

VIII. TABLES AND FIGURES

Table I.C-1.**Assumptions used to Identify and Analyze the Impacts Associated with Conducting 2D and 3D Seismic Surveys in the Arctic Ocean in 2006.**

Planning Parameters	Chukchi Sea	Beaufort Sea
Geographic boundaries	5-Year (2002-2007) Program Area	Leaseholds and 5-Year (2002-2007) Program Area
Working timeframe	June to early November	July to early October
Maximum number of permitted seismic surveys in 2006.	4	4
Maximum number of times a specific oceanographic area would be exposed to a seismic-survey event in 2006.	4	4
Types of G&G seismic-exploration surveys likely to be conducted in 2006.	2D and 3D seismic surveys using streamers.	2D and 3D seismic surveys using streamers. Ocean-bottom cable 2D and 3D seismic surveys. High-resolution surveys.
Number of vessels supporting the seismic-exploration operations vessel(s) in 2006.	1 per seismic exploration operation (in case of an emergency, 1 of the 4 support vessels may be capable of breaking ice).	1 per seismic exploration operation (in case of an emergency, 1 of the 4 support vessels may be capable of breaking ice).

Source:

USDOI, MMS, Alaska OCS Region.

Table III.C-1.

Future Lease Sale Activities in Federal and State Waters of the Beaufort and Chukchi Seas, and Vicinity.

Sale Federal	Proposed Sale Date(s)	Area/Description	Resources or Hydrocarbon Potential
MMS: Beaufort Sea 202	May 2007	As much as 9.9 million acres from the Canadian border on the east to Barrow on the west in the Beaufort Sea (<i>Federal Register</i> , 2001c).	1.02-1.71 Bbbl Oil (Estimated)
MMS: Beaufort Sea 208	2009*	Approximately the same as Beaufort Sale 202 Area, may be marginally larger depending on Final 5-Year OCS program for 2007-2012.	1.02-1.71 Bbbl Oil (Estimated)
MMS: Beaufort Sea 216	2011*		
MMS: Chukchi Sea 193	November 2007*	As much as 34 million acres from Barrow west to Point Hope and east to the international border.	1.0 Bbbl Oil (Estimated)
MMS: Chukchi Sea 211	2010*	Approximately the same as Chukchi Sale 193 Area, may be marginally larger depending on Final 5-Year OCS program for 2007-2012.	1.0 Bbbl Oil (Estimated)
MMS: Chukchi Sea 221	2011*		
BLM: Northeast NPR-A	September 2006	As much as 3 million acres of the Northeast NPR-A Planning Area (USDOJ, BLM, 2005).	0.50-2.2 Bbbl Oil (Estimated)
BLM: Northwest NPR-A	September 2006	As much as 9.98 million acres of the Northwest NPR-A Planning Area (USDOJ, BLM and MMS, 2003).	0.00-0.735 Bbbl Oil (Estimated)
State of Alaska			
North Slope Area Wide	March 2006 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 Area Wide	March 2006 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. The State of Alaska was scheduled to hold its first area wide sale in the Beaufort Sea on October 13, 1999. This sale was delayed pending the outcome of the British Petroleum-Amoco and ARCO merger and related uncertainties in future lease holdings.	Moderate to High
North Slope Foothills Area Wide	May 2006	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

Notes:

* Pending decisions of the Final 5-Year OCS Program.

Bbbl = billion barrels.

Source:

USDOJ, MMS, (2001).

Table III.D-1

Preliminary Screening of Potential Impacts of Marine Seismic Surveys on Beaufort and Chukchi Seas Resources.

Resources of Concern	Categories of Marine Seismic Survey-related Disturbances								
	Airgun Noise	Vessel Traffic and Movements	Aircraft Traffic	Seafloor Disturbance ¹	Vessel Operations				
					Air Emissions	Wastewater Discharges	Lights	Noise ²	Petroleum Spills ³
Air Quality	NA	NA	--	NA	O	NA	NA	NA	NA
Archaeological Sites	--	NA	NA	X	NA	NA	NA	NA	NA
Marine Invertebrates*	X	O	NA	X	NA	--	O	--	O
Coastal Wetlands	--	--	NA	NA	NA	--	NA	NA	O
Coastal & Marine Birds	X	X	X	NA	NA	--	X	O	O
Essential Fish Habitat	X	X	NA	X	NA	--	--	X	O
Marine Fish	X	X	NA	X	NA	--	--	X	O
Freshwater Fish	NA	NA	NA	NA	NA	--	NA	NA	--
Commercial Fisheries	X	X	NA	O	NA	--	--	--	O
Geology & Sediments	NA	NA	NA	O	NA	NA	NA	NA	O
Marine Mammals	X	X	X	O	NA	--	NA	X	O
Socio-cultural Environ. and Subsistence	X	X	X	O	NA	--	NA	--	O
Terrestrial Mammals	NA	--	O	NA	NA	--	NA	NA	--
Water Quality	--	NA	NA	O	NA	--	NA	NA	O

Note:

¹ Seafloor disturbances associated with ocean-bottom cable seismic surveys, anchoring, and cable hang-ups.

² Includes sounds from vessel engines, generators, compressors, machinery, navigation equipment, etc.

³ The assumption is that less than 5 gallons of petroleum would be spilled by each seismic operation each shooting season. No vessel collisions or sinkings are expected to occur.

* Includes benthic infauna and epifauna, and pelagic species.

X Indicates potential of adverse impact and environmentally analyzed in further detail in the Arctic Ocean OCS draft PEIS.

O Indicates negligible impact likely and not environmentally analyzed further in the Arctic Ocean OCS draft PEIS.

-- Indicates no impact likely and not environmentally analyzed further in the Arctic Ocean OCS draft PEIS.

NA – not applicable

Table III.D-2.

Example of Seismic Operations Potential to Emit (PTE)¹.

Seismic Vessel Specifications*					Emissions (tons)					
Engine Description	Specifications	Fuel	Rating	Units	PM	NOx	SO2	CO	VOC	CO2
Main Engines	4 x Bergen Diesel KRGB-9 x2065 bhp	Diesel	61.59	KW	2.00	68.42	11.53	15.68	2.01	3,307.10
Emergency & Harbor Generator Engine	1 x Cummings Diesel, NTA -855-G, 250kW.	Diesel	250	KW	0.03	.36	0.03	.08	.03	13.31
				Total	2.02	68.78	11.56	15.76	2.04	3,320.41

***Source:**

Vessel Specifications M/V Gilavar—WesternGeco.

Seismic Vessel Specifications*					Emissions (tons)					
Engine Description	Specifications	Fuel	Rating	Units	PM	NOx	SO2	CO	VOC	CO2
Main Engines	2 x GM EMD 20-645-E7	Diesel	5,369	KW	2.17	74.55	12.57	17.09	2.19	3603.38
Auxiliary Engines	2 x CAT D343TA	Diesel	400	KW	.05	.72	.05	.15	.06	26.61
Auxiliary Engine-Bow Thruster	1 x CAT D343	Diesel	200	KW	.03	.36	.02	.08	.03	13.31
				Total	2.25	75.63	12.64	17.32	2.28	3,643.30
				Total Emissions	4.27	144.41	21.19	33.07	4.31	6,963.71

Source:

*Vessel Specifications M/V Alex Gordon.

¹ Examples is based upon the operating assumptions and emission factors shown on Table III.D-3.

Table III.D-3

Emission Factors and Operating Assumptions used in the PEA's Air Quality Impact Assessment.

Emission Factors			
Pollutant	< 600 hp	> 600 hp	Units
PM	1.34	0.43	g/kw-hr
NO _x	18.85	14.59	g/kw-hr
SO ₂ *	1.25	2.46	g/kw-hr
CO	4.06	3.34	g/kw-hr
VOC	1.50	0.43	g/kw-hr
CO ₂	699.20	705.28	g/kw-hr

*Assumes sulfur concentration of .5% by weight

Operating Assumptions			
Seismic Vessel			
Main Engines	690.5		Hours
Aux. Engines	69.0		Hours
Support Vessel*			
Main Engines	863.1		Hours
Aux. Engines	86.3		Hours

Vessel	Vessel Transit Area (miles)	Vessel Speed (mph)	Elapse Time (hrs)
Seismic Vessel	3452.5	5.0	690.5
Support Vessel	4315.6	5.0	863.1

Support vessel assumed to operate 25% more than seismic vessel to account for back and forth travel to port.

EF Source: AP-42, Tables 3.3.1 & 3.4.1 (1996)

**Table III.D-4.
Prevention of Significant Deterioration (PSD) Standards**

Pollutant	Averaging Period	Maximum Allowable
Particulate Matter (PM10)	Annual	Increase ($\mu\text{g}/\text{m}^3$17)
	24-Hour	30
Sulfur Dioxide	Annual	20
	24-Hour	91
	3-Hour	512
Nitrogen Oxides	Annual	25
National Ambient Air Quality Standards.		
Pollutant	Averaging Period	Maximum Allowable Increase ($\mu\text{g}/\text{m}^3$)
Carbon Monoxide	8-hour	10,000
	1-hour	40,000
Nitrogen Dioxide	Annual	100
Ozone	1-hour	235
Lead	Quarterly	1.5
Particulate Matter (PM10)	Annual	50
	24-hour	150
Sulfur Dioxide	Annual	80
	24-hour	365
	3-hour	1300
Reduced Sulfur Compounds	30-minute	50
Ammonia	8-hour	2.1

Source:

State of Alaska, Dept. of Environmental Conservation (2002), 18 AAC 50.010, 18 AAC 50.020; 40 CFR 52.21 (43 *FR* 26388); 40 CFR 50.6 (52 *FR* 24663); 40 CFR 51.166 (53 *FR* 40671).

Table III.D-5
Potential to Emit for the Liberty Development and Production Facility

Pollutant	Amount (tons)
Particulate Matter (PM10)	30.9
Carbon Monoxide	156.4
Nitrogen Dioxide	868.1
Sulfur Dioxide	23.9
Volatile Organic Carbons (VOC)	56.2

Source:
USDOI, MMS, 2002

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

Table III.F-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)	<i>Gasterosteus aculeatus</i>	threespine stickleback	R	R
		<i>Pungitius pungitius</i>	ninespine stickleback	W	W
Scorpaeniformes					
	Hexagrammidae (greenlings)	<i>Hexagrammos stelleri</i>	whitespotted greenling	U-R	W
	Cottidae (sculpins)	<i>Triglops pingelii</i>	ribbed sculpin	W	W
		<i>Hemilepidotus papilio</i>	butterfly sculpin	—	W
		<i>Hemilepidotus jordani</i>	yellow Irish lord	—	R
		<i>Icelus spatula</i>	spatulate sculpin	W	W
		<i>Icelus bicornis</i>	twohorn sculpin	R	—
		<i>Gymnocanthus tricuspis</i>	Arctic staghorn sculpin	W	W
		<i>Cottus aleuticus</i>	coastrange sculpin	—	LD
		<i>Enophrys diceraus</i>	antlered sculpin	—	W
		<i>Megalocottus platycephalus</i>	belligerent sculpin	—	W
		<i>Myoxocephalus quadricornis</i>	fourhorn sculpin	W	W
		<i>Myoxocephalus scorpius</i>	shorthorn sculpin	W	W
		<i>Myoxocephalus scorpioides</i>	Arctic sculpin	W	W
		<i>Myoxocephalus jaok</i>	plain sculpin	—	W
		<i>Microcottus sellaris</i>	brightbelly sculpin	—	R
		<i>Artediellus gomojunovi</i>	spinyhook sculpin	R	R
		<i>Artediellus scaber</i>	hamecon	W	W
		<i>Artediellus pacificus</i>	hookhorn sculpin	—	R
	<i>Artediellus ochotensis</i>	Okhotsk hookear sculpin	—	R	
	Hemitripterae (sailfin sculpins)	<i>Blepsias bilobus</i>	crested sculpin	—	W
		<i>Nautichthys pribilovius</i>	eyeshade sculpin	—	W
	Psychrolutidae (fathead sculpins)	<i>Eurymen gyrinus</i>	smoothcheek sculpin	—	R
		<i>Cottunculus sadko</i>	Sadko sculpin	R	—
	Agonidae (poachers)	<i>Hypsagonus quadricornis</i>	fourhorn poacher	—	R
		<i>Pallasina barbata</i>	tubenose poacher	—	R
		<i>Occella dodecaedron</i>	Bering poacher	—	R
		<i>Leptagonus decagonus</i>	Atlantic poacher	R	R
		<i>Podothecus veterus</i>	veteran poacher	U-R	R/P

Table III.F-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)	<i>Ulcina olrikii</i>	Arctic alligatorfish	W	W	
		<i>Aspidophoroides monopterygius</i>	alligatorfish	—	LD	
	Cyclopteridae (lumpsuckers)	<i>Eumicrotremus derjugini</i>	leatherfin lumpsucker	R/P	—	
		<i>Eumicrotremus andriashevi</i>	pimpled lumpsucker	—	R	
	Liparidae (snailfishes)	<i>Liparis gibbus</i>	variegated snailfish	W	W	
		<i>Liparis tunicatus</i>	kelp snailfish	W	W	
		<i>Liparis bristolensis</i>	Bristol snailfish	—	R	
		<i>Liparis fabricii</i>	gelatinous seasnail	R/P	—	
			<i>Liparis callyodon</i>	spotted snailfish	—	W
	Perciformes					
	Zoarcidae (eelpouts)	<i>Gymnelus hemifasciatus</i>	halfbarred pout	R/P	R/P	
		<i>Gymnelus viridis</i>	fish doctor	R/P	R/P	
		<i>Lycodes seminudus</i>	longear eelpout	R	—	
		<i>Lycodes mucosus</i>	saddled eelpout	R	R	
		<i>Lycodes turneri</i>	estuarine eelpout	R	W	
		<i>Lycodes polaris</i>	polar eelpout	W	W	
		<i>Lycodes ravidens</i>	marbled eelpout	—	W	
		<i>Lycodes rossi</i>	threespot eelpout	R	R	
		<i>Lycodes sagittarius</i>	archer eelpout	R	—	
		<i>Lycodes palearis</i>	wattled eelpout	—	W	
		<i>Lycodes pallidus</i>	pale eelpout	R	—	
		<i>Lycodes squamiventer</i>	scalebelly eelpout	R	—	
		<i>Lycodes eudipleurostictus</i>	doubleline eelpout	R	—	
	<i>Lycodes concolor</i>	ebony eelpout	—	R		
	Stichaeidae (pricklebacks)	<i>Eumesogrammus praecisus</i>	fourline snakeblenny	W	W	
		<i>Stichaeus punctatus</i>	Arctic shanny	W	W	
		<i>Chirolophis snyderi</i>	bearded warbonnet	—	R	
		<i>Leptoclinus maculatus</i>	daubed shanny	R	R	
		<i>Anisarchus medius</i>	stout eelblenny	W	W	
		<i>Lumpenus fabricii</i>	slender eelblenny	W	W	
	Pholidae (gunnels)	<i>Pholis fasciata</i>	banded gunnel	—	R	
	Anarhichadidae (wolffishes)	<i>Anarhichas orientalis</i>	Bering wolffish	W	W	
	Ammodytidae (sand lances)	<i>Ammodytes hexapterus</i>	Pacific sand lance	W	W	

Table III.F-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)	<i>Hippoglossus stenolepis</i>	Pacific halibut	—	U-R
		<i>Hippoglossoides robustus</i>	Bering flounder	—	W
		<i>Reinhardtius hippoglossoides</i>	Greenland halibut	R	U-P
		<i>Platichthys stellatus</i>	starry flounder	W	W
		<i>Pleuronectes quadrituberculatus</i>	Alaska plaice	—	W
		<i>Pleuronectes glacialis</i>	Arctic flounder	W	W
		<i>Limanda proboscidea</i>	longhead dab	—	W
		<i>Limanda aspera</i>	yellowfin sole	—	W
		<i>Limanda sakhalinensis</i>	Sakhalin sole	—	U-R

Note

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

Sources:

Mecklenburg, Mecklenburg, and Thorsteinson, 2002; Stevenson, et al., 2004.

Table III.F-2

Arctic Fish Occurrence in Coastal and Marine Waters of the Alaskan Chukchi and Beaufort Seas

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

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

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

Table III.F-2

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

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

Note:

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

Table III.F-3.
Reduction in Fish Catch Rates as a Result of Seismic Survey Activity.

Species	Gear Type	Sound Pressure Level of Airgun Emissions (in decibels)	Catch Reduction	Source
Atlantic cod (<i>Gadus morhua</i>)	Trawl	250 dB	46-69% Lasting at least 5 days	Engas et al., 1993
	Longline	250 dB	17-45% Lasting at least 5 days	Engas et al., 1993
		Undetermined, 9.32 miles from the source	55-79% Lasting at least 24 hours	Løkkeborg and Soldal, 1993
Haddock (<i>Melanogrammus aeglefinus</i>)	Trawl	250 dB	49-72% Lasting at least 5 days	Engas et al., 1993
	Longline	250 dB	49-73% Lasting at least 5 days	Engas et al., 1993
Rockfish (<i>Sebastes</i> spp.)	Longline	223 dB	52% - Effect period not determined	Skalski et al., 1992

Table III.G-1
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
Diomedes	146	92.5
Shismaref	562	93.2
Wales	152	83.6

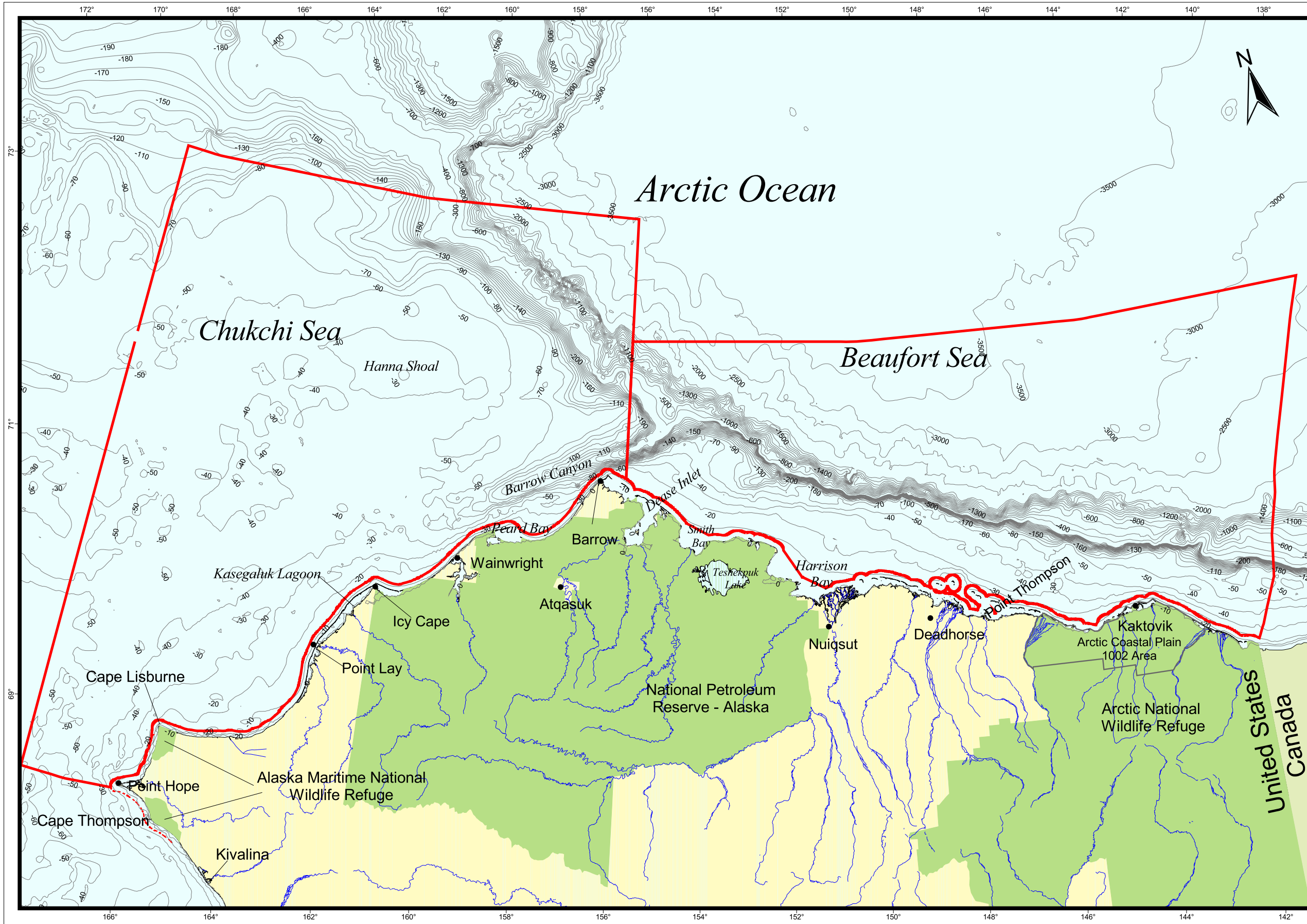
Source:
 USDOC, Bureau of the Census, 2000.

Table III.G-2.**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.



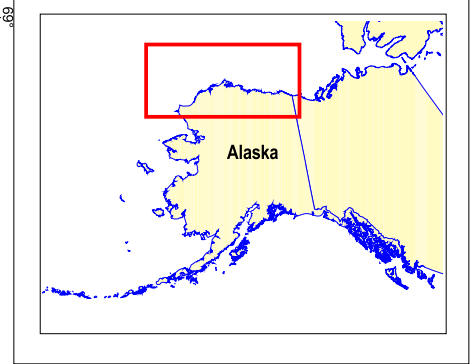
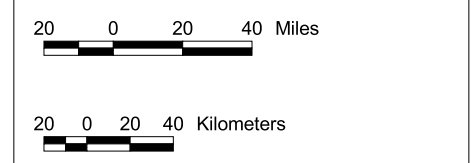
Map 1.
Arctic Ocean
Seismic
Proposed
Action Area

LEGEND

-  Action Area Boundary
-  Submerged Lands Act Boundary

Bathymetry

- Inner Shelf (0-20 M)
- Central Shelf (20-60 M)
- Shelf Break (60-200 M)



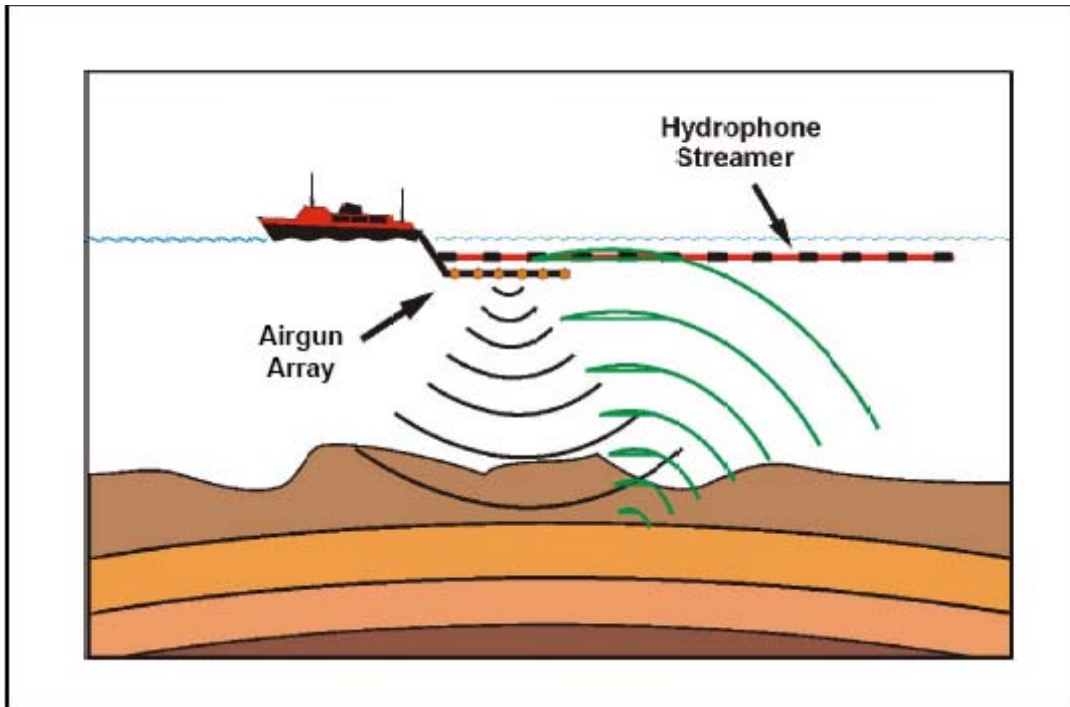
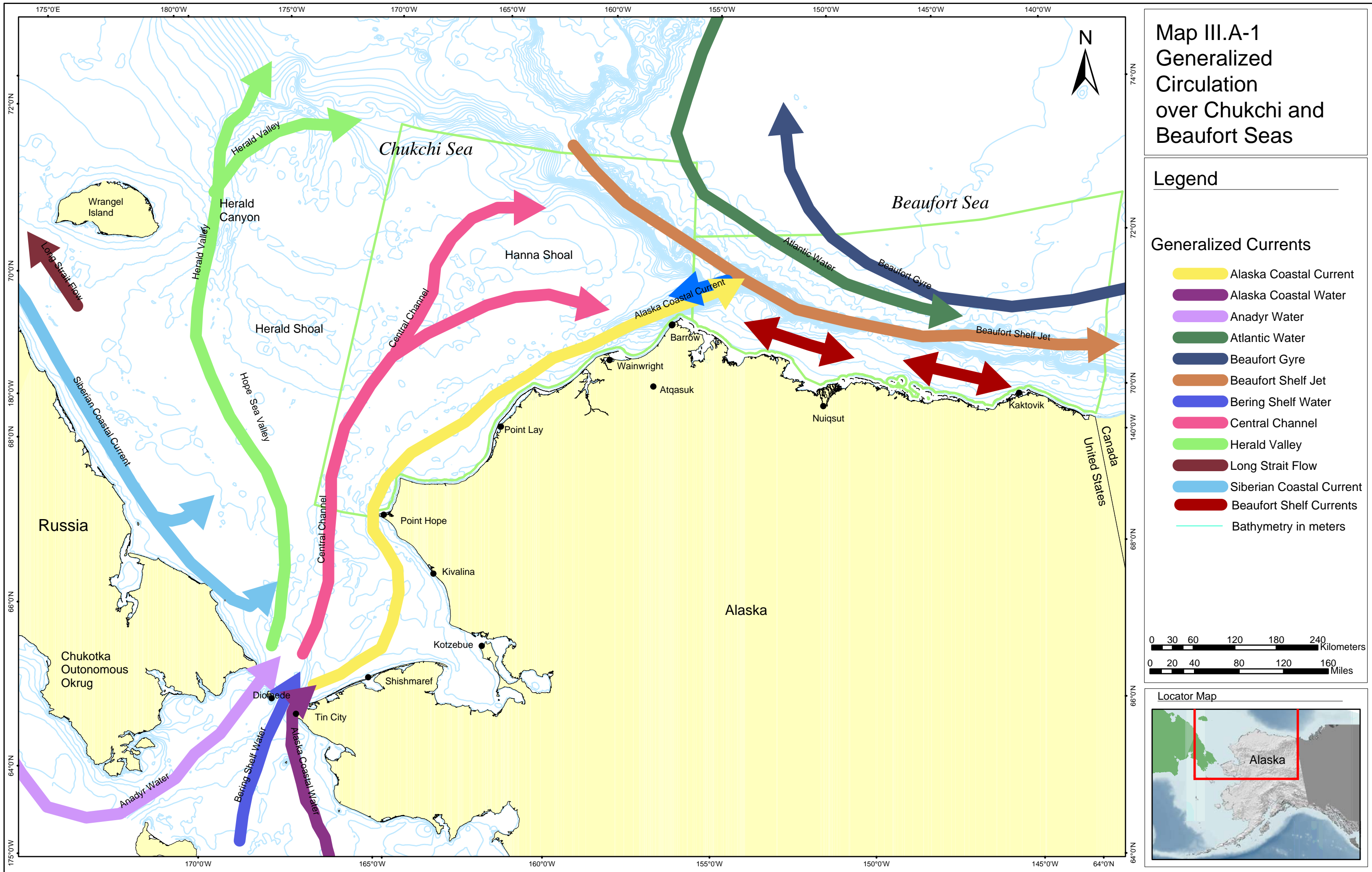


Figure I.E-1. Simple Illustration of a Marine Seismic Survey Operation using Streamers
Source: USDO, MMS, Alaska OCS Region



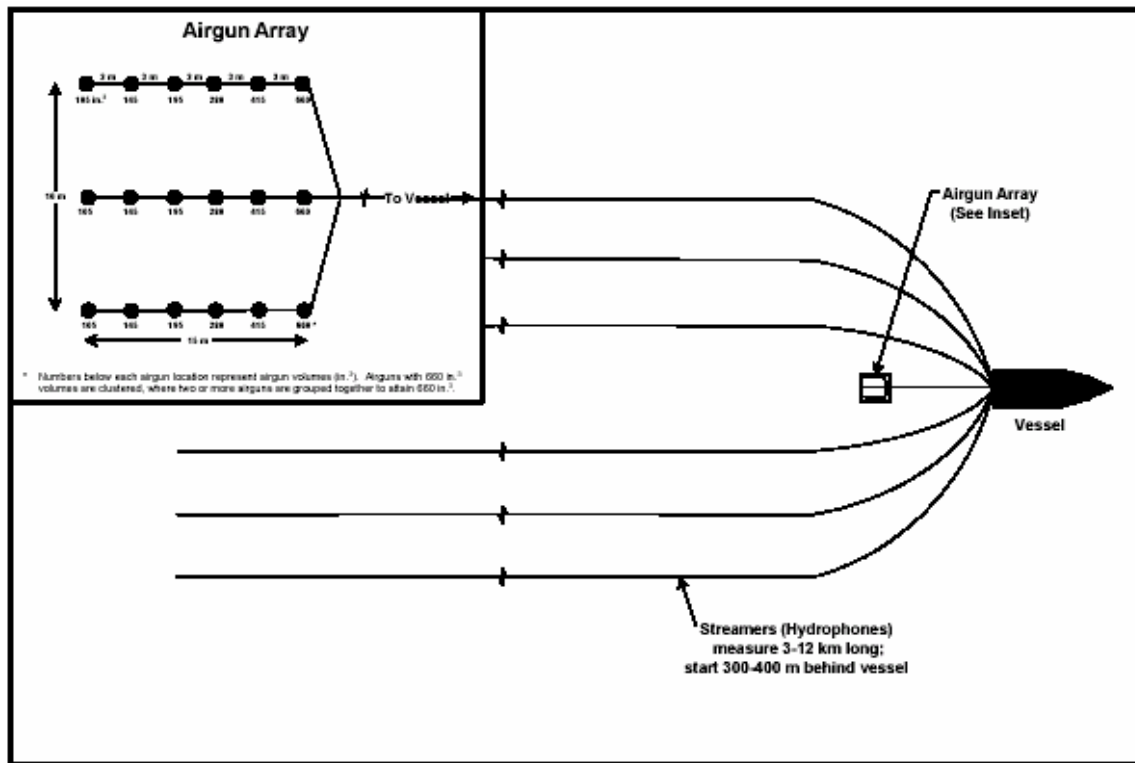


Figure III.B-1. Typical 3D marine seismic array configuration (Sources MMS AK OCS).

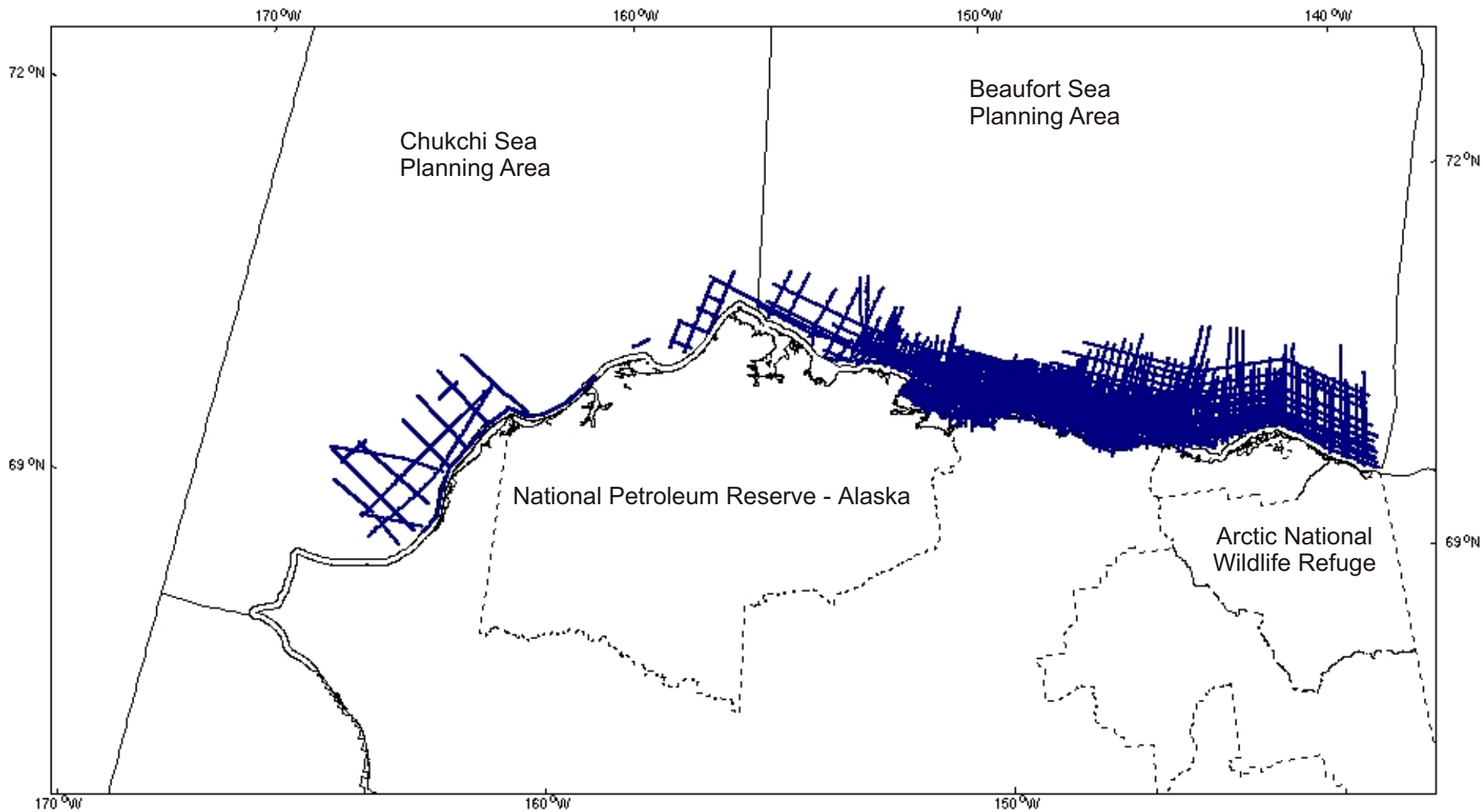


Figure III.C-1. Arctic Ocean Outer Continental Shelf 2D Seismic Data Collected from 1970 through 1979 (Source: MMS-AK OCS, Anchorage, Alaska).

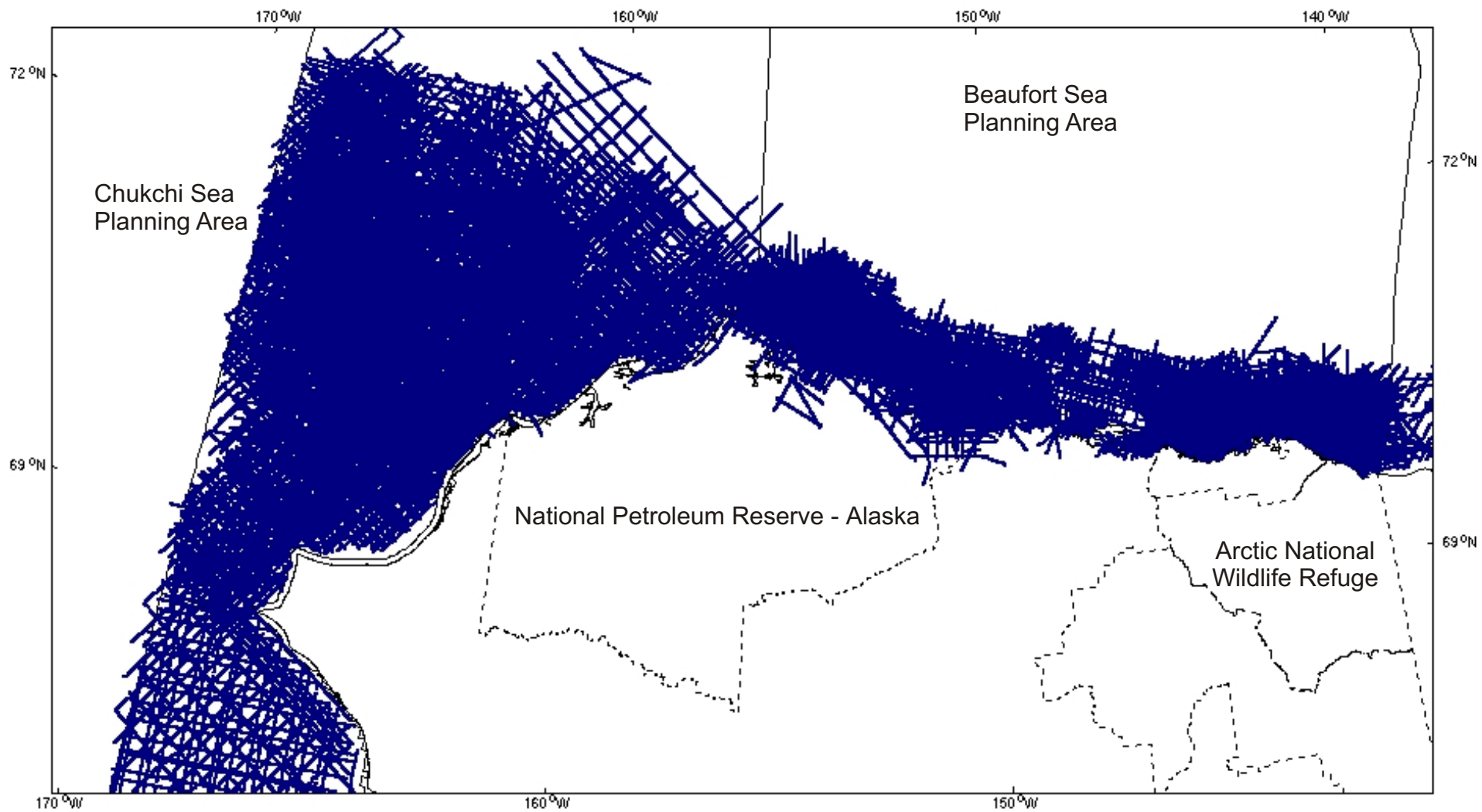


Figure III.C-2. Arctic Ocean Outer Continental Shelf 2D Seismic Data Collected from 1980 through 1989 (Source: MMS-AK OCS, Anchorage, Alaska).

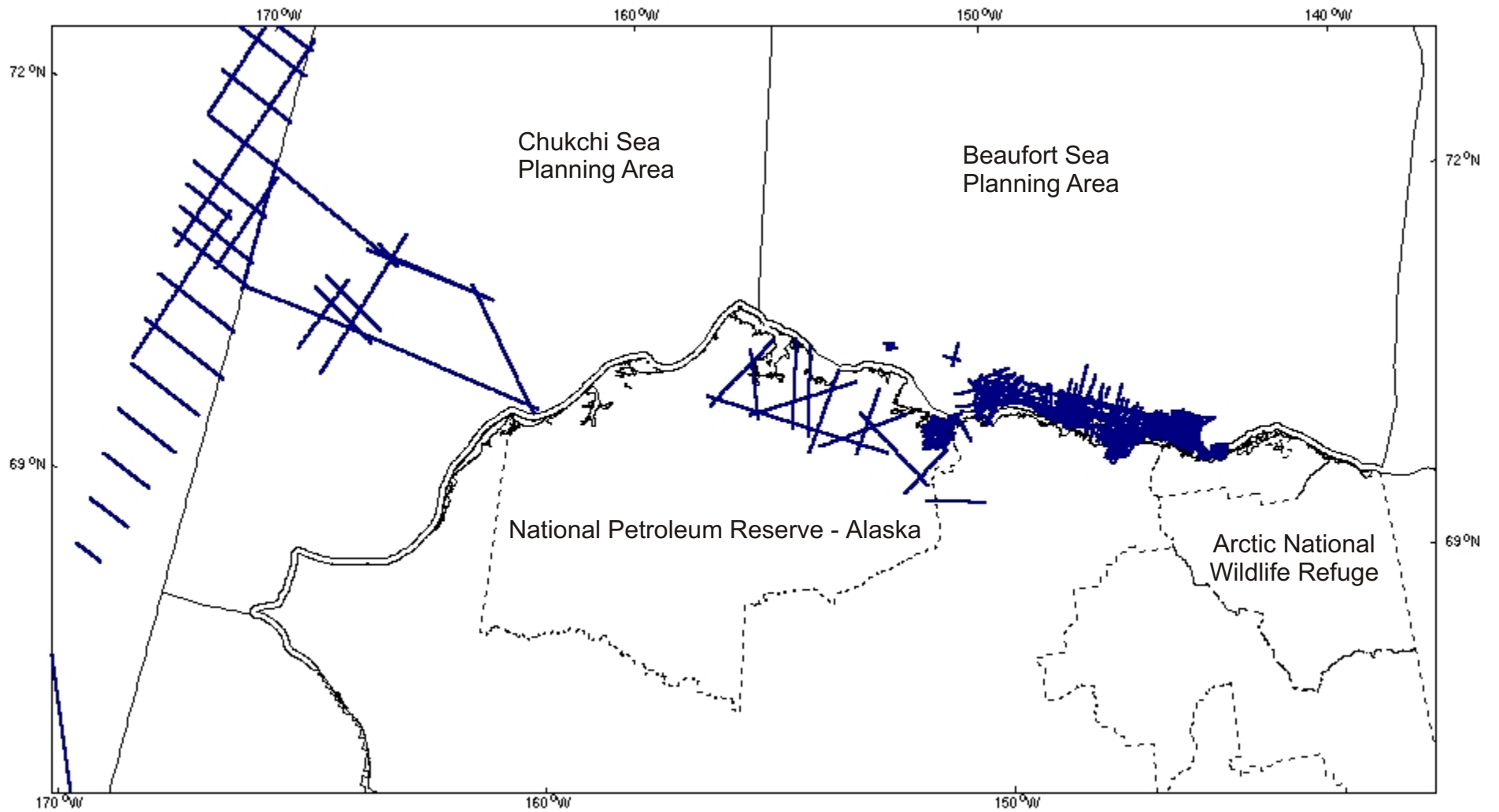
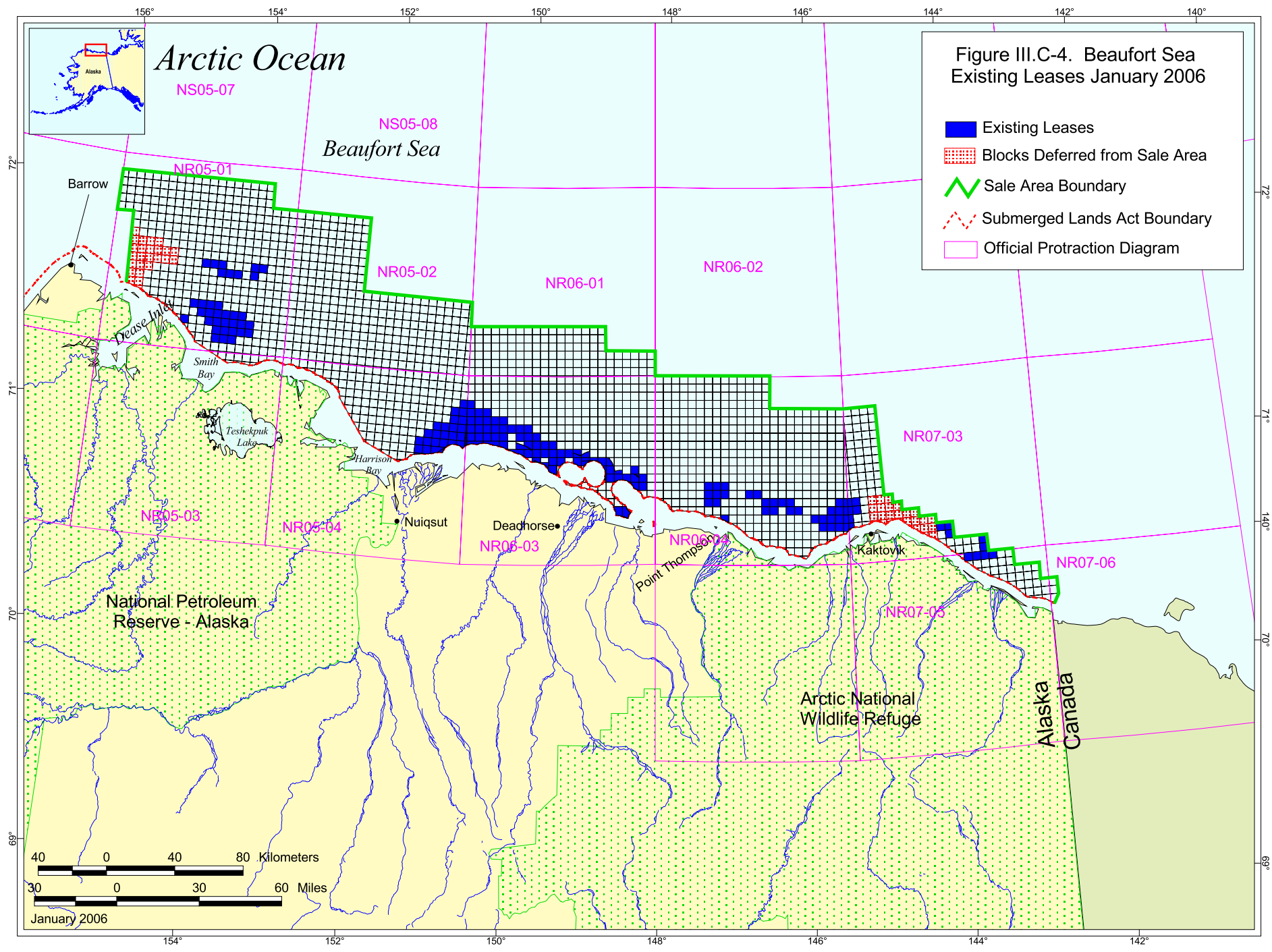


Figure III.C-3. Arctic Ocean Outer Continental Shelf 2D Seismic Data Collected from 1990 through 2004 (Source: MMS-AK OCS, Anchorage, Alaska).



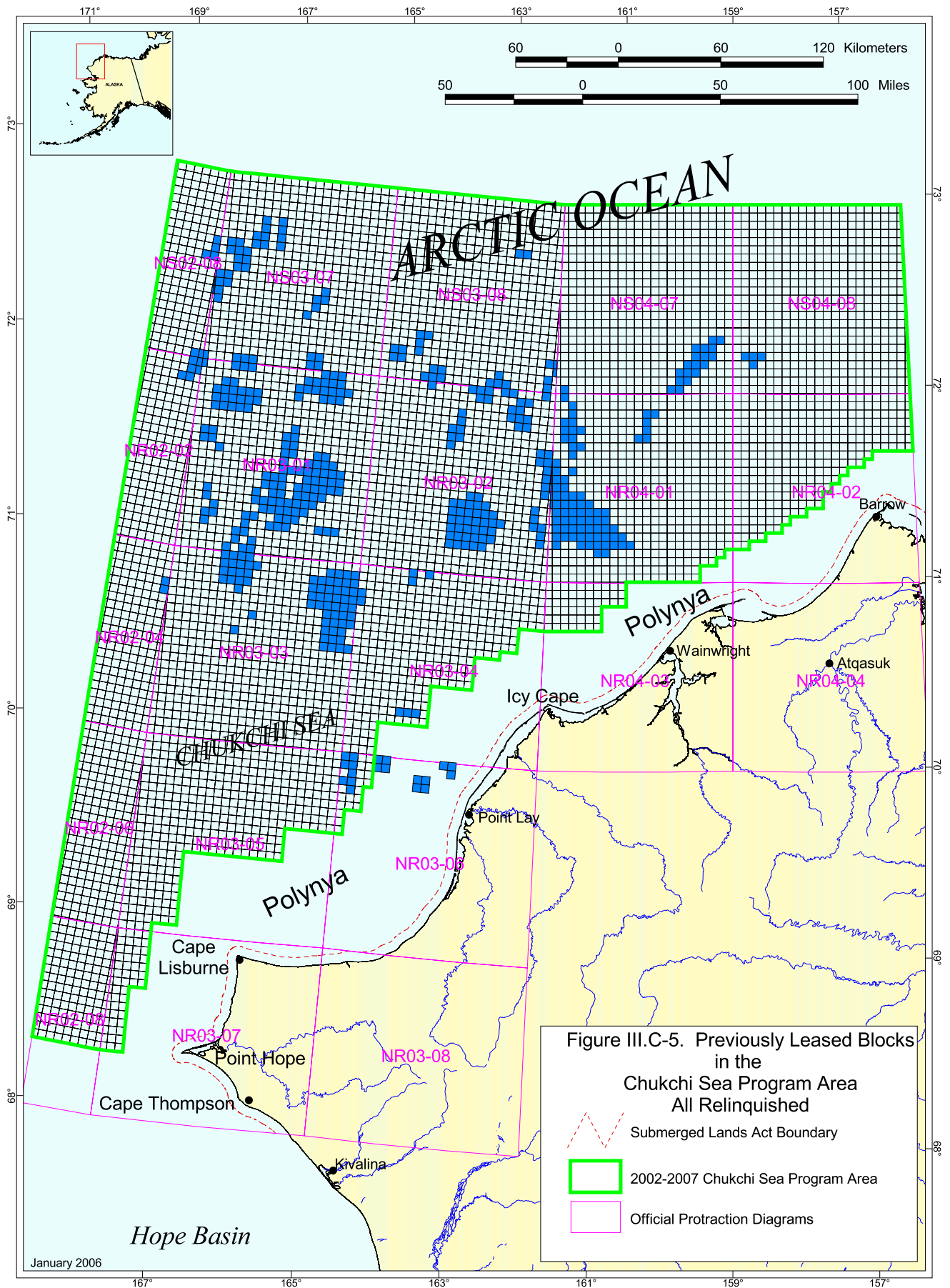





Figure III.C-5. Previously Leased Blocks in the Chukchi Sea Program Area All Relinquished

-  Submerged Lands Act Boundary
-  2002-2007 Chukchi Sea Program Area
-  Official Protraction Diagrams

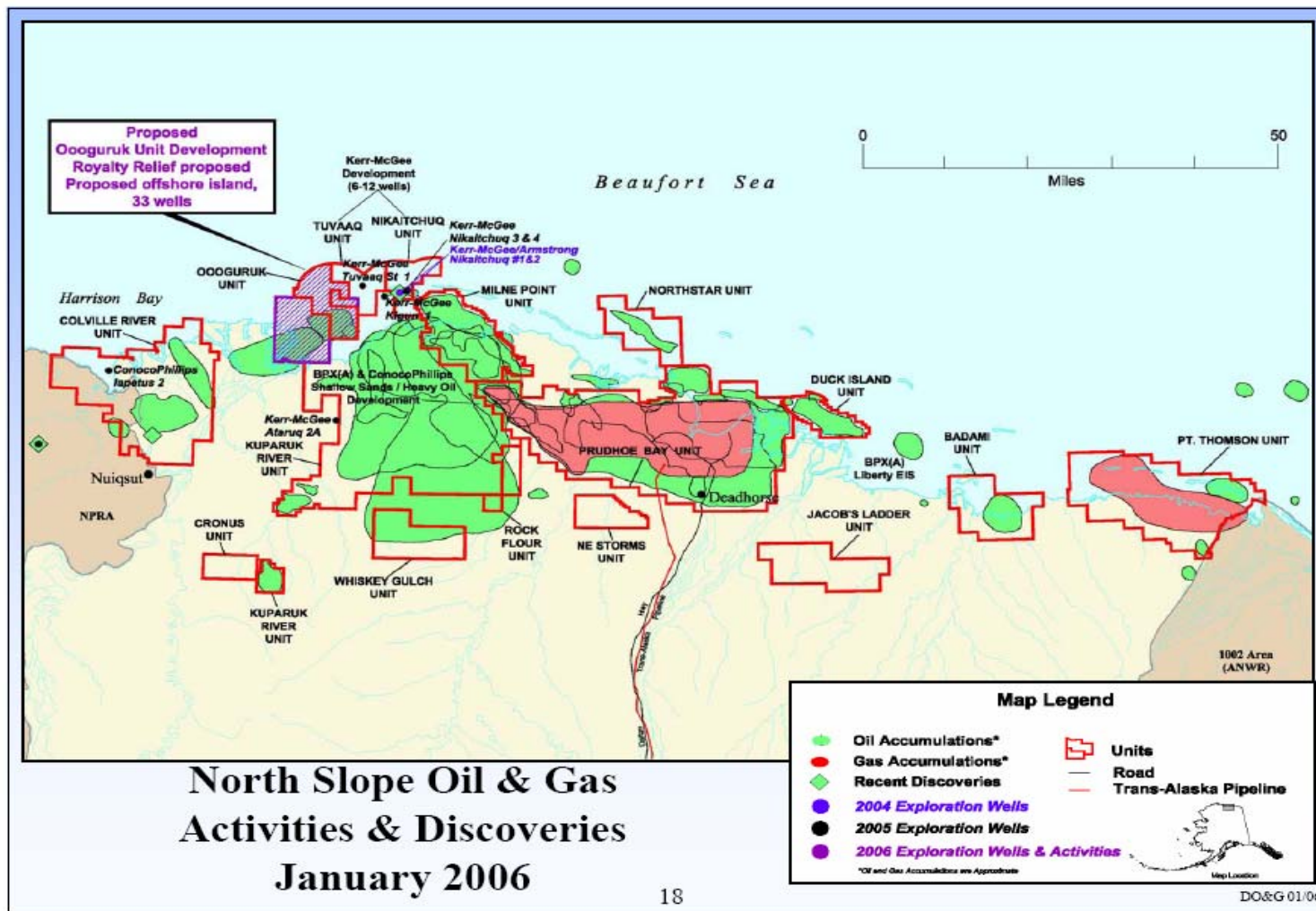


Figure III C-6. North Slope oil and gas activities and discoveries, as of January 2006. (Source: ADNR/Division of Oil and Gas).

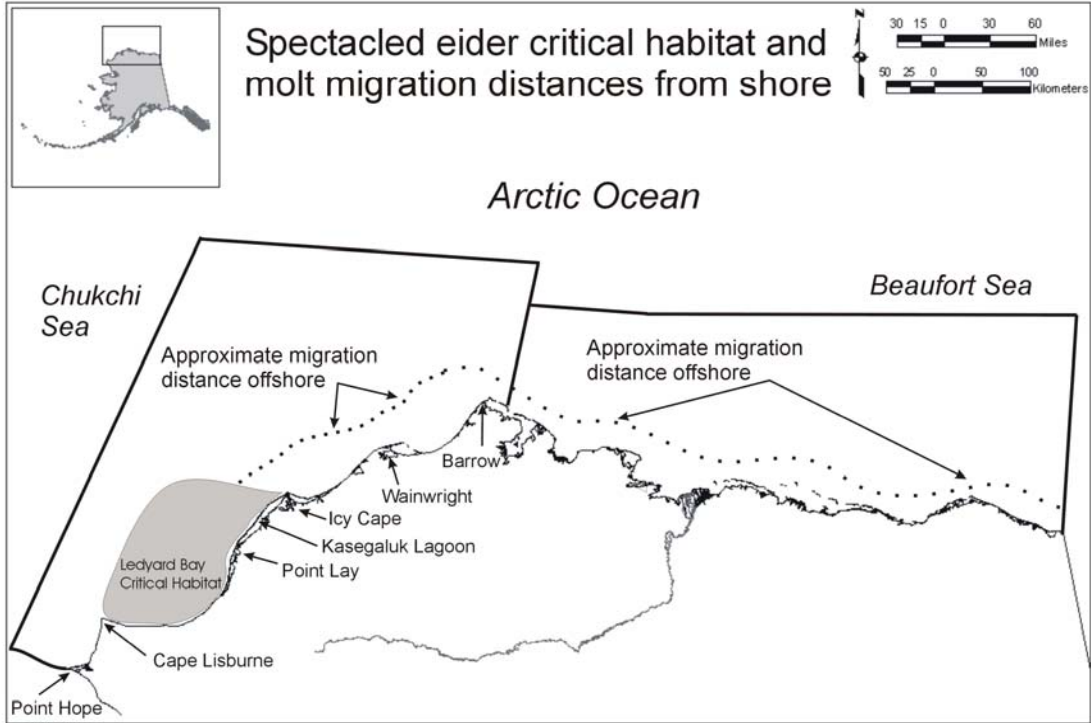


Figure III.F-1. Spectacled eider critical habitat at Ledyard Bay and molt migration distances from shore. Distances are based on female eiders which migrate further from shore than males. Distances depicted are approximate and based on Petersen *et al.*, 1999.