Onshore gas resources are from NPRA as associated and non-associated pools. Offshore gas resources are from associated gas reinjected during oil production. Offshore gas would then be recovered through existing oil field infrastructure. Associated gas estimates assume a GOR of 1000 cf/bbl.

**Table V-8**
**Cumulative Oil-Spill-Occurrence Estimates ≥500 Barrels or ≥1,000 Barrels Resulting from Oil Development over the Assumed 15-- to-20 Year Production Life of Sale 193**

| Category | Crude-Oil Spills | | | | | |
|---|---|---|---|---|---|---|
| | Reserves and Resources (Bbbl) | Spill Rate (Spills/Bbbl) | Size Category (bbl) | Assumed Size (Barrels) | Mean Number of Spills | Assumed Number of Spills for Analysis |
| **Offshore** | | | | | | |
| Past, Present, and Reasonably Foreseeable | 0.85 | 0.53 | ≥1000 | | 0.45 | 0 |
| Alternative I for Sale 193 | 1.0 | 0.51 | ≥1000 | | 0.51 | 0 |
| **Total** | **1.85** | **0.51** | **≥1000** | | **0.96** | **0** |
| **Onshore** | | | | | | |
| Past, Present, and Reasonably Foreseeable | 8.24 | 0.64 | ≥500 | 500–925 | 5.3 | 5 |
| Alternative I for Sale 193 | 1.0 | 0.11 | ≥500 | 0 | 0.11 | 0 |
| **Total** | **9.24** | **0.11** | **≥500** | **500-925** | **5.4** | **5** |
| **TAPS Pipeline** | | | | | | |
| Past, Present, and Reasonably Foreseeable | 10.1 | 0.21 | ≥500 | | 1.91 | 2 |
| Alternative I for Sale 193 | 1.0 | 0.21 | ≥500 | 0 | 0.21 | 0 |
| **Total** | **11.1** | **0.21** | **≥500** | | **2.12** | **2** |

**Source:**
USDOI, MMS, Alaska OCS Region (2006).

**Notes:**
The Alaska Dept. of Environmental Conservation database has no significant crude oil spills on the North Slope resulting from well blowouts and no facility or onshore pipeline spills greater than 1,000 barrels for the years 1985-2000. This has recently changed and spill rates for the North Slope may be updated when spill size is validated for the GC-2 transit pipeline spill and validated spill data is collected.

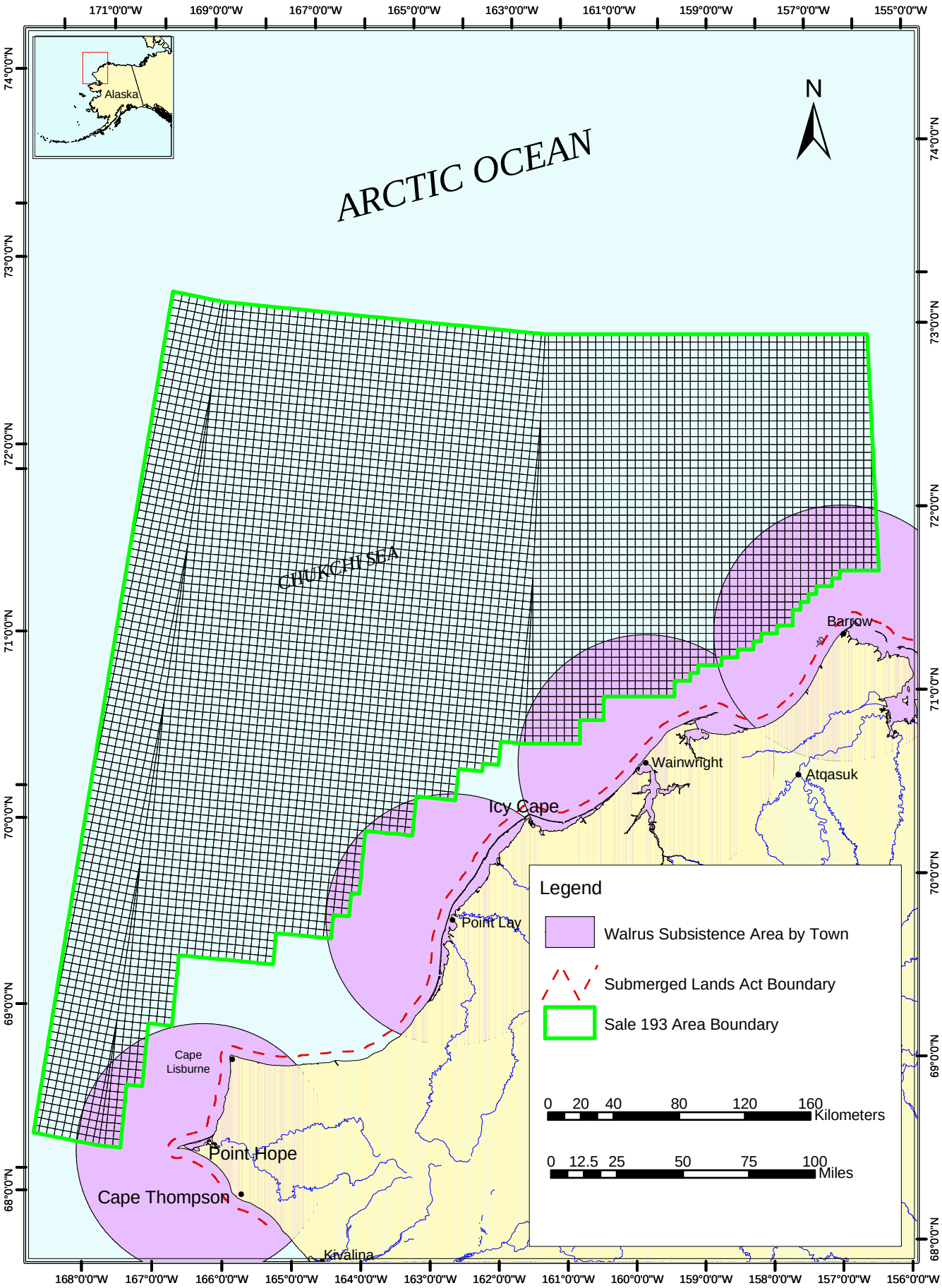



Figure II.B-1 Walrus Subsistence Areas

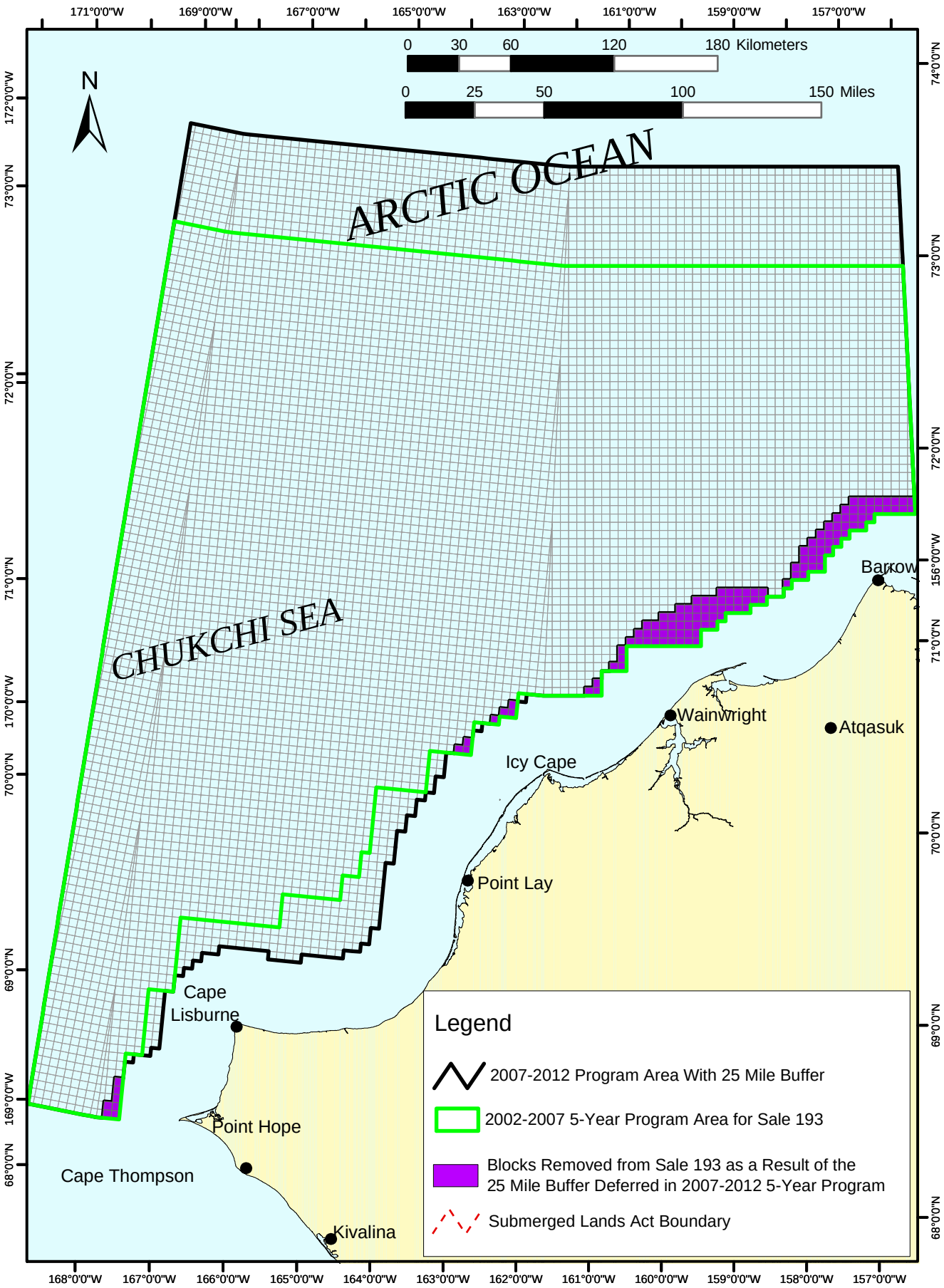



Figure II.B-2 2002-2007 5-Year Program Area for Sale 193 and 2007-2012 5-Year Program.

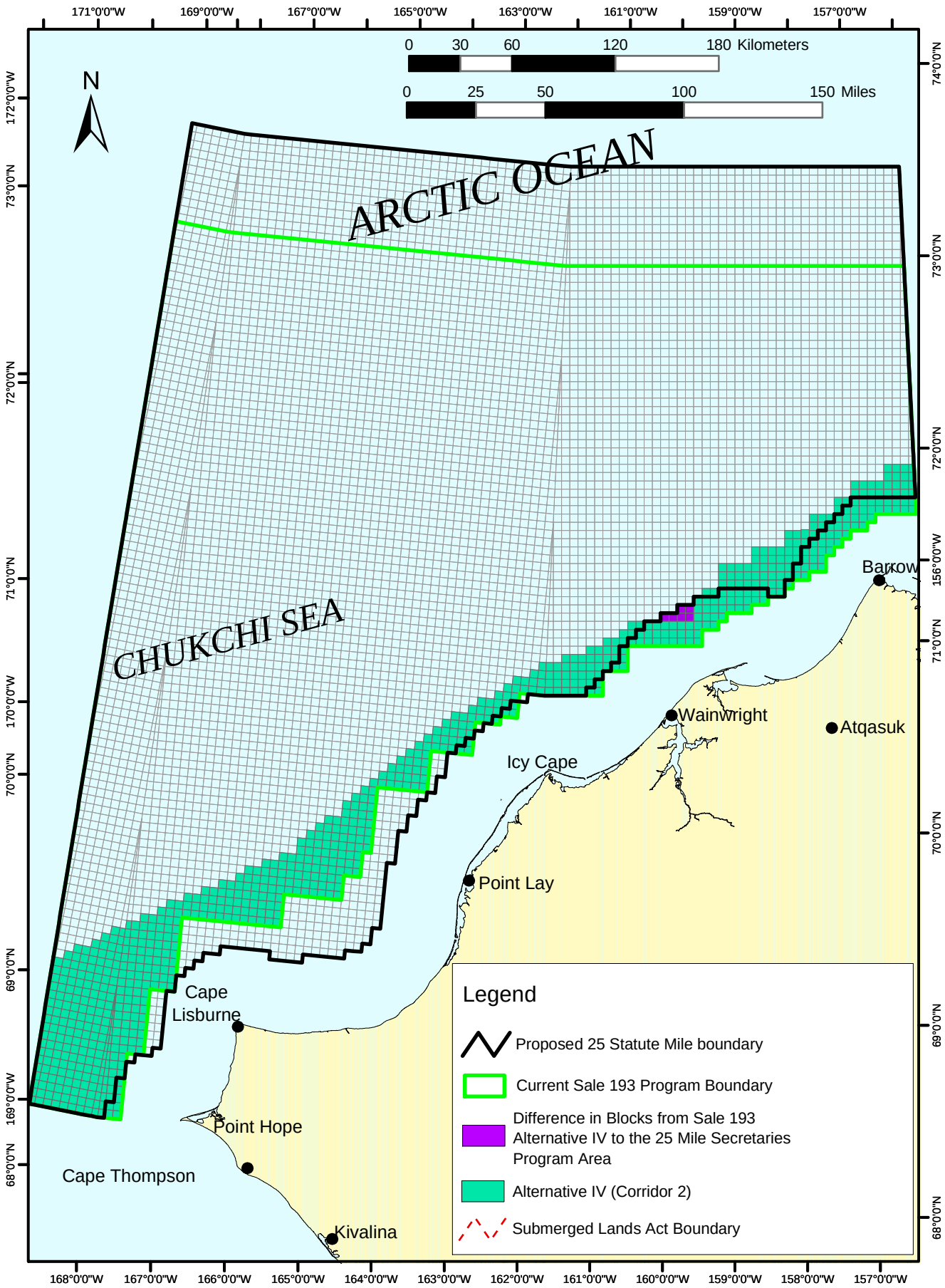
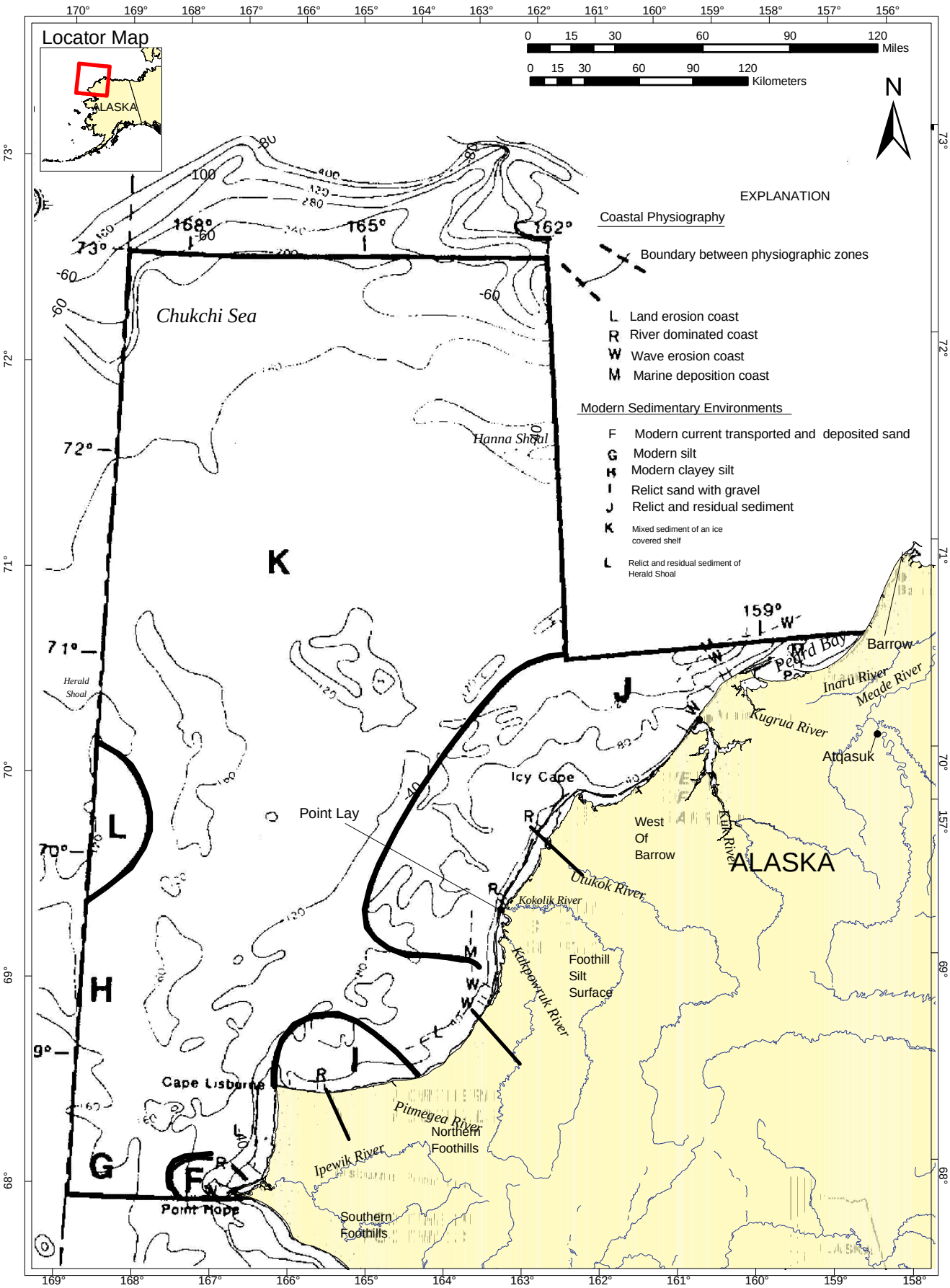
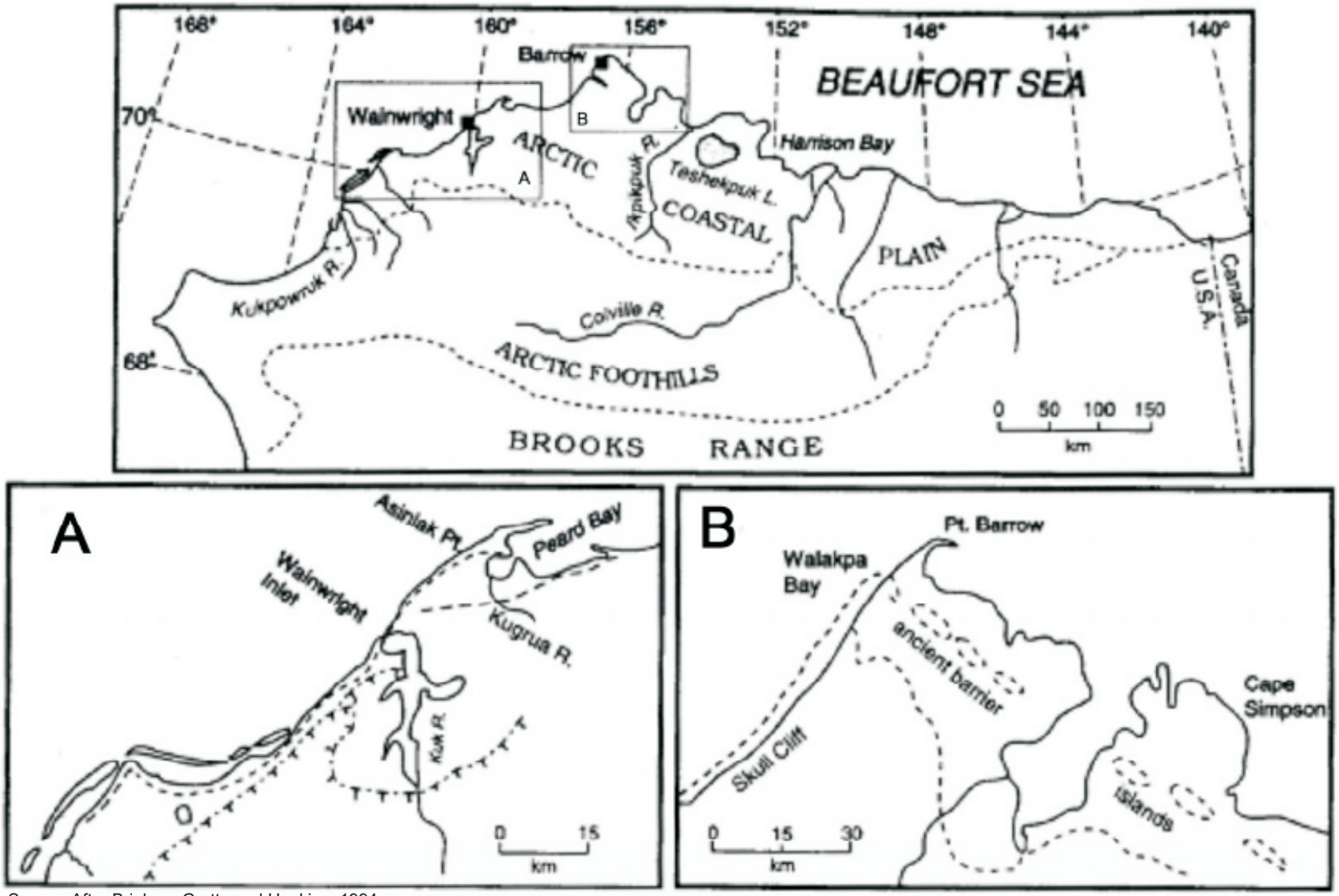



Figure II.B-3 Secretaries proposed program area 2007-2012 and the current Sale 193 Alternative IV (Corridor 2).




Source: McManus, Kelly, and Creager, 1969; Hartwell, 1973; Thurston and Theiss, 1987.

Figure III.A-1 Coastal Physiography.




Source: After Brigham-Grette and Hopkins, 1994.

Figure III.A-2 Last Interglacial Shoreline and Barrier Beaches along the Chukchi and Beaufort Sea Coasts. A. Paleoshorelines, bay mouth bar, and spit complex constructed during the last interglaciation in the Wainwright area; B. Paleogeography of ancient spit, lagoon,and barrier islands near Barrow, Alaska.