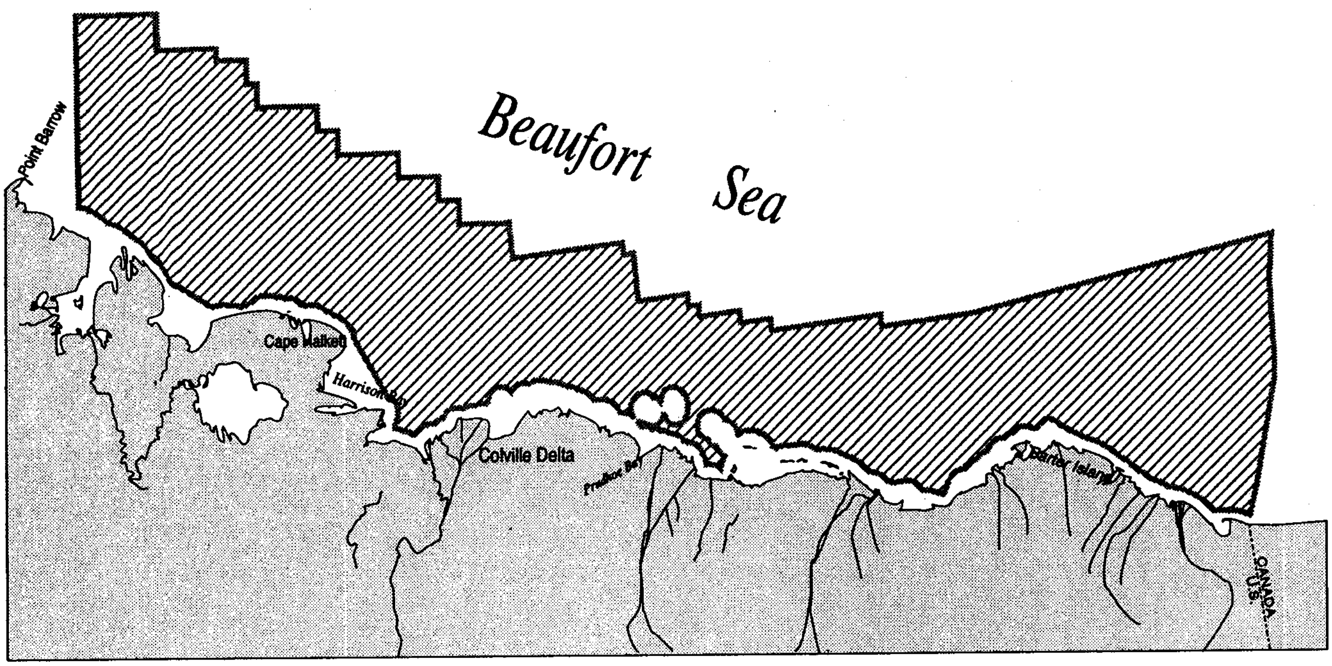
Alaska Outer Continental Shelf

OCS EIS/EA
MMS 96-0012

Beaufort Sea Planning Area Oil and Gas Lease Sale 144

Final Environmental
Impact Statement

Volume II



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

This Environmental Impact Statement (EIS) is not intended, nor should it be used, as a local planning document by potentially affected communities. The exploration, development and production, and transportation scenarios described in this EIS represent best-estimate assumptions that serve as a basis for identifying characteristic activities and any resulting environmental effects. Several years will elapse before enough is known about potential local details of development to permit estimates suitable for local planning. These assumptions do not represent a Minerals Management Service recommendation, preference, or endorsement of any facility, site, or development plan. Local control of events may be exercised through planning, zoning, land ownership, an applicable State and local laws and regulations.

With reference to the extent of the Federal Government's jurisdiction of the offshore regions, the United States has not yet resolved some of its offshore boundaries with neighboring jurisdictions. For the purposes of the EIS, certain assumptions were made about the extent of areas believed subject to United States' jurisdiction. The offshore-boundary lines shown in the figures and graphics of this EIS are for purposes of illustration only; they do not necessarily reflect the position or views of the United States with respect to the location of international boundaries, convention lines, or the offshore boundaries between the United States and coastal states concerned. The United States expressly reserves its rights, and those of its nationals, in all areas in which the offshore-boundary dispute has not been resolved; and these illustrative lines are used without prejudice to such rights.

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Author

Minerals Management Service
Alaska OCS Region

Cooperating Agency

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BEAUFORT SEA PLANNING AREA
OIL AND GAS LEASE SALE 144

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Volume II

SECTION V

REVIEW AND ANALYSIS OF COMMENTS RECEIVED

V. REVIEW AND ANALYSIS OF COMMENTS RECEIVED

A. INTRODUCTION:

1. Summary of Comments on the Draft EIS: During the DEIS comment period, various governmental agencies, organizations, communities, and individuals provided written statements and oral testimonies. The only comments received from the oil industry were written comments from BP Alaska Exploration and the Alaska Oil and Gas Association. More than 17 written statements were received, 12 of which had comments that required a written response. Public hearings were held on the DEIS in the communities of Nuiqsut, Kaktovik, and Barrow as well as the city of Anchorage. At these hearings, 33 individuals testified. The staff analysts responded to 151 separate comments derived from written submissions and 68 comments from oral testimony.

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Of the 151 written comments responded to, 44 were from Federal Agencies, 16 were from the oil and gas industry, 28 were from the State of Alaska, and 73 were from Native organizations and communities.

All oral-testimony comments that warranted a response, because they raised substantive issues, were from Native Alaskans or employees of Native organizations and/or communities. The comments from Native organizations and individuals were almost entirely in opposition to the proposed lease sale. Comments received from the State were supportive of the concerns of the North Slope communities.

Statements and oral testimonies requiring responses are noted in Sections V.B.2 and 3, respectively. The primary issues raised during the DEIS comment and public hearings period addressed the following concerns: (1) the desire by North Slope Native communities for expanded input into the design of industry monitoring studies and the formulation of exploration plans, (2) the belief that MMS consistently underestimated the effects of noise on the behavior patterns of migrating bowhead whales, (3) the perceived failure by MMS to incorporate indigenous "traditional knowledge" within the analysis of the effects of the proposal, (4) the desire by North Slope leaders for a seasonal drilling stipulation, (5) the inability of industry to clean up a spill in ice-pack conditions, and (6) the need for an additional block deferral alternative for the community of Nuiqsut.

2. EIS Changes in response to Comments on the Draft EIS:

a. Nuiqsut Deferral Alternative: In response to concerns raised during the comment and public hearings process, a third alternative (Alternative IV) to the proposed action (Alternative I) was included for analysis with in the FEIS. Alternative IV would defer 243 blocks out of the 1,879 offered by Alternative I and 559,872 hectares out of 4 million (Fig II.D-1). The deferred area comprises about 14 percent of the area offered by Alternative I.

The deferral was offered by the community of Nuiqsut and the Inupiat Whaling Commission. The area proposed for deferral encompasses Cross Island—a location viewed by the community of Nuiqsut as their primary harvest area for the bowhead whale and other marine mammals. The blocks offered in the Nuiqsut Deferral Alternative have been offered in other OCS lease sales and lie immediately offshore of active State and Federal leases, including the Northstar Unit. Currently, the Corps of Engineers is in the process of issuing a developmental EIS for the Federal portion of those resources produced from the Northstar Unit.

b. Mitigating Measures: Significant changes in mitigating measures between the draft and final EIS's consisted of major additions to and rewrites of two stipulations, the addition of four ITL's, and the deletion of one ITL.

(1) Stipulation No. 4, Industry Site-Specific Bowhead Whale-Monitoring Program: This stipulation was rewritten to ensure greater participation by the North Slope in the design and review of proposed bowhead whale-monitoring plans. The stipulation now requires, among other things, that the Regional Supervisor for Field Operations (RS/FO) consult with the North Slope Borough (NSB) and the Alaska Eskimo Whaling Commission (AEWC) before suspending the requirement for a

monitoring program, that the NSB or the AEWC be accorded the opportunity to participate in any monitoring program by providing an observer, and that the NSB and AEWC be provided the results of the monitoring program. The stipulation also requires lessees to fund an independent peer review of the monitoring plan, with some of the reviewers chosen by the NSB and the AEWC.

(2) Stipulation No. 5, Subsistence Whaling and Other Subsistence Activities: The principal difference in this stipulation from the draft EIS version is the requirement that lessees consult with affected communities as well as the NSB and the AEWC to discuss potential conflicts involved with the siting, timing, or logistics of a proposed operation. The stipulation also provided that the RS/FO may convene a panel to resolve disputes that may arise between the lessee and the stakeholders.

(3) ITL No. 1, Information on Community Participation in Operations Planning: This ITL was not present in the DEIS. Its purpose is to encourage lessees to bring residents on the North Slope communities into the planning process.

(4) ITL No. 2, Information on Kaktovikmiut Guide "In This Place": This ITL was not present in the DEIS. This ITL is new. Lessees are encouraged to obtain this guide and to incorporate it into Orientation Programs to assist in fostering understanding and sensitivity to community values.

(5) ITL No 9, Information on Geological and Geophysical Survey Activity: This ITL was not in the DEIS. This ITL is new. It advises of the potential effects of seismic surveys and reminds lessees of the specifics of the bowhead whale-monitoring program.

(6) No. 20, Information on Nuiqsutmiut Paper: This ITL was not present in the DEIS; it is new. Lessees are encouraged to obtain this guide and to incorporate it into Orientation Programs to assist in fostering understanding and sensitivity to community values.

(7) Information on the State Review of Exploration Plans and Associated Oil-Spill-Contingency Plans: This ITL appeared in the DEIS but was deleted for the final. This ITL is redundant with current Coastal Zone Management regulations and the provisions of ITL No. 16.

c. Text Revisions: The analysis in Section IV and the wording of stipulations and ITL's in Section II.E have been revised to reflect the concerns raised during the public comment period. Other text changes focused on major issues, as outlined in Section V.A.1. Of specific note was the addition of the Nuiqsut deferral and the rewrite of those sections dealing with subsistence activities (III.C.2 and 3 and IV.B.9 and 10) and the bowhead whale (III.B.5 and IV.B.6). These sections incorporated new information dealing with the effect of noise (particularly on the bowhead whale) as well as sources of "traditional knowledge." Where comments warranted other changes or presented new or additional information, revisions were made to the appropriate text in the EIS; references to the revised sections are presented in responses to specific comments.

B. STATEMENTS, COMMENTS, AND RESPONSES:

1. Statements Opposing or Supporting Sale 144: Of the 228 oral and written comments received on the DEIS, a decided majority were negative towards the sale as well as the document; the balance were informational in nature, with only written comments from industry actively supporting the sale. Comments received on the DEIS that provided new or additional information or addressed the adequacy of descriptive material or analysis are responded to in the FEIS in Sections V.B.2, V.B.3, and V.C. Those comments that express only opposition or support for a lease sale are included in the decision documents (Sec I.A.15) prepared to assist the Secretary of the Interior in making a decision on whether or not to hold a lease sale; they are not presented in this EIS. Following is a summary of concerns regarding the DEIS and reasons for not holding the sale.

Concerns regarding the DEIS and reasons for opposing the lease sale include:

Information
- Did not use or ignored traditional knowledge
- Used incomplete subsistence-harvest data
- Ignored certain studies
- Failed to use the full range of information available

Infrastructure
- The effects of onshore facilities
- The water-quality effects of nearshore facilities (shore-access structures)
- Logistics
- The effects of heated subsea pipelines

Oil Spills
- Inability to clean up during periods of ice
- Effects on migrating bowhead whales
- Effects on other marine mammals
- Effects in general on subsistence harvest

Exploration and Monitoring Plans
- Need for increased input from the North Slope
- Need for peer-review process
- Need for conflict-resolution mechanism
- Need for a Kaktovik Impact Office

Lack of a Nuiqsut Deferral
- Cross Island is an important bowhead-harvest area
- Ignored request from prominent North Slope resident

Stipulations and ITL's
- EIS needs stipulations with "teeth" in them
- Should have a seasonal drilling stipulation
- Should have a stipulation dealing with the protection of polar bears
- Lack of historical data regarding effectiveness

Caribou
- Core calving area in ANWR
- Effects of onshore development and facilities design
- Caribou herd ranges and populations

Bowhead Whales
- Effects of noise on behavior (seismic activity)
- Effects of oil spills
- Quality of analysis and adequacy of data.

Gray Whales
- No analysis

Water Quality
- CWA §303 (d) issues

Sale Boundary
- Offshore border issue between U.S. and Canada
- Bids may be invalid and development illegal

Onshore Development
- It is safer
- Onshore resources should be developed first
- ANWR should be opened

Reasons for supporting the sale:

Only the Alaska Oil and Gas Association (AOGA) and BP-Alaska Exploration sent letters endorsing the Sale. The AOGA urged the sale be held in a timely manner but stated its members were more interested in tracts closer to shore.

2. Comments and Responses: The following is a listing of all organizations that provided written comments during the DEIS review period. The issues raised in these comments are responded to in Section V.C. Comments requiring a response either provided new or additional information to be incorporated into the FEIS or addressed the adequacy of written material in the analysis. Specific comments in each letter are bracketed and numbered. The MMS responses to the specific comments follow each letter.

Federal Agencies
Marine Mammal Commission
U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency
- Region 10

State Of Alaska
State of Alaska
- Office of the Governor
  - Division of Governmental Coordination
  - Office of Management and Budget

North Slope Borough and Local Communities
North Slope Borough
- Office of the Mayor
City of Kaktovik
- Office of the Mayor
City of Nuiqsut
Village of Nuiqsut

Alaska Native Organizations
Alaska Eskimo Whaling Commission
Arctic Slope Native Association Limited
Indigenous People's Council for Marine Mammals
Kuukpik Corporation
Ukpeagvik Inupiat Corporation

Industry
Alaska Oil and Gas Association
BP Exploration (Alaska) Inc.

3. Public Hearing Comments: Following is a list of individuals who provided oral testimony at the Sale 144 public hearings. Individuals who had comments that were responded to are entered in bold print. Comments requiring a response either provided new or additional information to be incorporated into the FEIS or addressed the adequacy of written material in the analysis. Specific comments in each letter are bracketed and numbered. The MMS responses to the specific comments follow each oral-testimony transcript.

Public Testimony

Anchorage Public Hearings, October 26, 1995

Bell, Robert K.	**Hilde, Carl**

Nuiqsut Public Hearings, November 6, 1995

Akpik, Joseph	Nukapigak, Isaac
Lampe, Leonard	**Nukapigak, Joe**
Long, Frank	Simmonds, Abe
Napageak, Thomas	Tukle, Patsy

Kaktovik Public Hearings, November 7, 1995

Akootchook, Isaac	**Sonsalla, Lon**
Akootchook, Susie	**Tagarook, George**

Barrow Public Hearings, November 8, 1995

Adams, Billy	Edwardson, Robert
Ahgeak, Max	**George, Craig**
Ahmaogak, Maggie	**Hopson, Edward**
Albert, Tom	**Itta, Edward**
Brower, Arnold, Jr.	Okakok, Charlie
Brower, Eugene	Oleman, Nate Jr.
Brower, Harry, Jr.	**Pederson, Michael**
Brower, Johnny	**Rexford, Burton**
Brower, Ronald H., Sr.	Vorderstrasse, Jim
Carroll, Marie Adams	

C. COMMENTS ON THE INFORMATION CONTAINED IN THE DEIS FOR SALE 144 AND THE RESPONSES BY MMS TO THOSE COMMENTS:

Appearing next to each organizational title is the abbreviation used in outlining of the comments and the responses to those comments.

Table of Contents for Comments and Responses to Comments

MARINE MAMMAL COMMISSION
1825 CONNECTICUT AVENUE, N.W. #512
WASHINGTON, DC 20009

20 November 1995

Ms. Judith C. Gottlieb
Regional Director
Minerals Management Service
Alaska Region
949 East 36th Avenue
Anchorage, Alaska 99508-4302

RECEIVED
NOV 22 1995
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Dear Ms. Gottlieb:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, has reviewed the Draft Environmental Impact Statement for the Beaufort Sea Planning Area Oil and Gas Lease Sale 144. The Commission offers the following comments and recommendations regarding the assessment of the possible impacts of the proposed lease sale on marine mammals.

General Comments

The Draft Environmental Impact Statement (DEIS) provides an assessment of the resource potential and the possible environmental consequences of a proposal to lease approximately 9.8 million acres of submerged lands in the Beaufort Sea planning area for oil and gas exploration and development. It indicates that the proposed lease area is located 3 to 75 miles from shore. The DEIS also provides assessments of the resource potential and possible environmental consequences of three alternative actions, including a "no action" alternative.

MMC-01

The DEIS indicates (page III-B-6) that six species of nonendangered marine mammals occur commonly in the Alaskan Beaufort Sea, namely ringed seals, bearded seals, spotted seals, walruses, polar bears, and belukha whales. The DEIS indicates that bowhead whales are common seasonally in the Beaufort Sea planning area and that the species is listed as endangered under the Endangered Species Act. It notes that harbor porpoises, killer whales, narwhals, and hooded seals are uncommon or rare in the planning area and that, because of their "numerical insignificance", these species are not considered further.

The DEIS states (page IV-B-26) that "[o]il pollution, noise and disturbance, and alteration of habitats could adversely affect marine-mammal populations found in the proposed Sale 144 area." With regard to nonendangered marine mammals, the DEIS concludes (Table II.E) that --

MMC-01

"[t]he effects from activities associated with the base case are expected to include the loss of small numbers of seals (200-300), walruses (no more than perhaps several hundred), polar bears (perhaps 20-30), and belukha whales (<10), with populations recovering within one generation or less (such as about 2-5 years)."

The DEIS concludes (page IV-B-41 and Table II.E), with respect to bowhead whales, that --

"[o]verall, bowhead whales exposed to noise-producing activities and oil spills most likely would experience temporary, sublethal effects. Bowheads may exhibit temporary avoidance behavior in response to vessels and to activities related to seismic surveys, drilling, and construction during exploration and development and production. Avoidance behavior usually begins when a source of noise disturbance (vessel or drilling rig) is 1 to 4 km away. Behavioral changes may last up to 60 minutes after the disturbance has left the area or the whales have passed. Some bowhead whales could be exposed to spilled oil, resulting primarily in temporary, sublethal effects. Some mortality might result if exposure to freshly spilled oil were prolonged; however, the population is expected to recover within 1 to 3 years."

These conclusions may be valid. However, the DEIS does not provide data, analyses, or references to support all of them. For example, it is not clear how the stated recovery times were determined without information on the natural history and population dynamics of the various species. Without such information it is not possible to judge if the estimated recovery times are reasonable.

MMC-002

Also, the DEIS does not provide a thorough summary or assessment of the available information concerning marine mammals that occur in the planning area. It provides little information on the habitat use patterns of the marine mammals known to occur in the Beaufort Sea and how these species and their habitats have been affected by previous oil and gas development and other activities (e.g., Native subsistence harvest). In addition, it provides little information on the feeding habits and food requirements of the various marine mammal species that occur in and near the proposed lease sale area and how essential prey species might be affected by the proposed activities. Further, it does not identify critical uncertainties concerning the natural history, demography, and essential habitats and habitat components of the marine mammals that could be affected or how they might be affected, both directly and indirectly.

The Environmental Impact Statement (EIS) should provide a more complete and up-to-date assessment of what is known about the demography, habitat requirements, and status of the marine mammal species that occur in the Beaufort Sea and adjacent waters and how they could be affected indirectly, as well as directly, by oil and gas activities in and near the proposed sale area.

The Marine Mammal Commission recognizes that it may be prohibitively costly, if not impossible, to obtain all of the information necessary to accurately predict the possible direct and indirect effects of the proposed action on every species and population that could be affected by it. Consequently, some requirements of the Marine Mammal Protection Act and other relevant legislation, such as the Endangered Species Act, might best be met by designing and conducting post-lease sale monitoring programs to detect possible adverse effects before they reach significant levels. In this regard, we note that section 20 of the Outer Continental Shelf Lands Act, as amended, requires that the Service conduct post-lease monitoring to detect and determine the cause of environmental change possibly resulting from oil and gas exploration and development. The design and the results of the monitoring programs should be peer reviewed. Power analyses should be done at the design stage to ensure that the monitoring programs will be capable of detecting possible unanticipated adverse effects. MMC-03

Also, the DEIS does not note that, if marine mammals or their availability to Alaskan Natives for subsistence purposes may be affected by exploration and development activities, authorization for taking marine mammals may be necessary under the Marine Mammal Protection Act. Neither does it point out that section 101(a)(5) of the Marine Mammal Protection Act, as amended, provides that U.S. citizens engaged in offshore oil and gas activities can be exempted from the taking prohibitions in the Act when the taking is unintentional, involves small numbers of animals, has negligible effects on the affected population(s), and satisfactory provisions have been made to monitor and report the taking. MMC-04

The Marine Mammal Commission recommends that the EIS be expanded to more fully describe what is being or will be done to meet the monitoring requirements of section 20 of the Outer Continental Shelf Lands Act and to ensure that lessees are aware of the Marine Mammal Protection Act's general moratorium on taking marine mammals and the Act's provisions for obtaining a "small take" exemption or waiver of the Act's moratorium on taking marine mammals. MMC-05

Specific Comments

Pages II-3 through II-8 (Mitigating Measures that are Part of the Proposed Action: Information on Bird and Marine Mammal Protection): The DEIS states (page II-3) that "[t]his report details the laws and regulations under which the MMS OCS leasing program operates; the report also outlines permit requirements, engineering criteria, testing procedures and information requirements." However, the information provided is incomplete. The EIS should provide a more complete description of the intents and provisions of the Marine Mammal Protection Act, the Endangered Species Act, the Outer Continental Shelf Lands Act, and other statutes relevant to the activities described in the DEIS. MMC-06

In this regard, the Commission notes that the Marine Mammal Protection Act was amended by Congress in April 1994. New section 101(a)(5)(D) and regulations and programs being developed by the National Marine Fisheries Service and the Fish and Wildlife Service to implement the amendments could make it easier for both the oil and gas industry and the Minerals Management Service to meet the requirements of the Marine Mammal Protection Act. Therefore, if the Minerals Management Service has not already done so, it should consult with the National Marine Fisheries Service and the Fish and Wildlife Service to ensure that it is aware of potentially relevant provisions of the 1994 Marine Mammal Protection Act amendments, and the regulations and programs being promulgated to implement them. A copy of the Marine Mammal Protection Act, as amended, is enclosed. Also enclosed is a paper entitled "Marine mammal and habitat monitoring: requirements; principles; needs; and approaches". Although this paper is somewhat outdated by the 1994 Marine Mammal Protection Act amendments, it may be useful to understand the intent and measures necessary to meet the provisions of section 101(a)(5) of the Act.

Table II.E: It appears that the comparison of the possible effects of Alternative I and III provided in this table is based largely on a determination that there likely would be two major oil spills associated with Alternative I, and but a single major spill associated with Alternative III. Figure IV.A.2-7 indicates that the estimated mean number of spills for Alternative I and III are 2.12 and 1.91, respectively, and that the modal estimates, 2 and 1, are "most likely." It is not evident why the estimated modes, rather than estimated means, were used as the basis for comparing possible effects. MMC-07

Pages III-B-6 through III-B-11 (Description of the Affected Environment: Pinnipeds, Polar Bears, and Belukha Whales and Endangered and Threatened Species): This section describes the status and aspects of the distribution and diet of the principal marine mammal species that occur in the Beaufort Sea and adjacent MMC-08 waters. Some of the data and information referenced and used are incomplete, not up-to-date, or not described accurately. For example, the walrus abundance estimates are outdated, and the distribution map for bearded seals (Figure III.B.4) does not include haulout sites in Smith Bay and at Oarlock Island. In addition, while the second paragraph of the bowhead whale discussion on page III-B-10 indicates that there have been no clear trends in population size in recent years, the 1993 paper by Zeh, referenced in the same paragraph, indicates that the Bering Sea stock increased at a rate of about 3 percent per year between 1978 and 1988. Also, in some cases, references for population estimates are not provided. In this regard, the Minerals Management Service should be aware that, in response to provisions of the 1994 Marine Mammal Protection Act amendments, the National Marine Fisheries Service and the Fish and Wildlife Service have prepared stock assessment reports for each marine mammal stock that occurs in U.S. waters. Among other things, the stock assessments provide estimates of minimum population size and the sources and levels of human-related mortality and injury. MMC-08

The Marine Mammal Commission recommends that the Minerals Management Service, if it has not already done so, obtain and use the stock assessment reports for marine mammal species and populations that occur in and near the Beaufort Sea planning area to help ensure that the EIS (1) incorporates the best available information on the natural history, size, status, and sources and levels of human-related mortality of the stocks that potentially could be affected by the proposed action, and (2) describes any uncertainties in this regard and what is being done or being planned to resolve them. MMC-09

On a related point, the discussion on page III-B-11 does not provide a complete and accurate description of bowhead whale feeding areas in the Beaufort Sea planning area. For example, the paper by Lowry (1993)[1], referenced but incompletely discussed, described two feeding areas north of Alaska, "one extending from Barter Island to the U.S./Canada border and the second from Point Barrow east to approximately Pitt Point." Thus the fall feeding area around Point Barrow shown in Figure IV.A.2-4 should extend further east, and include the area between Barter Island and the Canadian border. In this same regard, Table II.E does not, but should, indicate that the proposed lease sale area contains important bowhead whale feeding areas. MMC-10

Also, it is noted correctly on page III-B-9 that the eastern North Pacific gray whale population was removed from the List of MMC-11

[1]Lowry, L.F. 1993. Foods and feeding ecology. Pp. 201-238. In Burns, J.J., J.J. Montague, and C.J. Cowles (eds). The Bowhead Whale Book. Special Publication Number 2, The Society for Marine Mammalogy, Allen Press, Lawrence, Kansas.

Endangered and Threatened Wildlife. However, this species does not, but should, appear on the list on page III-B-6 of marine mammal species that are uncommon or rare in the sale area. MMC-11

In addition, as noted earlier, the DEIS indicates (page III-B-6) that species which are not common in the planning area are not considered further in the DEIS. Although some species (e.g., gray whales, killer whales) are not abundant in the planning area and are not likely to be affected adversely by exploration and development activities in the proposed sale area, the probability of adverse effects on these species is not zero. Therefore, the EIS should include these species in the discussion of potential impacts or provide clearer justification for not doing so.

Pages III-C-1 through III-C-16 (Social Systems: Subsistence Harvest Patterns): This section includes a series of tables showing the numbers of marine mammals taken by subsistence hunters. However, much of the information is incomplete or not current. For example, Table III.C.3-4 on "Annual Subsistence Harvest of Bowhead Whales..." does not, but should, include the number of bowhead whales taken in 1993 and 1994. Also, Table III.C.3-7 on "Barrow Annual Harvest of Subsistence Resources for which Sufficient Data are Available, 1962-1982" does not include data on marine mammal harvest beyond 1982, whereas Table III.C.3-5 on "Barrow 1988 to 1989 Harvest Estimates for Marine Mammals" cites data for the same species as late as 1989. MMC-12

Pages IV-B-26 through IV-B-41 (Effects of Alternative I - The Proposal, Base Case - On: Pinnipeds, Polar Bears, and Belukha Whales and Endangered and Threatened Species): As noted earlier, the DEIS states (page IV-B-26) that "[o]il pollution, noise and disturbance, and alteration of habitats could adversely affect marine-mammal populations found in the proposed Sale 144 area." A number of other activities or factors not identified also could have deleterious effects on marine mammals. They include platform removal, discarded trash and debris from service vessels and drill platforms, and vessel operation and other activities required to contain and clean-up oil spills. MMC-13

This section also states (page IV-B-26) that

> "[d]irect contact with spilled oil may kill some marine mammals and have no apparent effect on others depending on factors such as the species involved and the animals' age and physiological status. Some polar bears and newly born seal pups occurring in the sale area are likely to suffer direct mortality from oiling through loss of thermoinsulation, which could result in hypothermia. Adult ringed, spotted, and bearded seals and walruses are likely to suffer some temporary adverse effects such as eye and skin irritation with possible infection. Such effects may increase

physiological stress and perhaps contribute to the death of some individuals (Geraci and Smith, 1976; Geraci and St. Aubin, 1980; St. Aubin, 1990). Deaths attributable to oil contamination are more likely to occur during periods of natural stress such as during molting or times of food scarcity and disease infestations." MMC-13

These statements do not identify or consider the full range of possible direct and indirect effects of contact with spilled oil, many of which were illustrated, as noted below, by the Exxon Valdez oil spill. For example, oil spills also could (1) cause starvation or nutritional deficiencies by reducing the abundance or productivity of important prey species; (2) cause stress making animals more vulnerable to disease, parasitism, environmental contaminants, and predation; (3) cause animals to abandon or avoid feeding areas or other areas of similar importance; and (4) cause animals to be attracted to prey debilitated by the oil, making them more vulnerable to contact with oil and ingestion of contaminated prey.

The EIS should be expanded to provide a more complete assessment of how marine mammals could be affected, both directly and indirectly, by exploration and development activities and related possibilities, such as oil spills, in the lease sale area. The various ways that marine mammals possibly could be affected by offshore oil and gas development are outlined in Enclosure 3. This outline can be used as a check list for determining whether the EIS has assessed all possibilities. MMC-14

Also, some of the conclusions in this section do not seem consistent with conclusions in other sections. For example, on page IV-B-28 the DEIS states "[l]ittle or no significant contamination of benthic food organisms and bottom-feeding habitats of walruses and bearded seals is expected, because very little oil is likely to sink to the bottom except for scattered tarballs." However, on page IV-A-12 (in the section on Environmental Consequences) the DEIS indicates with respect to spilled oil that "[m]ost of the oil droplets suspended in the water column eventually will be degraded by bacteria in the water column or deposited on the seafloor. The rate of sedimentation depends on the suspended load of the water, the water depth, turbulence, oil density, and incorporation into zooplankton fecal pellets." In addition, the discussion on pages IV-L-1 and IV-L-2 (in the section on a hypothetical oil spill) estimates that within 1,000 days of a large spill (160,000 bbl) about 16 percent (roughly 2,500 bbl) would sink to the bottom. MMC-15

On a related point, as noted earlier, with regard to nonendangered marine mammals, this section concludes (page IV-B-33 and Table II.E) that --

"[t]he effects from activities associated with the base case are expected to include the loss of small numbers of seals (200-300), walruses (no more than perhaps several hundred), polar bears (perhaps 20-30), and belukha whales (<10), with populations recovering within one generation or less (such as about 2-5 years)."

It is self-evident that the biological significance of any mortality would depend, in part, on the size and reproductive rates of the affected stocks, as well as the number, age, and sex of animals affected. However, it is not self-evident how the conclusion was reached that recovery would take place "within one generation or less (such as about 2-5 years)." Therefore, the rationale for the conclusions should be explained more clearly. MMC-16

Also, it appears that "recovery" in this section refers to the replacement of a small number of individuals that may be killed as a consequence of the proposed action. Inasmuch as the word "recovery" generally is used in the context of rebuilding a threatened, endangered, or depleted species, possible misunderstanding could be avoided by making it clear that recovery in this context means replacement of animals killed as a consequence of the proposed action. MMC-17

<u>Pages IV-B-34 through IV-B-41 (Potential Effects of Noise and Disturbance)</u>: This section states (page IV-B-34) that "[n]oise-producing exploration activities, including aircraft traffic, icebreaking or other vessel traffic, geophysical-seismic surveys, and drilling are the activities most likely to affect bowhead whales." It concludes on page IV-B-40 that

> "[b]owheads may exhibit avoidance behavior if approached by vessels at a distance of 1-4 km (0.62-2.5 mi). They are not affected much by any aircraft overflights at altitudes above 300 m (328 yd). Most bowheads exhibit avoidance behavior when exposed to sounds from seismic activity at a distance of a few kilometers but rarely show avoidance behavior at distances >7.5 km (4.7 mi)."

These statements do not reflect the fact that effects and the distances at which effects occur may vary depending upon such things as the frequency composition of the sound, water depth, bottom type, and bottom contour. Also, marine mammal responses to underwater noise will vary in some cases depending upon what the animal is doing. That is, individuals engaged in essential functions such as feeding or breeding may react to a stimulus at a higher threshold than resting or milling animals. MMC-18

In this same context, the discussion does not consider or cite a number of studies done to determine the effects of anthropogenic noise on bowhead whales and other marine mammals, MMC-19

MMC-19

many of which have been done by Minerals Management Service contractors. In this regard, the enclosed list of reports and published papers concerning the effects of noise, oil, and rig removal on marine mammals may be helpful in updating this section and other sections of the EIS (Enclosure 4). Also, the enclosed report by C. Fairfield, which provides a list of studies sponsored by the Minerals Management Service on the effects of noise on marine mammals, may be useful in this regard.

MMC-20

On page IV-B-41 the DEIS indicates that "[b]owheads may exhibit temporary avoidance behavior in response to vessels and to activities related to seismic surveys, drilling, and construction during exploration and development and production." Although exposure to individual sources of disturbance may result in temporary avoidance behavior, cumulative effects may not be temporary. The DEIS does not, but should, consider the potential cumulative effects of repeated exposure to such activities. Repeated disturbance could result, for example, in abandonment of important feeding areas or migration routes.

MMC-21

Pages IV-B-37 and IV-B-38 (Effects on the Bowhead Whale: Potential Effects from an Oil Spill): This and other sections of the DEIS cite studies by Geraci, St. Aubin, and others which suggest that contact with oil, and consumption of oil and oil-contaminated prey, are unlikely to have more than temporary, non-lethal effects on cetaceans. The results of studies of the effects of the Exxon Valdez oil spill on seals, sea otters, and other marine mammals suggest that oil spills may have substantially greater acute and chronic effects on marine mammals, including cetaceans, than indicated by the studies cited[2]. Therefore, the Marine Mammal Commission recommends that the Minerals Management Service, if it has not already done so, consult with the National Marine Fisheries Service, the Fish and Wildlife Service, the Environmental Protection Agency, the Alaska Department of Fish and Game, and other organizations, as appropriate, to obtain the best available information concerning both the direct and indirect effects of the Exxon Valdez oil spill on cetaceans and other marine mammals.

Pages IV-G-1 through IV-G-18 (Effects of the Cumulative Case): On page IV-G-1 of this section it is stated that:

> "[t]he analysis for the cumulative case is based on the potential effects associated with (1) exploitation of known or estimated resources from onshore and offshore State and/or Federal leases, (2) major potential and ongoing resource-development projects, (3) major potential and ongoing construction projects, and (4)

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[2]See for example, Loughlin, T.R. (ed). 1994. Marine Mammals and the Exxon Valdez. Academic Press. San Diego. 395 pp.

> other facilities whose activities may affect the proposed sale area."

MMC-22

With regard to pinnipeds, polar bears, and belukha whales, the discussion considers the potential adverse effects from oil spills and oil transportation, noise and disturbance, commercial fishing, and harvesting of walruses. Although the potential impacts of these factors on marine mammals are considered individually, the DEIS does not, but should, assess the potential additive effects including possible food chain effects. Also, there is no discussion in this section of other sources and levels of human-related mortality and injury (e.g., hunting of polar bears, belukha whales, and seals) either within the proposed lease sale area or in other areas where marine mammals from the sale area may occur at different times of the year.

The Marine Mammal Commission recommends that this section of the EIS be expanded to provide a more thorough assessment of how the proposed action, by itself and in combination with other sources of human-caused mortality, injury, and habitat degradation, might affect the marine mammal populations in the Beaufort Sea. If there are uncertainties regarding possible cumulative effects, they should be identified clearly.

MMC-23

Pages IV-L-1 through IV-L-6 (Effects of a Low-Probability, High-Effects, Very Large Oil-Spill Event): This section provides a description of the possible effects of a large oil spill (160,000 bbl) on each of the marine mammal species that commonly occur in the Beaufort Sea planning area. It does not, but should, (1) provide an assessment of the possible indirect effects if a large spill occurred and contacted an important marine mammal feeding area; and (2) consider the possible effect the various components of the oil that enter the water column when oil breaks down as a result of weathering or evaporation might have on various aspects of the Beaufort Sea food web. If there are uncertainties concerning the distribution, abundance, seasonal movement patterns, food habits, food requirements, etc. of the various species, or how important prey species or other components of the food web of which marine mammals are a part might be affected by oil spills, the uncertainties should be identified clearly.

MMC-24

On a related point, the hypothetical spill scenario indicates that the spill would occur in late fall or winter. It does not appear to take into account that Arctic weather, remote locations, and winter darkness could seriously hamper oil containment and clean-up efforts. Also in this regard, pages IV-A-21 and IV-A-22 indicate that the Federal On-Scene Coordinator has received pre-approval from the Alaska Regional Response Team to use in situ burning of oil as a response tool to minimize the impacts of spilled oil in Cook Inlet, Prince William Sound, and the Beaufort Sea. The possibility that this technique might be used was not, but should, be discussed in this section. In particular, the by-products of the burn which enter the air and water column, and their potential adverse effects on air and water quality, the Arctic marine environment, and its biota should be discussed. MMC-24

Summary

In summary, the DEIS provides a generally thorough overview and assessment of the possible direct effects of oil and gas activities in the proposed lease sale area on marine mammals. It does not, however, provide a thorough or objective assessment of all possible effects on marine mammals and their habitat in the Beaufort Sea planning area. For example, there is little discussion or consideration given to the possible indirect effects of the proposed action on marine mammals through impacts on important prey species and feeding areas. Likewise there is no discussion or consideration given to the possible impacts of the proposed action on the availability of marine mammals for subsistence uses by Alaska Natives.

The Commission believes that the Minerals Management Service can and should expand the EIS to provide a more thorough assessment of both the possible indirect food chain effects and the possible direct effects of the proposed action on marine mammals in the Beaufort Sea.

If available information is insufficient to accurately predict the possible effects of the proposed action, the EIS should identify the uncertainties and describe the additional studies being conducted or planned to resolve the uncertainties and the monitoring programs that are being or will be conducted to verify that oil and gas exploration and development in the Beaufort Sea do not have unacceptable adverse effects.

* * * * * * * *

I hope that the enclosures and these comments and recommendations are helpful. If you or your staff have questions about any of them, please let me know.

Sincerely,

R. J. Hofman

Robert J. Hofman, Ph.D.
Scientific Program Director

Enclosures

cc with selected enclosures: The Honorable Rolland A. Schmitten
The Honorable Thomas A. Fry, III
Richard N. Smith, Ph.D.

MMC-01
The text contains a number of references regarding studies on the effects of various noise-producing activities and potential effects of an oil spill on bowhead whales. Additional references have been added in the FEIS. Natural history and population information is provided in Section III.B.5. The International Whaling Commission accepted rate of increase for the bowhead whale population is 3.1 percent per year from 1978 to 1988 and the current best estimate of population is 8,000 whales. A recovery rate of 1 to 3 years is likely to be very conservative.

MMC-02
The primary purpose of the Sale 144 DEIS is to assess the potential effects of the proposal on resources such as nonendangered marine mammals that occur in the Beaufort Sea. Past Beaufort Sea EIS's (for Sales 71, 87, and 97) have included more lengthy descriptions of marine mammals and their environments. The commenter suggested that uncertainties about the distribution, abundance, seasonal-movement patterns, food habitats, food requirements, etc., of the various species or components of the food web that marine mammals are a part should be identified. Considerable information on these topics has been presented in Section III.B of the EIS and in past Beaufort Sea EIS's as well as scientific reports and synthesis reports referenced in this EIS. Although there always is a need for more scientific information because scientific investigations always bring up more questions than answers, much of the "uncertainty" about marine mammal abundance, distribution, movement patterns, food habitats, etc., represents the high degree of natural variability in the environment rather than uncertainties in the scientific information.

MMC-03
Monitoring requirements of the OCSLA have been addressed through MMS funding of a number of postlease monitoring programs in the Arctic or relevant to arctic-produced oil that would be transported through the Gulf of Alaska. Completed studies include Beaufort Sea Monitoring, Monitoring Beaufort Sea Waterfowl and Marine Birds, Effects of Production Activities on Arctic Whales, and Gulf of Alaska Sea Otter Information Update. Continuing studies include Monitoring Seabird Populations in Areas of Oil and Gas Development on the Alaskan Continental Shelf (including Seasonal Movements of Seabirds Determined by Satellite Telemetry), Monitoring the Distribution of Arctic Whales, Alaskan Marine Mammal Tissues Archival Project, Application of Satellite-Linked Tags for Bowhead Whales, and Testing Conceptual Models of Marine Mammal Trophic Dynamics Using Carbon and Nitrogen Stable Isotope Ratios. Experimental aspects of the study Sensitive Nonendangered Marine Mammals and Marine Birds in the Beaufort and Chukchi Seas are being tested at southern locations before application in arctic areas. Also continuing are studies funded by the MMS/UAF Coastal Marine Institute, including Microbial Degradation of Aromatic Hydrocarbons in Marine Sediments, Winter Circulation Processes in the Northeastern Chukchi Sea, Intertidal and Subtidal Effects of Pollution: Assessment of Top-Trophic-Level Predators as Bioindicators, North Slope Amphidromy Assessment, and Defining Habitat for Juvenile Flatfish in Southcentral Alaska. The Alaska Environmental Studies Strategic Plan calls for funding of additional studies such as the Coastal Chukchi Sea Monitoring Program, Sediment Quality in the Depositional Areas of Shelikof Strait and the Outermost Lower Cook Inlet, and Monitoring Key Arctic Marine Mammals. The investigators use sample designs appropriate for detecting environmental and population changes and clarifying causal relationships. Final reports of funded studies are peer reviewed, and authors contribute articles for journal publication.

MMC-04
Stipulation No. 4, Industry Site-Specific Bowhead Whale-Monitoring Program; Stipulation No. 5, Subsistence Whaling and other Subsistence Activities; the ITL on Endangered Whales and MMS Monitoring Program; and the ITL on The Availability of Bowhead Whales for Subsistence-Hunting Activities, are found in Section II of the FEIS. These Stipulations and ITL's do, in fact, relate to the authorization process that lessees must follow when exploration and development activities could affect marine mammal availability to Alaska Native subsistence hunters. Stipulations No. 4 and 5 inform lessees of the need to request an LOA from NMFS for the incidental "take" of marine mammals, and the ITL on Endangered Whales and MMS Monitoring Program specifically discusses Section 101(a)(5) of the MMPA and Section 7(b)(4) of the ESA, stating clearly that incidental taking of marine mammals and threatened species is allowed only when the statutory requirements of these acts are met. The ITL on endangered whales and the MMS monitoring program also addresses monitoring and reporting requirements for lessees.

MMC-05
Monitoring requirements of the Outer Continental Shelf Lands Act are being satisfied through MMS funding of a substantial number of postlease monitoring programs, as listed in the response to Comment MMC-03. Provisions of the MMPA and ESA allowing incidental take of marine mammals are clearly highlighted in Information to Lessee No. 1, Information on Bird and Marine Mammal Protection, Section II of the EIS.

MMC-06
The report titled *Legal Mandates and Federal Regulatory Responsibilities* (Rathbun, 1986) is being revised to incorporate changes in existing laws and new relevant legislation, regulations, and other pertinent information. In an effort to minimize the volume of our environmental impact statements, we incorporate by reference documents that already exist and are available to the public.

MMC-07
Oil spills are treated statistically as a Poisson process, meaning that they occur independently of one another. If we constructed a histogram of the probability of exactly 0 spills occurring during some period, the probability of exactly one spill, two spills, etc., the histogram would have a shape known as a Poisson distribution. An example is shown in Figure IV.A.2-7 of this EIS. An important and interesting feature of this distribution is that it is entirely described by a single parameter, the expected mean number of spills. Given the mean number of spills, you can calculate the entire histogram. The most likely number is often called the mode. If you have to guess exactly how many spills may occur, the mode is useful. Here, the mode provides a good substitute for the expected number of spills.

MMC-08
The information on walrus abundance is from the 1990 census of the Pacific walrus population. There has not been a more recent census of the population since 1990 (Schliebe, 1995, personal comm.). The commenter's statement about Figure III.B.4 not including "bearded seal haul-out sites in Smith Bay and Oarlock Island" is incorrect. Bearded seals are not known to haul out on land and only haul out on ice. The commenter must have been referring to spotted seal haulout sites on Oarlock Island and Smith Bay. These spotted seal haulouts were mentioned in the text in Section III.B.4 under spotted seals, and these sites have been added to Figure III.B.4.

MMC-09
The MMS is aware of and has a copy of the NMFS and FWS stock assessments for marine mammals that occur in the Beaufort Sea Planning Area. The information in these assessments does not include more recent information on marine mammal populations than what already is included in the DEIS.

MMC-10
Information on bowhead whale feeding areas identified in Lowry (1993) has been added to the text in Section III.B.5. It is not a conclusion and, therefore, has not been added to Table II.E.

MMC-11
The gray whale had been added to Section III.B.4 in the statement about marine mammal species that are uncommon or rare in occurrence in the proposed Sale 144 lease area.

Additional justification for not adding further discussion of gray whales, killer whales and other marine mammal species uncommon or rare in the proposed sale area to the EIS has been added to the text in the first paragraph in Section III.B.4.

MMC-12
Subsistence-harvest information has been updated where such information has become available. Table III.C.3-4 has been updated to indicate bowhead whale harvests for 1994 and 1995. Table III.C.3-7 is supplemented for bowheads by Table III.C.3-4. Walrus-harvest figures have been updated in new Table III.C.3-8a, Barrow Annual Harvest of Walrus for the Harvest Years 1988 to 1995. It should be noted that Barrow walrus subsistence data for the years 1980 through 1987 are not available. As a general comment, it should be noted that subsistence-harvest figures are only updated when the State of Alaska, ADF&G, Subsistence Division, performs subsistence-data gathering for its Community Profile Data Base in particular rural communities; seldom is a community surveyed on a yearly basis.

MMC-13
The EIS analysis discusses the significant types of effects and effect factors that may be associated with the proposal regarding pinnipeds, polar bears and belukha whales in Section IV.B.5. Platform removal, discarded trash, and debris from service vessels and platforms are expected to have negligible effects on marine mammals. The dumping of trash from service vessels and platforms is prohibited under OCS operating orders and EPA regulations. Regarding other types of oil-spill effects that the commenter suggests as examples from the EVOS, comments are as follows: (1) ". . .oil spills cause nutritional deficiencies or starvation." This concern is discussed under Indirect Effects of Oil. (2) ". . .cause stress making animals more vulnerable to disease," etc. This concern is addressed in Section IV.B.5 under Direct effects of Oil. (3) ". . .cause animals to abandon or avoid feeding areas." This concern is discussed in Section IV.B.5 under Oil-Spill Avoidance. (4) ". . .cause animals to be attracted to prey debilitated by the oil-." This concern is discussed in Section IV.B.5 under Oil-Spill Avoidance.

MMC-14
In the DEIS were analyzed and discussed the types of possible effects listed in MMC Enclosure 3 that significantly could affect marine mammal populations that occur in the proposed sale area. Some of the possible effects listed in the enclosure are redundant, while others are expected to have negligible effects on marine mammals in the sale area. See also the response to Comment MMC-13.

MMC-15
The text in Section IV.B.5 under Site-Specific Effects of Oil Spills has been changed in response to this comment.

MMC-16
Please see the response to Comment MMC-01.

MMC-17
The text in Section IV.B.5. under Conclusion and in Table II.E has been changed in response to this comment.

MMC-18
Information pertaining to this comment has been added to the text in Section IV.B 6 of the FEIS.

MMC-19
Information pertaining to this comment has been added to the text in Section IV.B.6 of the FEIS.

MMC-20
Information pertaining to this comment has been added to the text in Section IV.B.6 of the FEIS.

MMC-21
The MMS wildlife biologists have and continue to consult with NMFS, EPA, FWS, and ADF&G on the best available information concerning effects of EVOS on cetaceans and other marine mammals. The results of studies on the effects of the EVOS on marine mammals, as summarized in Loughlin, 1994, Marine Mammals and the *Exxon Valdez*, generally suggest that oil spills have acute and lethal effects on sea otters, sublethal to lethal effects on heavily oiled seals, and possible lethal effects on cetaceans that might have prolonged and acute contact with a large highly toxic oil spill. The overall findings of these studies support the analysis on marine mammals in Section IV.B.5. The conclusion on the effects of the EVOS on killer whales by Dahlheim and Matkin (1994, as cited in Loughlin, 1994) states that the disappearance of 14 killer whales was correlated spatially and temporally with the EVOS, but there was no clear cause-and-effect relationship, and that some of these missing whales may have died from natural causes or a combination of interactions with fisheries or the EVOS. Even if it is assumed that all 14 whales were killed by the spill (a much larger spill than assumed in the 144 analysis), this loss is comparable to the estimated loss of belukha whales in the Section IV.B. 5 conclusion. The estimated losses of harbor seals to the EVOS (302 animals) reported by Frost et al. (1994, as cited in Loughlin, 1994) were comparable to the estimated losses of seals in Section IV.B.5 of the EIS, even though the 144 analysis assumed much smaller spills over the life of the proposal. There was no evidence given in Loughlin (1994) of any food-chain effects on marine mammals evident from the EVOS. Even studies on the effects of the EVOS on sea otters, the species of marine mammal most impacted by the spill, showed no clear evidence of food-chain effect. The study on sea otter foraging behavior and hydrocarbon levels in prey did not show any significant differences in

hydrocarbon content in bivalve prey of sea otters between oiled and unoiled habitats (Doroff and Bodkin, 1994, as cited in Loughlin, 1994).

The results of studies on the effects of the EVOS on marine mammals, as summarized in Loughlin, 1994, do not pertain to bowhead whales directly. However, some additional information on potential effects of an oil spill on bowheads has been added to the text in Section IV.B.6 of the FEIS.

MMC-22

The EIS does consider the cumulative-additive effects (mortality) of oil spills, commercial fishing, and subsistence (on walruses where hunting-harvests were a significant factor in past walrus declines) on pinnipeds, polar bears, and belukha whales. There is no evidence of possible food-chain effects from oil spills or from commercial fishing on arctic marine mammal species (see also the response to Comment MMC-21). Other than the harvest of Pacific walruses, subsistence hunting is not expected to have significant cumulative effects on pinniped or polar bear populations in the Arctic, and thus this source of cumulative effects is not discussed further in Section IV.H.5.

MMC-23

The indirect effects of oil spills on marine mammals is discussed in Section IV.B.5, and the 160,000-bbl spill is not expected to have significant effects on marine mammal populations through the food chain (see also the response to Comment MMC-21). The behavior and effects of the spill and its components in the water column and weathering and evaporation are discussed in Section IV.L under Spill Behavior, Effects on Water Quality, and Effects on Lower Trophic-Level Organisms. The commenter suggests that uncertainties about the distribution, abundance, seasonal movement patterns, food habitats, food requirements, etc., of the various species or components of the food web that marine mammals are part of should be identified. Considerable information on these topics has been presented in Section III.B of the EIS and in past Beaufort Sea EIS's, as well as scientific reports and synthesis reports referenced in this EIS. Although there always is a need for more scientific information because scientific investigations always bring up more questions than answers, much of the "uncertainty" about marine mammal abundance, distribution, movement patterns, food habitats, etc., represents the high degree of natural variability in the environment rather than uncertainties in the scientific information.

In addition to the discussion in Section IV.L.6 regarding possible effects of an oil spill on bowhead whales, possible direct and indirect effects of an oil spill, including a very large oil spill, are also discussed in Section IV.B.6 of the FEIS. The behavior of spilled oil, including weathering, evaporation, broken-ice conditions, etc., is discussed in Section IV.A and Section IV.L of the FEIS.

MMC-24

Air-quality effects from oil-pollution events have been addressed in Section 4 b.12 of the EIS. This discussion includes anticipated effects from in-situ burning efforts that may be initiated to mitigate an oil-spill event. See also the response to Comment AEC-05.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. Tudor Rd.
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:

NAES/DHC

NOV 20 1995

Memorandum

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NOV 22 1995
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

To: Regional Director
Minerals Management Service, Alaska

From: Regional Director
Region 7

Subject: Comments on Draft Environmental Impact Statement Oil and Gas Lease Sale 144 - Beaufort Sea

The U.S. Fish and Wildlife Service has reviewed the Draft Environmental Impact Statement for Beaufort Sea Planning Area Oil and Gas Lease Sale 144, which is planned for 1996. The Service has provided comments on environmental documents at various stages of the leasing process for this and previous Beaufort Sea sales (BF, 71, 87, 97, and 124). Concerns addressed in those comments are applicable to proposed Gas Lease Sale 144. Our comments on the Draft EIS for Oil and Gas Lease Sale 144 are attached for your consideration.

We appreciate the opportunity to comment on the Draft EIS. If you have any questions regarding these comments please contact Tony DeGange at 786-3492 or Lori Quakenbush at 456-0442.

Attachments

Attachment

We recommend Alternative III, Barter Island Deferral Alternative as it deletes areas important to fish and wildlife, and areas used for subsistence harvests, and does not reduce the oil resource forecast.

USFWS-01

Stipulation No. 5, Subsistence Whaling and other Subsistence Activities. Spring whaling is not included under this stipulation. Even though the Barrow area is not included in this lease sale, certain industry related activities could interfere with spring whaling. We recommend that the April - June time period and a description of the spring whaling areas be included in this stipulation.

USFWS-02

The Service also recommends that a Stipulation No. 6, Protection of Polar Bears and Walruses, be added to Section II.D.(1) of the EIS. We recommend the following language for this stipulation:

Protection of Polar Bears and Walruses

Prior to submitting an exploration plan or development and production plan to the lessor, the lessee shall consult with the Fish and Wildlife Service (FWS) to discuss potential conflicts with the siting, timing, methods of proposed operations and safeguards or measures which could be implemented by the operator to avoid or mitigate adverse impacts on polar bears or walruses. A discussion of resolutions reached during this consultation, any unresolved conflicts, and plans for continued consultation with the FWS shall be included in the exploration plan or the development and production plan. A discussion of multiple or simultaneous operations shall be included in order to accurately assess the potential for cumulative effects.

Lessees shall conduct a site-specific monitoring program for polar bears and walruses during exploratory drilling activities to determine when they are present in the vicinity of leasing operations and the extent of behavioral, or other adverse impacts on these species. The lessee shall provide its proposed monitoring plan to the Regional Supervisor, Field Operations (RS/FO) no later than 60 days prior to the commencement of drilling. The RS/FO, in consultation with the FWS, will review and approve the monitoring plan.

If the lessees hold a FWS Letter of Authorization (LOA) for the incidental taking of polar bears and/or walruses, no additional MMS approved monitoring plan or additional consultation with the FWS would be necessary.

USFWS-03

Information to Lessees No. 1, Information on Bird and Marine Mammal Protection. The second sentence of the paragraph on walruses should be changed to read: "The FWS issued incidental take regulations for walruses in the Beaufort Sea and adjacent northern coast of Alaska that were in effect for an 18-month period beginning December 16, 1993 (50 CFR 18.121 et seq.)." The third sentence should read: "These regulations have been extended until December 15, 1998."

USFWS-04

Information to Lessees No. 10, Information on Polar Bear Interaction. The second sentence of the second paragraph should be changed to read: "These regulations were effective for an 18-month period and have been extended for an additional 40 months through December 15, 1998." Please note that the same change should be made in paragraph 7 on page II-7. USFWS-04

Information to Lessees No. 12, Information on the Spectacled and Steller's Eider. The first sentence should read: "Lessees are advised that in 1993 the spectacled eider (*Somateria fischeri*) was listed as threatened ..." The North American breeding population of Steller's eiders is proposed to be listed as threatened, not endangered. USFWS-05

Note that the above changes to *Information to Lessees* may need to be changed in *Purpose and Background of the Proposed Action*.

III. Description of Affected Environment

(b) Gwydyr Bay to Foggy Island Bay. A 650' breach was added to the West Dock causeway this summer. USFWS-06

B. Biological Resources, 3. Marine and Coastal Birds. The first full paragraph on Page III-B-6 begins "Within the proposed sale area...", then discusses Peard Bay and the Point Barrow area, neither of which are in the lease sale area as proposed in this EIS. The general description of marine and coastal birds also fails to capture the magnitude of some of the populations that migrate or molt in areas that could be affected by an oil spill. For example, 800,000 king eiders and 130,000 common eiders are estimated to migrate past Point Barrow each spring into the Beaufort Sea. Up to 50,000 oldsquaw may be present in Simpson Bay in late July (Johnson and Herter 1989) USFWS-07

c. **Spectacled Eider:** This section should be modified to reflect new information. Recent aerial surveys by fixed-wing aircraft, corrected for visibility bias, indicate densities of 0.19 pairs/km^2 across the entire North Slope as far east as the Canning River (Larned and Balough, 1995, unpubl. data). USFWS-08

We suggest that the first sentence in the last paragraph of the spectacled eider account be replaced with: "Information on spectacled eider molting and wintering areas has also increased as a result of advances in satellite radio tracking and winter surveys." At the end of the paragraph, please add: "A large portion, perhaps even all, of the global spectacled eider population was observed wintering in nearly closed pack ice about halfway between St. Lawrence and St. Matthew islands (Larned and Balough, 1995, unpubl. data)."

d. **Steller's Eider:** The third sentence should read: "Aerial surveys indicate, as many as 1,000 pairs may nest in northwestern Alaska (Brackney and King 1993), however, the only confirmed nesting area used currently in North America occurs in the vicinity of Barrow (Quakenbush and Cochrane 1993)." USDOI, FWS, 1991 was cited in this section, but we did not find it in the Literature Cited. USFWS-09

B. Biological Resources, 4b. Polar Bears. Based on the amount of text describing denning, this section leaves readers with the impression that denning on land is more important than denning on pack ice or shore-fast ice. Of 90 dens found in the Beaufort Sea area between 1981 and 1991, 48 (53%) were on pack ice suggesting that pack ice denning is quite common. This is particularly relevant for this proposed lease sale since most of the lease sale area is seasonally covered by pack ice. It is also important to point out that pack ice dens are not fixed in space like terrestrial dens. In the Beaufort Sea they move with the pack ice, generally in a clockwise direction. See Figure 6a showing the location of polar bear dens in Alaska, which is page 23 in the attached **Habitat Conservation Strategy for Polar Bears in Alaska** prepared by the Service in 1995. This figure has considerably more denning information on polar bears than Figure III.B.IV in the EIS. Also see Amstrup (1993) and Amstrup and Gardner (1994) for more information on polar bear denning in the Beaufort Sea. USFWS-10

C. Social Systems, 3. Subsistence-Harvest Patterns.

More current and accurate data from 1981 to the present are available for polar bears. The number of bears cited in the EIS was only for those households that were surveyed. For accurate harvest summaries for polar bears refer to Table 1 in Schliebe et al. 1995 (copy attached). The following two years of data are provided since they are not included in this table: USFWS-11

	1992-93	1993-94
Barrow	26	26
Kaktovik	3	5
Nuiqsut	0	5

IV. Environmental Consequences

B. Effects of Alternatives. The various development cases under the proposed alternative all predict oil spills and lethal impacts to spectacled eiders. Predicted recovery times from these spill-related losses vary from two to four generations. As long as the spectacled eider population continues to decline, it is difficult to perceive how the population could recover from any additional mortality. Only under the "cumulative case" (IV.G.) is the uncertainty of population recovery from oil spills relative to the overall decline of the population even mentioned. USFWS-12

Literature Cited

Amstrup, S.C. 1993. Human disturbances of denning polar bears in Alaska. Arctic 46:246-250.

Amstrup, S.C. and C. Gardner. 1994. Polar bear maternity denning in the Beaufort Sea. J. Wildl. Manage. 58:1-10.

Brackney, A.W. and R.J. King. 1993. Aerial breeding pair surveys of the Arctic Coastal Plain of Alaska: revised estimates of waterbird abundance 1986-1992. Unpubl. report, U.S. Fish and Wildl. Serv., Anchorage, AK. 21pp.

Johnson, S.R. and D.R. Herter. 1989. The birds of the Beaufort Sea. BP Exploration Inc., Anchorage, AK. 372pp.

Quakenbush, L. and J.F. Cochrane. 1993. Report on the conservation status of the Steller's Eider (*Polysticta stelleri*), a candidate and threatened species. Unpubl. report, U.S. Fish and Wildl. Serv., Anchorage, AK. 26pp.

Schliebe, S.L., S.C. Amstrup, and G.W. Garner. 1995. The status of polar bears in Alaska. Pgs. 125-138, In O. Wiig, E. Born, and G.W. Garner (eds.), Polar Bears: Proc. Eleventh Working Group Meeting , IUCN/SSC Polar Bear Specialist Group. IUCN Gland, Switzerland and Cambridge, UK.

FWS-01
The Barrow/spring-whaling area is not included within the boundaries of the proposed sale. Also, the area is not the site of any supposed support or supply bases. Sea lift of facilities and marine resupply of offshore islands within the area of the proposal would not occur during the April-June timeframe. Seismic surveys related to the emplacement of drilling islands on leases sold as a result of Sale 144 would not occur outside the boundary of the proposed sale area. The question, then, of describing spring whaling areas in any Sale 144 stipulation is moot.

FWS-02
The MMS believes that it is not necessary for the 144 EIS to have a stipulation to protect polar bears or walruses. Neither of these species is on the endangered or threatened species list nor is either species proposed to be on the list. These species already are protected under the Marine Mammal Protection (MMPA) of 1972 as amended in 1995. Provisions that require lessees for the proposed Sale 144 to follow regulations on the incidental taking of walruses and polar bears as formulated by the FWS. The ITL's 4 and 10 in the Sale 144 EIS inform the lessees of the requirements under the MMPA. The MMS does not have the legal authority to stipulate the requirements of the MMPA.

FWS-03
The ITL on Information on Bird and Marine Mammal Protection has been revised to reflect the FWS-revised incidental take regulations.

FWS-04
Changes have been made to ITL 10 in response to this comment (see Sec. II.D.(2)).

FWS-05
ITL No. 12 has been revised to reflect the changes recommended by the FWS.

FWS-05
ITL No. 12 has been revised to reflect the changes recommended by the FWS.

FWS-06
Appropriate language has been added to Section III.A.3.b(2)(b).

FWS-07
The text in Section III.B.3 has been revised in response to this comment.

FWS-08
Information concerning spectacled eider nesting density and wintering area provided by FWS has been incorporated into Section III.B.5.

FWS-09
Information concerning Steller's eider nesting population provided by FWS has been incorporated into Section III.B.5. The FWS 1991 reference has been added to the bibliography.

FWS-10
Although 90 polar bear dens (53%) were located on pack ice, most of these dens are not located within the Sale 144 proposed lease area but rather are located far offshore in the pack ice north of the lease area. The den locations shown in Figure III.B.4 in the EIS were taken from Figure 6a on page 23 of the Habitat Conservation Strategy Plan for Polar Bears in Alaska (FWS, 1995). The reason why Figure 6a on page 23 in that report has more denning locations offshore in the pack ice is that the Figure 6a-map covers most of the Arctic Ocean, while Figure III.B.4 of the EIS covers only the Beaufort Sea Planning Area. Most of the Sale 144 area is located within the active ice (flaw) zone (Fig. III.B.4) where few polar bear dens have been recorded in Figure 6a (FWS, 1995). Activities associated with the proposal, such as on-ice seismic exploration and onshore support activities, are more likely to affect polar bears that den onshore or on the shorefast ice than bears that den far offshore in the pack ice.

FWS-11
Polar bear subsistence-harvest numbers from Schliebe (1995) were used to update Table III.C.3-7 in the FEIS. Also, a new Table, III.C.3-7a, Annual Harvest of Polar Bear for the Harvest Years 1983 to 1994 for the Communities of Barrow, Kaktovik, and Nuiqsut, was created with the new subsistence-harvest data from Schliebe and Evans (1995).

FWS-12
Analyses of potential effects from Federal oil and gas development for the proposed action scenario and alternatives are restricted to specific effects of exposure to hydrocarbons or potentially disturbing stimuli on populations that typically are assumed to be naturally variable. Such analyses incorporate spill-contact probabilities (low in this case) as well as probable results of contact. If relatively few spectacled eiders are exposed to an oil spill along the Beaufort coastline as a result of the proposed action, recovery to the prespill population level is considered a potential short-term result; if substantial numbers are lost, recovery in the near future is not likely under present circumstances. The analyses have been revised to reflect the uncertainty of this species' situation. Additive effects of all potentially adverse factors, including all potential hydrocarbon developments, are considered in the cumulative case section; thus, the precipitous decline of the spectacled eider population over the past 20 years, assumed to be the result of unknown factors ultimately related to human activities of natural variation, is considered in this section.

DEC-06-95 WED 17:40 EPA REG 10 WETLANDS FAX NO. 2065531775 P. 01/04

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Reply To
Attn Of: WD-126

Raymond R. Emerson
Environmental Assessment Section
949 East 36th Avenue
Anchorage, Alaska 99508

Dear Mr. Emerson:

The Environmental Protection Agency (EPA) has reviewed the draft environmental impact statement (EIS) for the **Alaska Outer Continental Shelf (OCS) Beaufort Sea Planning Area Oil and Gas Lease Sale 144.** Our review was conducted in accordance with the National Environmental Policy Act (NEPA) and our responsibilities under Section 309 of the Clean Air Act.

This draft EIS presents a comprehensive evaluation of the potential effects that could result from this lease sale. Overall, it reflects the current state of knowledge about the physical, chemical, and biological characteristics of the Beaufort Sea planning basin. However, we have several concerns which are described in the enclosed detailed review comments. We are providing these comments in an effort to improve the information presented in the final EIS and to clarify issues that are important for making decisions on the leasing options for the proposed lease sale.

EPA-01

EPA is concerned about three main issues: 1) The proposed action does not provide a commitment to the Stipulations and Information to Lessees (ITL's). Many of the proposed stipulations and ITL's presented in the draft EIS have been included in past Alaska OCS lease sales. The discussions of the effectiveness of these stipulations in mitigating adverse effects could be improved if they provided a historical perspective on how well these mitigating measures have actually performed; 2) The level of detail presented in the alternatives analysis in chapter II does not provide enough information to fully

EPA-02

DEC-06-95 WED 17:36 EPA REG 10 WETLANDS FAX NO. 2065531775 P. 03/06

comprehend the proposed actions; 3) The cumulative effects discussion should include more information regarding impacts to water quality under Section 303(d) of the Clean Water Act. Based on this EPA is rating this project EC-2 (Environmental Concerns - - Insufficient Information).

EPA-03

Thank you for the opportunity to comment on this project. A copy of our rating system is enclosed for your information. If you have further questions, please contact John Bregar in our Office of Ecosystems and Communities at (206) 553-1984.

Sincerely,

Richard B. Parkin

Richard B. Parkin, Manager
Geographic Implementation Unit
Office of Ecosystems and Communities

These mitigation issues bring into question the timing of the exploration stage of the Lease Sale draft EIS process. If adequate information is not available to describe and guarantee implementation of appropriate mitigation measures until the lease has been awarded to a specific Lessee, it seems appropriate to consider delaying the EIS process until that Lessee is known and more specific information can be revealed in the draft EIS.

Alternatives

The alternatives analysis in chapter II should focus on the proposed activities under each alternative. There does not seem to be a clear description of these activities. Specific information should be disclosed regarding potential causeways (Chapter IV-G-1, Cumulative Case effects states that eight docks and causeways could exist after project completion), construction activities, locations of drilling rigs, location of outfalls, timing for exploration, duration of exploration, types of drilling rigs, technologies utilized, etc. EPA-04

Cumulative Impacts

The Cumulative Case effects discussion starting on page IV-G-1 is very helpful to understand the potential impacts from the proposed activities. EPA is concerned, however, with the lack of information regarding impacts related to construction of causeways and docks, and impacts to temperature and salinity near shore in the Beaufort Sea. EPA-05

Page IV-G-7 states that, "For the purpose of the analysis, all of the causeways described are assumed, bringing the total number of docks and causeways for the cumulative case to eight. However, most of them are projected to be relatively short causeways that probably would not affect fish distributions." EPA-06 EPA is very concerned that the analysis for impacts from causeways is incomplete. The final EIS should describe locations and features of causeways and docks as well as analyze their impacts on resources in the project area. EPA-07

The Alaska Department of Environmental Conservation (DEC) has listed a portion of the Beaufort Sea, near the Endicott Causeway, on its 303(d) list of impaired water bodies for temperature and salinity exceedences. Section 303(d) of the Clean Water Act (CWA) requires that the State develop a list of water bodies for which existing pollution controls or

requirements are inadequate to provide for the attainment and maintenance of water quality standards. This §303(d) list provides an inventory of water bodies impaired or threatened by pollutants from all sources including point sources, nonpoint sources, or a combination of both. Executive Order 12088 requires that, among other things, Federal agencies comply with environmental standards established in accordance with the Clean Water Act.

Since this area has already been identified as a water body of concern with the DEC, MMS must demonstrate in the final EIS that this project will not exacerbate the already degraded water quality conditions in this area by: EPA-08

1. Providing data to demonstrate that the water body will not be impaired or does not belong on the CWA §303(d) list.

2. Show that the proposed activity or project is part of a larger plan that will bring the water body into compliance with water quality standards. The environmental document must describe and evaluate the effectiveness of the specific actions in the larger plan so that EPA and the affected state(s) can be confident that the proposed actions will, indeed, contribute to improving water quality and habitat conditions.

3. Modify the proposed activity or project so that it will result in a net decrease in the pollutant loading for the pollutant(s) of concern to the CWA §303(d) listed water body. Here too, the environmental analysis will need to demonstrate that the proposed activity or project will result in a net decrease in pollutant loadings for the pollutants of concern.

We are aware that this is a relatively strict policy, however, we emphasize that water quality violations are flagrant and frequent and this policy is necessary to preserve and protect the waters of the U.S. When the Draft EIS does not adequately evaluate the potential cumulative effects of the proposal on CWA §303(d) listed water bodies, EPA will rate the Draft EIS "inadequate" and strongly encourage the development of a supplement to the Draft EIS before a Final EIS is develcped. When the lead agency's preferred or selected alternative in its Final EIS would exacerbate existing water quality standards

exceedances on a §303(d) listed water, EPA will refer the matter to the President's Council on Environmental Quality for resolution in accordance with the requirements of 40 C.F.R. Part 1504.

U.S. Environmental Protection Agency Rating System for
Draft Environmental Impact Statements
Definitions and Follow-Up Action*

Environmental Impact of the Action

LO - - Lack of Objections

The Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC - - Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO - - Environmental Objections

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU - - Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 - - Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 - - Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 - - Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.

USEPA-01
The MMS's commitment to the Sale 144 mitigating measures (lease stipulations and environmentally relevant ITL's) is demonstrated by their inclusion in both the draft EIS and the proposed Notice of Sale (NOS). The decision on which measures to include in the Sale 144 draft EIS and proposed NOS was approved by the Secretary/Assistant Secretary, Lands and Minerals, at the Area Identification step (Sec. I.A.7 of the EIS) of the lease-sale process (Sec. I.A). This decision was based on information derived from experience with previous Alaska OCS lease sales and from public comments and consultations with stakeholders during the EIS scoping process.

As a result of comments received on the Sale 144 draft EIS and proposed NOS, the following actions regarding mitigating measures have been taken for the final EIS: (1) three new ITL's have been added (Secs. II.E.2: ITL's No. 1, No. 2 and No. 9; II.J.2; and V.A.2.b(2), (3), and (4)) and (2) Stipulations No. 4 (Industry Site-Specific Bowhead Whale-Monitoring Program) and No. 5 (Subsistence Whaling and Other Subsistence Activities) have been revised to include greater participation by the North Slope in the design and review of proposed bowhead whale-monitoring; require lessees to fund an independent peer review of the monitoring plan, with some of the reviewers chosen by the NSB and the AEWC; and require that lessees consult with affected communities as well as the NSB and the AEWC to discuss potential conflicts involved with the siting, timing, or logistics of a proposed operation. These actions further demonstrate MMS's commitment to considering and analyzing measures that help to mitigate the actions of the proposed lease sale.

Of course, no final decision on the adoption of the mitigating measures can or should be made until completion of the lease-sale process (Sec. I.A. 10 to 16). This includes: public review of the draft EIS and proposed NOS; preparation of the final EIS; comments from the Governor of Alaska on the proposed notice regarding size, timing, location, terms, and conditions of the sale; a determination of consistency with coastal management plans; biological opinions from NMFS and FWS regarding the effect of the proposed action on endangered or threatened species; and a balancing of all pertinent information in a final decision on the lease sale.

The requirements of the Council of Environmental Quality Regulations for Implementing the Procedural Provision of the National Environmental Policy Act implementing regulations stated in Section 1505.2 state, in part, that "At the time of its decision—each agency shall prepare a concise public record of decision." The EIS is an environmental disclosure document, not a decision document. As noted in Section I.A.14 of the EIS, a decision document is prepared after the final EIS.

The status of the Sale 149 mitigating measures suggested during the scoping process are listed and summarized in Section I.D.3 of the EIS. New mitigating measures or revisions to existing measures suggested by comments on the Sale 144 draft EIS and proposed NOS are listed and summarized in Section V.A.2. A detailed description of all the Sale 144 mitigating measures analyzed in the EIS is provided in Section II.E.

To date, only exploratory-drilling activities have been conducted on the Alaskan OCS as a result of previous oil and gas lease sales. Because of the relatively short-term nature of exploratory-drilling operations, MMS has not developed a strategy to monitor the effectiveness of the mitigating measures that are part of a lease sale. However, as noted in Stipulation No. 4, lessees will be required to determine when bowhead whales are present in the vicinity of lease operations and the extent of behavioral effects on bowhead whales due to exploratory operations. Support for including mitigating measures has been received from some of those individuals, organizations, and governmental agencies—including USEPA—that have commented on the Sale 144 DEIS as well as DEIS's from past lease sales. This support indicates that the measures are perceived as being effective. The effectiveness of the measures in achieving mitigation may not be measurable. However, if production becomes a possibility as the result of this or any sale, MMS would work with USEPA to develop a reasonable strategy to monitor the effectiveness of mitigating measures on activities that take place over a relatively long period of time.

The MMS believes the mitigating measures for Sale 144 have been adequately described in the EIS (Sec. II.E); the comment does not provide any suggestions about what additional material is thought to be needed.

Based on the results of the scoping process, the effects of oil spills on environmental resources in and adjacent to the Sale 144 area is a significant issue. Because the effects of oil spills is a significant issue, it is appropriate to include in the EIS a discussion of spill prevention and response. This discussion does not focus the EIS on oil-spill response and effectiveness as a means to minimize environmental damage, as the comment suggests. As noted in Section IV.A.4, MMS has established stringent requirements for spill prevention and response and employs an inspection program to ensure industry compliance. To complement the regulatory programs in place, the petroleum industry uses state-of-the-art technology for prevention equipment and the most current operating procedures while conducting operations on the OCS. Additionally, the petroleum industry must maintain a constant state of readiness for oil-spill response to meet the MMS's stringent response requirements.

The MMS does have a commitment to ensure safe and environmentally sound exploration and production of offshore natural gas, oil, and other mineral resources. Measures to identify and protect biologically sensitive wildlife species and their habitats as well as the subsistence resources of Alaska's North Slope include the Protection of Biological Resources stipulation, the Orientation Program stipulation, as well as the previously mentioned stipulations that dealt with Bowhead Whale Monitoring and Subsistence Whaling and Other Subsistence Activities, as well as ITL's No. 1 through No. 13. . The regulations governing offshore operations are contained in 30 CFR 250 and have been formulated to ensure safe and environmentally sound operations. Mitigating measures provide environmental protection that is in addition to existing laws and regulation. The Transportation of Hydrocarbons Stipulation is intended to ensure that the decision on which method to use in transporting hydrocarbons considers the social, environmental, and economic consequences of pipelines.

The Sale 144 EIS Appendix K notes a cooperating agency agreement between Minerals Management Service, Alaska Outer Continental Shelf Region, and the U.S. Environmental Protection Agency, Region 10. This agreement notes USEPA recommendations will be considered in making balanced decisions on the EIS and the lease sale process, but MMS will retain final responsibility for the content of the EIS's and for the determination of which alternatives and mitigation measures are selected for inclusion in the project.

USEPA-02
The Section II discussion of the of the scenario for the Proposed Action (Alternative I) is a summary of the information contained in the various scenario discussions in Section IV. For further and more complete information regarding the scenario of Alternative I and its alternatives, please read the appropriate scenario discussions in Sections IV.A (Alternative I, Base Case); IV.D (Alternative III, Barter Island Deferral); IV.E (Alternative IV; The Nuiqsut Deferral); IV.F (Alternative I, Low Case); and IV.G (Alternative I, High Case).EPA-02

EPA-03
Additional information regarding 303 (d) effects on water quality has been added to Sections IV.B.1, IV.E.1, and IV.G.1.

EPA-04
The text has been modified to address these concerns. Please see the responses to Comments EPA-03 and -07.

EPA-05
Please see the response to Comment USEPA-03.

EPA-06
Section 3.a.(4) of the cumulative case summarizes the effects of all the existing causeways and docks. The section describes and illustrates the overall cumulative effect on arctic cisco and other anadromous fish populations during the past two decades. The section summarized briefly the assumptions about future causeways and docks. More information has been added to the sections about the assumptions; however, it still notes that site-specific and design-specific information is not available at this time. Please also see the response to Comments EPA-03 and -07.

EPA-07
The generalized locations of the four additional causeways (three in the base case and one in the high case) and some assumptions as to the nature of their construction are discussed in the base case of Alternative I. The location of two of these structures could be coterminous with existing causeways at West Dock and Oliktok Point. Some additional information regarding these structures is presented in the water-quality sections (please see the response to Comment EPA-03). However, the exact locations of these causeways as well as their design will be an issue for further analysis in a developmental EIS (DVEIS). A DVEIS will be compiled only if recoverable quantities of hydrocarbons are located within the sale area.

USEPA-08
Please see the response to Comment USEPA-03.

STATE OF ALASKA

OFFICE OF THE GOVERNOR

OFFICE OF MANAGEMENT AND BUDGET
DIVISION OF GOVERNMENTAL COORDINATION

TONY KNOWLES, GOVERNOR

SOUTHCENTRAL REGIONAL OFFICE
3601 "C" STREET, SUITE 370
ANCHORAGE, ALASKA 99503-5930
PH: (907) 269-7470/FAX: (907) 561-6134

CENTRAL OFFICE
P.O. BOX 110030
JUNEAU, ALASKA 99811-0030
PH: (907) 465-3562/FAX: (907) 465-3075

PIPELINE COORINDATOR'S OFFICE
411 WEST 4TH AVENUE, SUITE 2C
ANCHORAGE, ALASKA 99501-2343
PH: (907) 271-4336/FAX: (907) 272-0690

RECEIVED
DEC 14 1995
1:30 pm.
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

December 12, 1995

Ms. Judy Gottlieb
Director
Alaska OCS Region
Minerals Management Service
949 East 36th Avenue
Anchorage, AK 99508-4302

Dear ~~Ms. Gottlieb~~ Judy:

Thank you for the opportunity and the extended deadlines for submitting comments on the draft Environmental Impact Statement (EIS) for Outer Continental Shelf (OCS) Lease Sale 144 in the Beaufort Sea. Attachment I to this letter provides the consolidated state agency comments resulting from a review of the draft EIS and the Proposed Notice of Sale. These include input from the Departments of Fish and Game, Natural Resources and Environmental Conservation and from the North Slope Borough Coastal District. Attachment II provides a copy of the State of Alaska 1990 Beaufort Sea Seasonal Drilling Restriction Policy.

Governor Knowles' comments on the size, timing and location of the sale requested under Section 19 of the OCS Lands Act will be submitted separately.

The state appreciates continuing efforts by the Minerals Management Service (MMS) to be responsive to the important issues raised by the North Slope Borough Coastal District. Efforts to incorporate local knowledge into the EIS process are also appreciated. As discussed in the attached comments, it is important to further explore opportunities to resolve differences in opinion among the stakeholders concerning the possible effects of this lease sale.

I recognize the amount of work that the your staff has committed to develop the EIS and hope that the attached comments will be helpful when writing the final EIS. Please

I-A35LH

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contact me or Glenn Gray of my staff if we can be of additional assistance.

Sincerely,

Diane Mayer

Diane Mayer
Director

Enclosure

cc: Mayor George Ahmaogak, North Slope Borough
Gene Burden, Commissioner, Department of Environmental Conservation
Marilyn Heiman, Office of the Governor
William Hensley, Commissioner, Department of Commerce and Economic Development
John Katz, Office of the Governor, Washington, D.C.
Frank Rue, Commissioner, Department of Fish and Game
John Shively, Commissioner, Department of Natural Resources

Attachment I

State of Alaska Comments
Comments on the Draft Environmental Impact Statement
for OCS Lease Sale 144 in the Beaufort Sea

The State of Alaska comments on the draft Environmental Impact Statement (EIS) for Outer Continental Shelf (OCS) Lease Sale 144 reflect responses from the Alaska Departments of Fish and Game. Natural Resources and Environmental Conservation and from the North Slope Borough Coastal District.

The comments first address incorporation of local knowledge. The comments continue with a discussion of offshore issues including effects of noise on bowhead whales. subsistence concerns, water quality concerns, bear interaction plans, and oil spill issues. The next section addresses onshore support facilities including discussions on potential pipeline routes and construction. habitat issues, birds, caribou, and fish. The comments conclude with a recommendation concerning the timing of Section 19 and draft EIS comments.

INCORPORATION OF LOCAL KNOWLEDGE

The state acknowledges the substantive efforts made by the Minerals Management Service (MMS) to incorporate local knowledge into the EIS process for Lease Sale 144 during public meetings and other outreach efforts. Continuation of these efforts must ensure that important information from residents of the North Slope Borough is incorporated into the final EIS and scientific studies. One specific example where traditional knowledge can be useful relates to local observations concerning the importance of the Barter Island area for feeding by bowhead whales.

OFFSHORE ISSUES

Effects of Noise on Bowhead Whales

As stated in the November 17, 1995 letter from the North Slope Borough, the findings of a number of studies appear to missing in the draft EIS. The state supports inclusion of a discussion of these studies in the final EIS and appreciates the commitment by MMS to incorporate them as outlined in the November 24, 1995 response to Mayor George Ahmaogak Sr. of the North Slope Borough.

A number of questions remain unresolved in the Beaufort Sea OCS, specifically concerning the extent of negative effects of noise from oil and gas activities on Bowhead whales, the effect of OCS and related activities on subsistence, and on the ability to clean

up an oil spill in broken ice conditions. The state encourages MMS to incorporate local review of proposals and results of ongoing studies in an attempt to resolve differences in opinion among stakeholders.

Studies of noise impacts clearly show that whales are affected to some degree by noise related to drilling operations and support craft activities. There appear to be differences in opinion, however, concerning the range of distance from the activities that a whale will be affected. Likewise, these studies have not provided definitive answers regarding long-term effects of noise from oil and gas activities on whales.

SOA-01

Considering the range of opinion of the effects of noise, it is important to clearly identify uncertainty and risk. The final EIS would be a more useful document if it included an in-depth discussion of the risks and uncertainty considering the range of information from current studies on noise effects on bowhead whales.

SOA-02

The recent MMS-sponsored Arctic Synthesis meeting provided a useful forum for scientists and subsistence users to present findings and local knowledge about the effects of noise from oil and gas activities on bowhead whales. The next logical step would be to convene a round-table discussion of the stakeholders to clearly identify points of agreement and disagreement and to discuss how studies can be designed to help narrow the gap of understanding about the effects of noise. Also, a meeting of the stakeholders could address the degree of peer review needed to satisfy concerns about study design and findings.

Subsistence Concerns

The state has a long history of leasing offshore tracts including incorporation of mitigation measures to address subsistence concerns. The Administration's strategy includes a priority to leasing offshore tracts that can be reached by directional drilling technology. Where offshore drilling is necessary in the Beaufort Sea. the state implements a seasonal drilling restriction policy.

SOA-03

In response to the issues relating to whale migration routes, seasonally variable oil spill response and clean up capability, and provision of opportunities for subsistence activities, state lease sales have incorporated a seasonal drilling stipulation. This policy addresses exploratory drilling in broken ice as well as restrictions on drilling to reduce potential conflicts with subsistence whalers. For example, in the Eastern Subsistence Whaling Zone, drilling is prohibited during the fall bowhead whale migration until whaling quotas have been met. A copy of the state seasonal drilling restriction for the Beaufort Sea is included in Attachment II. The state urges MMS to consider implementing seasonal drilling restrictions or other acceptable means to address constraints to oil spill containment and cleanup during broken ice conditions and to ensure that oil and gas activities will not unduly interfere with subsistence whaling activities of Nuiqsut and Kaktovik residents. SOA-03

The North Slope Borough raised concerns about implementation of Stipulation No. 1, Protection of Biological Resources. Specifically, it may be feasible to include a provision in this stipulation for North Slope Borough review of site-specific bowhead whale monitoring programs before the plans are finalized. This step would insure that the Borough has an opportunity to provide input on monitoring procedures. SOA-04

Stipulation No. 5, Subsistence Whaling and Other Subsistence Activities, requires lessees to consult with the communities of Barrow, Kaktovik and Nuiqsut and the Alaska Eskimo Whaling Commission to discuss potential conflicts. Lessees must include in a development or exploration plan a discussion of issues resolved, unresolved conflicts and plans for further consultation. This stipulation would be a more effective alternative to season drilling requirements if it identified a means for resolving conflicts identified by lessees during consultations with North Slope communities before approval of exploration or development plans. SOA-05

The North Slope Borough supports a deferral in the vicinity of Kaktovik as depicted in Alternative III of the draft EIS. The state generally supports the use of mitigative measures in lieu of area deferrals. The state continues to implement the March 1990 seasonal drilling restriction for the Beaufort Sea. The MMS, however, has not included seasonal drilling restrictions for this lease sale. SOA-06

The last paragraph of Information to Lessee (ITL) (j), Availability of Bowhead Whales for Subsistence Hunting Activities, references procedures from Lease Sale 124 to coordinate results of site-specific Bowhead whale surveys. The last sentence of this ITL in the draft EIS appears to be missing from the ITL in the Preliminary Notice of Sale (PNOS). Addition of this sentence will make it clear that these procedures are applicable to Lease Sale 144. SOA-07

Water Quality Protection

Historically, the State of Alaska has taken an active role in recommending mitigating measures for the Beaufort Sea and other federal OCS lease sales through the coastal consistency process in an effort to protect water quality from potential oil spills and

effluent discharges. Since the 1980 joint federal-state Beaufort Sea oil and gas lease sale, lease stipulations for both state and federal sales routinely prohibit produced water disposal within the ten meter depth contour and ensure careful management of drilling fluid disposal as a function of the depth of discharge. The Environmental Protection Agency's national rules governing effluet discharges within the coastal subcategory affirm this approach. The state continues to support inclusion of these requirements in the terms of sale for Lease Sale 144 and looks forward to working with the MMS to ensure consistency with the Alaska Coastal Management Program. SOA-08

Polar and Grizzly Bear Interaction

Information to Lessees (ITL) (k), Polar Bear Interaction, should be updated to reflect extension of incidental take regulations by the U.S. Fish and Wildlife Service. On August 17, 1995, the Fish and Wildlife Service extended these regulations until December 15, 1998. SOA-09

Concerning the discussion on polar bear interaction on page II-11 of the draft EIS, the state makes two recommendations: 1) include grizzly bears, and 2) encourage lessees to prepare and implement bear interaction plans for both grizzly and polar bears to minimize conflicts between bears and humans. Inclusion of grizzly bears would be for onshore activities relating to OCS exploration, development and production. These plans should include measures to: a) minimize attraction of bears to the drill sites, b) site buildings and work areas to minimize human-bear interactions, c) detect bears on or near drill sites and advise personnel when bears are sighted, d) deter bears from the drill site, if authorized, e) provide contingencies in the event bears do not leave the site or cannot be deterred by authorized personnel, f) store and dispose of materials that may be toxic to bears, and g) provide a systematic record of bears on the site and in the immediate area. SOA-10

Oil Spill Issues

State oil spill legislation set more comprehensive planning standards than those currently imposed by federal regulation. The state's oil discharges contingency planning standard for exploration facilities requires control and clean up of the realistic maximum discharge within 72 hours of a spill. Operators on the OCS should be expected to comply with these more restrictive measures. In addition, because oil spill clean up technology continues to improve, operators should be expected to use the best available and safest technologies. SOA-11

The language in ITL (I) State Review of Exploration Plans and Associated Oil Spill SOA-12

Contingency Plans as written is confusing. The title of this ITL should be changed to include review of oil spill contingency plans associated with development and exploration plans. The intent of the ITL would be more clear if the following language was used. SOA-12

> The State of Alaska will review Outer Continental Shelf plans and associated oil spill contingency plans through the review process for consistency with of the Alaska Coastal Management Program. The Alaska Coastal Management Program includes statewide standards found in 6 AAC 80 and enforceable polices found within approved coastal district programs. Contingency plans will be reviewed for compliance with state standards, the use of best available and safest technologies, and with state and regional contingency plans on a case-by-case basis.

The draft EIS primarily discusses effects of contact and ingestion of oil to wildlife during oil spills. One effect of oil spills that is not discussed in this document is the potential for harassment, disturbance, and displacement associated with increased activity during oil spill response and shoreline or on-water recovery. SOA-13

ISSUES RELATED TO ONSHORE SUPPORT FACILITIES

Pipeline Routes and Construction Techniques

The draft EIS describes elevated pipelines with associated gravel roads for all discussions of onshore pipelines from Pitt Point to Kuparuk and from the Canning River to Prudhoe Bay. There is no discussion of the potential impacts to fish and wildlife of the following alternatives: 1) an elevated pipeline and no gravel road (i.e., winter pipeline construction from a temporary ice road), or 2) a buried pipeline with no road (also constructed from a winter ice road). These two options are viable alternatives to the elevated pipe and gravel road option, and they should be described in the final EIS along with a discussion of the potential impacts to fish and wildlife. SOA-14

Habitat Issues

The final EIS should address all reasonable effects concerning disturbance and habitat loss within identified high-use wildlife habitat rather than only addressing a best-case scenario. The draft EIS favors best-case scenarios regarding recovery times for wildlife populations following oil field development and operation activities and for oil spills. It appears the draft EIS assumes all populations are stable or increasing at the time of impact. For cases which this is correct, the predictions may be acceptable, although optimistic. For those populations that may be declining, recovery to pre-development or SOA-15

pre-spill conditions may take considerably longer than predicted. For species with low reproductive rates, such as polar bears, recovery may take much longer than predicted if most of the affected animals are breeding females. The final EIS should incorporate these considerations. SOA-15

Birds

The predictions regarding the effects of actual habitat loss, the distance of disturbance to birds, and the length of time of these effects may present an overly optimistic viewpoint (Pages IV-B-19 - 25; IV-F-8,9; and IV-G-7-10). Depending on the species involved, the life function for which the habitat is used, such as molting, and the availability of alternative habitats of equal value, the consequences of disturbance and habitat loss could be much more severe than that described in the draft EIS. SOA-16

For example, construction and operation of shore-based facilities within the Teshekpuk Lake Special Area (TLSA), a portion of the National Petroleum Reserve-Alaska (NPR-A), likely would affect geese longer than the one hour and farther than the one mile limits suggested in the draft EIS. Abandonment of considerably larger portions of this internationally significant molting area is possible. SOA-17

Considering possible impacts of a pipeline in the TLSA , the final EIS should include mitigation measures to ensure that pipeline-related infrastructure and monitoring and maintenance activities do not result in significant adverse impacts. It should be noted that any proposed pipeline that would cross the TLSA could result in substantial impacts. The TLSA supports one of the most productive, diverse and sensitive wetland ecosystems in Arctic Alaska. It is the most significant known molting area for the non-breeding brant, Canada, greater white-fronted, and snow geese from Alaska, Canada, and Russia. No other area on the Arctic Coastal Plain supports a comparable variety or number of waterfowl. The coastal wetlands in this area provide important habitat for large numbers of geese, ducks, tundra swans, and shorebirds during fall staging. Also, the year-round use of this area by the Teshekpuk Lake Caribou Herd, including calving, is an important component of this ecosystem. SOA-18

The Record of Decision for the final EIS on Oil and Gas Leasing in the NPR-A deleted 217,000 acres from leasing including acreage for a pipeline from Pitt Point. The BLM TLSA Habitat Evaluation (Silva 1985) protective measures for Zone 1 acreage, a significant portion of the area to be traversed by a Pitt Point pipeline, states that no permanent facilities, including pipelines, would be allowed in this area. The state has recommended against leasing in the portion of the TLSA through which a pipeline from

Pitt Point would traverse (letter, Grogan to Penfold, October 29, 1985).

The Sagavanirktok River Delta-Howe Island-Duck Island area should be considered for inclusion in the list of identified areas of special biological sensitivity to be considered in oil spill contingency plans on page II-8. This consideration is justified based on the importance of this area to snow geese, brant, and other birds for nesting and brood-rearing, and for its importance to anadromous fish for summer rearing and overwintering. SOA-19

Caribou

A more thorough discussion of the potential effects on caribou from the reasonably foreseeable development of onshore support facilities associated with offshore drilling is needed. This discussion should include analysis of requirements for minimizing risk to caribou based on information developed from over two decades of caribou interaction studies, including the most recent research. SOA-20 Mitigation measures the state continues to incorporate into our discussion of development of the Arctic National Wildlife Refuge include siting facilities, such as roads, pipelines and other infrastructure, to minimize the risk to wildlife, and the use of best available technology to minimize surface alterations and site disturbance. SOA-21

The discussion must also acknowledge that development of expanded onshore infrastructure in support of OCS activities may promote development of small, marginal onshore fields. Increased activity, including vehicular traffic, must be managed with the same high standards for wildlife. To achieve this objective, the Department of Fish and Game offers its expertise to companies during the design of facilities. Also, the Department wishes to participate in the design of field studies conducted or required by MMS to ensure coordination of our expanded data about these important resources. SOA-22

Three additional changes should be made to the EIS concerning caribou. First, the population estimates for caribou on page III-B-13 of the draft EIS should reflect current estimates: SOA-23

Porcupine Caribou Herd	152,000 (1994)
Western Arctic Caribou Herd	450,000 (1993)
Teshekpuk Lake Caribou Herd	27,600 (1993)
Central Arctic Caribou Herd	18,093 (1995)

Second, page IV-V-45 should be corrected to note that caribou shed their hair in early-to- SOA-24

mid summer, not in the fall. SOA-24

Third, page IV-G-22 should note that hunting of caribou by bow and arrow is permitted within five miles of the Dalton Highway south of the oil fields. SOA-25

Impacts to Fish

The draft EIS should address potential impacts to fish resources from stream and major river crossings of onshore pipelines, roads, and other facilities associated with offshore exploration and development. SOA-26

Other Comments

Corrections should be made to pages IV-A-3 and IV-B-47 to note that the Dalton Highway is no longer restricted to commercial carriers but is now open to all vehicles. Consequently, levels of traffic have increased on the Dalton Highway, particularly during the summer tourist and fall hunting seasons. SOA-27

The section on effects of natural gas development and production does not adequately discuss the potential effects to wildlife of onshore facilities related to this development. This is particularly true for noise generated from compressor stations and other facilities. SOA-28

TIMING OF THE SECTION 19 AND DEIS RESPONSE DEADLINES

The State of Alaska appreciates the efforts of the MMS to solicit Section 19 comments early in the lease sale process. The deadline for Section 19 comments for Lease Sale 144, however, was several weeks later than the deadline for comments on the draft EIS. It would be helpful to the state in the review of future lease sales, if the timing of the draft EIS comments and the Section 19 comments occurred at the same time.

This concludes the State of Alaska comments on the draft EIS for OCS Lease Sale 144. Attachment II outlines the state's Beaufort Sea Seasonal Drilling Restriction Policy.

SOA-01
Additional information from other studies on the effects of noise on bowhead whales has been added to the text of the FEIS. The results of these additional referenced studies do not change the general conclusions as discussed in the text of the FEIS.

SOA-02
In the FEIS, the stipulations dealing with bowhead whale monitoring and subsistence whaling have been rewritten from the DEIS. In the FEIS, Stipulations No. 4 and No. 5 expand the role of various North Slope communities and organizations in regard to the formulation and peer review of monitoring plans and related studies, the observance of monitoring and development activities, and the provision for a mechanism for conflict resolution.

SOA-03
The issue of spilled oil during periods of bowhead whale migration and the need for a seasonal drilling restriction to protect the bowhead whale were addressed by the NMFS in their Arctic Biological Opinion. In their opinion, NMFS stated that the seasonal restriction of drilling "may not be necessary". However, Stipulation No. 5 states that "In enforcing this stipulation, the RS/FO will work with other agencies and the public to assure that potential conflicts are identified and efforts are taken to avoid these conflicts (for example, timing operations to avoid the bowhead whale subsistence hunt). These efforts might include seasonal drilling restrictions, seismic and threshold depth restrictions, and requirements for directional drilling and the use of other technologies deemed appropriate by the RS/FO."

The remainder of these comments involve issues relating to subsistence, bowhead behavior patterns and oil-spill-cleanup technology. Regarding bowhead whale behavior and subsistence, the reader is specifically referred to Sections IV.B.6, IV.B.9, and IV.B.10, as well as the comments made by the North Slope Borough and other Native organizations and the responses to those comments that are contained in Section IV.C. Regarding oil-spill-cleanup technology, the reader is referred to the response to Comment AEWC-05.

SOA-04
Stipulation No. 1 would not be an appropriate place to include the provision suggested. The Arctic Biological Task Force (BTF), which provides recommendations to the Regional Supervisor, Field Operations regarding the conduct of biological surveys, is involved with implementation of this stipulation. In the past, the BTF has viewed this stipulation in terms of protection to marine life on a given lease, primarily benthic communities such as the boulder patch community. The recommendations have been site-specific, pertaining to a lease or a group of leases, and have been concerned with the need for and the scope of biological surveys to determine the presence of specific marine communities. The NSB has always been provided an opportunity to review the industry-sponsored site-specific monitoring plans for bowhead whales. Stipulation No. 4, Industry Site-Specific Bowhead Whale-Monitoring Program, provides for an independent peer review of a proposed monitoring program. The peer reviewers will be selected by the RS/FO from experts recommended by the NSB, the AEWC, industry, NMFS, and MMS. The NMFS, in their proposed rule for incidental take of marine mammals, is proposing a peer-review process for monitoring programs. This is discussed further in Comment NSB-12.

SOA-05
Stipulation No. 5, Subsistence Whaling and Other Subsistence Activities, has been rewritten to include a conflict resolution mechanism. If subsistence resource conflicts are identified during review of exploration or development and production plans,

> *the lessee, the Alaska Eskimo Whaling Commission, the North Slope Borough, or any of the subsistence communities may request that MMS convene a panel to address the conflict and attempt to resolve the issues. The RS/FO will consider the recommendations of the panel before making a final determination of the adequacy of the mitigation. . .Restrictions, including seasonal drilling restrictions, seismic and threshold depth restrictions, and requirements for directional drilling and other technologies deemed appropriate by the RS/FO may be implemented.*

SOA-06
Please see the response to Comment SOA-03.

SOA-07
Inclusion of this language into the Final Notice of Sale (FNOS) will be evaluated by MMS. The contents of the FNOS will be determined by MMS during July and August of 1996.

SOA-08
Although the Department of the Interior included a stipulation regulating discharges in the 1979 BF Sale, the MMS ceased using stipulations to regulate muds and cuttings discharges after Sale 71 in 1982 and ceased using stipulations to regulate produced-water discharges after Sale 87 in 1984. Instead, the restrictions for exploration discharges are set in the general Arctic NPDES (exploration) permits issued by the USEPA. Discharge restrictions for production discharges would be set by the USEPA following an Ocean Discharge Criteria Evaluation (ODCE) for an OCS production proposal from industry, based on USEPA's national rules governing effluent discharges within the offshore subcategory. To date, no such production proposal has been submitted for any of the five OCS lease sales over the last 16 years. However, any such production proposal would have to meet applicable consistency requirements of the Alaska Coastal Management Program.

SOA-9
The ITL on Polar Bear Interaction has been updated to reflect extension of incidental take regulations by the Fish and Wildlife Service.

SOA-10
The MMS does not believe it is necessary to have a stipulation to protect polar bears or grizzly bears. Neither of these species is on the endangered species list, nor are either of these species populations declining. The existing wildlife regulations implemented by the FWS and ADF&G are expected to prevent or reduce conflicts between humans and bears. Also, the ITL on Polar Bear Interaction was written to inform the lessees of provisions that protect polar bears under the Marine Mammal Protection Act. Grizzly bears are not covered under this act. However, such measures that minimize polar bear-human interactions would do the same to prevent adverse interactions between grizzly bears and humans.

SOA-11
Federal law requires that operators be prepared to respond to "worst-case" spills that could result from their activity. This is in agreement with the State's current planning standard. All spill-response plans submitted for exploration and production activities on the OCS will be sent to the State of Alaska for review. The MMS will work with the State of Alaska to ensure that the spill-response plans are adequate and use the best available and safest technologies.

SOA-12
This ITL has been deleted, as it duplicated the ITL on Coastal Zone Management (ITL No. 17).

SOA-13
The text in Sections IV.B.4., IV.B.5., and IV.B.7. have been changed in response to this comment.

SOA-14
There are a number of viable scenario options to develop potential Beaufort Sea resources. The MMS is charged with selecting a reasonable and prudent method by which potential resources can be developed. We believe the method chosen represents a reasonable method to develop offshore resources and, therefore, is an appropriate scenario on which to base the environmental analysis of the proposed action.

SOA-15
This comment states that the DEIS uses "best case scenarios" regarding recovery times for biological resources such as marine mammals, particularly polar bears, and suggests that some biological populations in the Arctic are declining and, thus, recovery of these populations would take much longer. The DEIS does not use a "best case scenario" but rather uses the base-case scenario using the assumptions on levels of industrial activity (air and vessel traffic) that are expected to be associated with the proposal. Based on these relatively low levels of air and vessel traffic (such as 1 to about 3 helicopter flights per day and 1 or 2 vessel trips per day), the amount of disturbance of wildlife is expected to be minimal. First, there are no indications that arctic populations are in decline. Although species such as the polar bear have low reproductive rates, the losses estimated from the assumed oil

spills (perhaps 30 bears) represent less than the number of bears harvested annually (about 60 bears/year) by subsistence hunters on the North Slope from the of Beaufort Sea polar bear population. Although the spills may kill a higher proportion of females than the numbered females harvested by Native hunters, the losses estimated from the spill represent a one-time or two-time loss (30 bears) over the 20- to 30-year life of the proposal. Losses of mortality of female bears from subsistence harvest over the same time period would represent a far greater source of mortality over 20 to 30 years than the losses due to the assumed oil spills. The current polar bear population in the Beaufort Sea was reported to be stable or increasing over the past 20 years according to the FWS (1995); thus, the annual mortality due to subsistence (about 60 bears/year) apparently has not had a long-term or more than 1-year effect on the population or less than or equal to the annual recruitment rate of the population. Over the 20- to 30-year life of the proposal, the losses due to oil spills are not expected to significantly increase the overall mortality of polar bears in the Beaufort Sea; and the estimated loss due to the spills plus current harvest rate is within the estimated sustainable harvest of the Beaufort Sea polar bear population.

SOA-16
Disturbance of marine and coastal SOA-birds from air or vessel traffic is not expected to cause any loss of habitat, only temporary displacement of birds. Habitats lost or altered hy construction of onshore pipelines and roads are expected to include no more than those habitats within 100 m of the pipeline-road corridor and, in the most likely onshore oil-transportation scenario, would connect with existing pipeline-road corridors. There is no evidence that existing pipelines, roads, and other facilities in the Prudhoe Bay-Kuparuk River oil fields have significantly affected bird populations on the North Slope, and the assumed additional pipelines and roads associated with the proposal also are not expected to affect these bird populations.

SOA-17
The DEIS recognizes that the construction of an onshore pipeline and road across the Teshekpuk Lake Special Area or any other onshore habitat area of marine and coastal birds would displace and disturb birds during construction activities lasting about 2 years. These industrial activities are not expected to affect birds beyond about 1 mile of the assumed pipeline and road, because such activities have not greatly affected bird populations on the Prudhoe Bay and Kuparuk River oil fields beyond comparable distances to such types of facilities.

SOA-18
The DEIS assumes that a pipeline and road would be built across the Teshekpuk Lake Special Area only under the high-case scenario. The MMS has neither the jurisdiction nor authority to implement onshore mitigating measures. If this scenario does become part of a development plan associated with Sale 144 offshore leases, other agencies such as the Army Corp of Engineers would be involved in permitting such construction activities along with the FWS and other agencies. At that time, mitigating measures would be proposed and probably implemented to protect this important bird habitat.

SOA-19
The ITL Information on Sensitive Areas to Be Considered in the Oil-Spill-Contingency Plans has been updated to include the Sagavanirktok River Delta-Howe Island-Duck Island area, May-September.

SOA-20
Please see the response to Comments SOA-18 and BPX-9.

SOA-21
The MMS does not have the jurisdictional authority to stipulate the nature or design of onshore facilities; other Federal agencies, such as the Army Corps of Engineers, are responsible for onshore-facility design and placement.

SOA-22
The analysis within the FEIS takes into account the effects of onshore facilities immediately engendered by the proposed action. Regarding the analysis of effects of future fields the proposed action may cause to be developed, the staff lacks the (proprietary) information necessary to make such assumptions. While the FEIS does make a good-faith effort to analyze the cumulative effects of the proposal, information as to what future fields may be developed as result of the proposal is subjective in nature and largely held as proprietary data/policy by industry. The MMS appreciates the Alaska Department of Fish and Game's offer of expertise to the oil industry regarding onshore-facility siting and their desire to be a part of the studies- review process; however, such offers should be made to the appropriate Federal agency. The MMS does not have jurisdictional authority over onshore facilities; other Federal agencies, such as the Army Corps of Engineers, are responsible for onshore facility design and placement.

SOA-23
Please see the response to Comment BPX-4.

SOA-24
The text in Section IV.B.7 has been changed in response to this comment.

SOA-25
The text in Section IV.H.7 has been changed in response to this comment.

SOA-26
Section IV.B.3 discusses the effects of offshore pipelines and nearshore structures of fish populations. Onshore effects due to river-crossing construction as well as effects due the emplacement of production facilities may vary according to placement of the structures. The exact location of these structures, should production occur, will be identified in detail in a developmental EIS. This document will closely analyze the environmental effects of any structure constructed to facilitate the production of offshore resources.

SOA-27
The text in Section IV.B.3 has been amended in response to comments. The discussion in Section IV.B.7.c is a generalized discussion on the effects of traffic on caribou. The traffic- movement restrictions mentioned in the discussion refer to restrictions in vehicle movement across a hypothetical road through the NPR-A.

SOA-28
The assumed onshore facilities associated with possible gas development in the Sale 144 area are expected to be very similar to the facilities described under the base-case scenario in Section IV.B, and they would have about the same effects as described in Section IV.B.

NORTH SLOPE BOROUGH
OFFICE OF THE MAYOR
P.O. Box 69
Barrow, Alaska 99723

Phone: 907-852-2611 or
907-852-0200
Fax: 907-852-0337

GEORGE N. AHMAOGAK, SR.
MAYOR

November 17, 1995

RECEIVED
NOV 21 1995
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Judy Gottlieb, Alaska Regional Director
Minerals Management Service
Alaska OCS Region
949 E. 36th Avenue
Anchorage, AK 99508

Dear Ms. Gottlieb:

This letter (with Attachment) presents our comments on the Draft Environmental Impact Statement (DEIS) pertaining to the Beaufort Sea Planning Area Oil and Gas Lease Sale 144. In this letter I wish to especially stress the eight points mentioned below.

1. The North Slope Borough continues to be opposed to offshore Beaufort Sea lease sales, therefore we support Alternative II (No Sale).

2. If MMS does move ahead with the lease sale, the waters between Barter Island and the U.S.-Canadian border should be deleted such as is mentioned in Alternative III (Barter Island Deferral).

3. From examining the bowhead related sections of the DEIS it is apparent that MMS has ignored the many comments, especially concerning noise impacts, that we have made over the years. Considering the time and effort that we have made over the years (Borough personnel, subsistence hunters, etc.), MMS insults us by not including appropriate mention of our concerns. **NSB-01**

4. From examining the bowhead related sections of the DEIS it is apparent that MMS has ignored several studies that; show noise related impacts, provide a basis for likely oil impacts, and question the validity of a feeding study. **NSB-02**

5. When the Environmental Impact Statement is finalized to produce the FEIS I hope that MMS will give appropriate recognition to our earlier comments, to our comments presented here, and to the studies concerning impacts that were "overlooked" by the DEIS. A few general and specific comments are presented in Attachment 1. **NSB-03**

6. One of our greatest concerns is noise interference (especially from seismic exploration) that deflects the fall migrating bowhead whales and/or makes them more wary. As you know, there is a real difference of opinion as to how long range are the noise impacts from drill rigs and seismic vessels. We have no confidence in the 7.5 km value that the DEIS puts forward. Our hunters for years and years have experienced interference over many miles (10-20 miles) not just a few kilometers. How are you going to address our concerns? So far our concerns have been more or less ignored. In this instance we are not going to be ignored anymore. You must provide a reasonable response to our concerns, ignoring them is no longer adequate. **NSB-04**

7. The mitigating measures as proposed in "section D" on DEIS pages II-3 to II-12 are inadequate. Of special concern to us are those that pertain site specific monitoring, subsistence whaling, and oil spill cleanup capability. These all need to be strengthened. A few additional comments are also included in Attachment 1. **NSB-05**

8. If, in the FEIS, MMS continues to ignore our comments and ignore relevant studies and fails to strengthen mitigating measures it will send a definite message to the people of the North Slope Borough. If you send us such a message there is no need for us to continue to try to work cooperatively with MMS.

I hope this information is helpful and we look forward to an FEIS that is greatly improved over the DEIS.

Sincerely,

George N. Ahmaogak, Sr.
Mayor

cc: Burton Rexford, Chairman, AEWC
Glenn Gray, Office of the Governor, State of Alaska

Attachment (1)

Attachment 1

Comments regarding impacts to bowhead whales and our subsistence hunt of the bowhead whale

1. The DEIS clearly "downplays" potential impacts to the bowhead whale due to noise and due to contact with spilled oil. NSB-06

2. The DEIS clearly "downplays" potential impacts to our subsistence hunt of the bowhead whale. NSB-07

3. The DEIS in item 9 on page I-9 notes that impact assistance to affected communities (such as Kaktovik, Nuiqsut and Barrow) is not being considered in the DEIS. As you know, we have repeatedly asked that there be impact aid to the communities that suffer direct impacts from lease sales and related activities. The "benefits" from such lease sales extend to the state and the nation, however, the adverse impacts are nearly all limited to the people of the nearby communities (Kaktovik, Nuiqsut, Barrow) and the marine life they depend upon. When will this issue be faced in an evenhanded manner? Regarding our suffering most of the adverse impacts see References 1,2 and 3. NSB-08

4. On page II-15 (para. 6) the DEIS states that bowheads "may exhibit temporary avoidance behavior in response to vessels and to activities related to seismic surveys, drilling, and construction during exploration and development and production. Avoidance behavior usually begins when a source of noise disturbance (vessel or drilling rig) is 1 to 4 km away". The value of 1-4 km as a response distance is also mentioned in Table II E (Alternative 1, bowhead section) which appears after DEIS page II-13. NSB-09

We have no confidence in such short distances (1-4 km) needed to produce impacts. For example, see comments 16-21 below. See also References 1, 2 and 3.

5. On page IV-B-35 (para. 3) the DEIS mentions that vessel activities associated with the sale should cause only "_ _ small deflections in individual bowhead swimming paths _ _". In the same paragraph is stated that "_ _ bowheads probably would adjust their individual swimming paths to avoid approaching within several kilometers of vessels attending a drilling unit _ _ _". NSB-10

We have no confidence in the idea of a "small deflection". For example, see comments 16-21 below.

6. On DEIS page IV-B-36 (paras. 2 and 3) considerable verbiage is devoted to citing sources showing how close bowheads have been reported to approach drilling structures, however, no reference is made to available studies showing avoidance of such structures. For example, see comments 16-18 below. NSB-11

7. On DEIS page IV-B-35 (para. 4) the apparently "chiseled in concrete" value of 7.5 km (4.7 miles) is again put forward as the "dividing line" for seismic noise effects. It is stated that "_ _ most bowheads exhibit strong avoidance response _ _ _" to a seismic vessel only when it is "within a few kilometers". NSB-12

<u>We have no confidence in the "7.5 km" value</u>. For example, see comments 16, 17, 19, 20, 21 below.

8. On DEIS page IV-B-35 (last para.) is stated that since "_ _ high-resolution seismic surveys are relatively quiet, these activities are not likely to have significant effects on endangered whales". No data are presented to support this statement and we surely do not believe this statement. For example, see comments 17, 19, 20, 21. NSB-13

9. On DEIS page IV-B-36 (para. 3) is stated that "There are no observations of bowhead reactions to icebreakers breaking ice." In the same paragraph is stated that "Based on models, bowhead whales would then likely respond to the sound of the attending icebreakers at distances of 2 to 25 km (1.24 - 15.53 mi) _ _ _". NSB-14

Regarding icebreakers the DEIS should consider the great amount of information presented in Reference 14 (see also comments 16-18 below).

Even though there is uncertainty as to the exact size of the zone of responsiveness regarding a working ICEBREAKER (pushing ice), the size of the expected impacted area is impressive for a site similar to the Corona drillsite (page 317 of Reference 14). The estimated <u>radius</u> of the zone of responsiveness (even assuming median ambient noise levels) at a 20 dB signal to noise ratio (using 250 Hz and East/West distance values) is 25 miles. The zone in which <u>some</u> whales will respond to an icebreaker (pushing ice) is therefore <u>50 miles in diameter</u>.

When using a signal to noise ratio of <u>30 dB</u> (using 250 Hz and East/West distance values, <u>median</u> ambient noise) the size of the zone of responsiveness is still very large (page 317 of Reference 14). Under these conditions it is estimated that <u>50%</u> of the whales will "<u>move away</u>" in response to the noise of the icebreaker. In this case the radius of the zone would be about 11 miles so therefore the <u>zone of responsiveness would be 22 miles in diameter</u>.

Impact areas such as these are indeed impressive even though there are uncertainties. During "average" ambient noise conditions a <u>working icebreaker</u> at the drillsite will probably cause 50% of the whales to "move away" in a zone that is 22 miles in diameter. Such a tremendous impact zone argues for extreme caution.

One must remember that the estimated zones of responsiveness would even be much larger during periods of quiet environmental (ambient) conditions.

10. On DEIS page IV-B-36 (para. 4) is stated that "_ _ spring- migrating bowheads are not likely to be exposed to drilling noise". The same paragraph also states that the subsequent discussion about noise affecting spring migrating bowheads "_ _ is theoretical only". These are unfortunate statements since drilling and related noise from industrial activity in the western portions of the proposed lease sale area will surely be heard by bowheads in the spring lead system. For example, see comments 16-21 below. NSB-15

11. The summary section (DEIS page IV-B-40) regarding the effects of Alternative I (Base Case) on bowhead whales is "unbelievable". The "magical number" of 7.5 km in relation seismic noise impacts is again mentioned. Mention is also made about how close bowheads come to drillships (0.2 to 5 km) and it is stated that "_ _ some bowheads probably change their migration speed and swimming direction to avoid close approach to noise-producing activities". The paragraph also states that bowhead "behavioral changes are temporary" lasting up to 30 to 60 minutes in the case of seismic activity. NSB-16

The paragraph dealing with oil contact impacts (last para. on page IV-B-40) is just too hard to believe! We have no confidence in anyone's ability to deal with a major oilspill in the Beaufort Sea under broken ice conditions. We also have no confidence in statements that downplay impacts to bowheads that contact or swallow spilled oil. For example, see comment 22 below.

The "summary" section downplays potential impacts. Why is there no mention of the studies that show long range seismic impacts and deflection around drilling structures? Why is there no mention of the many, many comments made by the Borough, Alaska Eskimo Whaling Commission (AEWC) and individual hunters over the years regarding noise impacts and likely impacts due to contact with spilled oil? See also comments 16-23 below.

12. On DEIS page IV-B-41 mention is made of the Industry Site-Specific Bowhead Whale Monitoring Program (paras. 1 and 2 of Effectiveness of Mitigating Measures section). It is stated that the program "_ _ will determine when bowhead whales are present in the vicinity of leases during exploratory-drilling operations and study the effects of these activities on the behavior of the bowheads". NSB-17

This brief section of the DEIS concludes with a most bizarre statement "While benefits are gained, the overall effects on bowhead whales with these mitigating measures

V-32

in place is likely to be the same as if the measures were not in place". What does this mean? Does this statement really mean that the mitigating measures will produce no protection for the bowhead whale? NSB-17

Does this brief section of the DEIS mean that the monitoring program will only study impacts in relation to drilling and will ignore the noisiest of all activities which is seismic exploration? If the monitoring is to be effective, the monitoring programs must withstand critical review. Will the monitoring study design be subject to adequate peer review? Will the monitoring study draft report be subject to adequate peer review? Will the North Slope Borough and the Alaska Eskimo Whaling Commission be allowed to participate in peer review of the monitoring study design and the monitoring study draft report?

Let me clearly state that if the study design and the study draft report are not subject to vigorous peer review, we will not have confidence in the findings. We are tired of seeing one impact assessment study after another that is poorly designed, collects a minute amount of data, and promptly concludes "no adverse impacts were seen". See also comments 16-23 below.

13. On page IV-B-41 of the DEIS is the one paragraph conclusion section regarding the effects of Alternative I (Base Case) on bowhead whales. As in the summary section, potential impacts are again downplayed. Mention is made that "Bowheads may exhibit temporary avoidance behavior _ _" in response to seismic surveys, drilling, etc. Mention is also made that "Avoidance behavior usually begins when a source of noise disturbance (vessel or drilling rig) is 1 to 4 km away" and that "Behavioral changes may last up to 60 minutes _ _" after the disturbance is gone or the whales have passed. NSB-18

Where is mention of the long distance responses to seismic noise and the massive deflection of whales around the Corona, Hammerhead and Kuvlum drilling sites (see References 5 and 10)? Why is there no mention of the 6.8 hour observation of a bowhead whale being deflected around the Hammerhead drill site (see Reference 10)? Where is reference to the many, many comments made by the Borough, AEWC, and individual subsistence hunters regarding the hunters inability to locate whales within many miles of drilling structures and seismic operations? See also comments 16-23 below.

14. On DEIS page III-B-10 (para. 2 of Bowhead Whale section) the size of the bowhead population is presented incorrectly. The current best estimate as accepted by the International Whaling Commission (IWC) is 8000 as noted on page 145 of Reference 18. The same paragraph in the DEIS also incorrectly states that there is no clear trend as to whether or not the population is increasing. The IWC accepted rate of increase between 1978 and 1988 is 3.1% per year (see Reference 18, page 149). The same paragraph on DEIS page III-B-10 implies that the increase seen is due to improved data, while the truth is NSB-19

that there has been a documented increase (Reference 18, page 149 and Reference 22) and improved counting methods have also contributed to the change in estimated population size. NSB-19

15. On DEIS page III-B-11 (largest para.) there is an effort to downplay the importance, as feeding habitat, of the waters between Kaktovik and the U.S.-Canadian border. The authority cited is the feeding study by Richardson, 1987 (Reference 19). As MMS well knows, that MMS sponsored feeding study was severely criticized in a report prepared by the Science Advisory Committee of the North Slope Borough (see Reference 15). Our Science Advisory Committee conducted a detailed review of the feeding study report and concluded that the feeding study's conclusion of "not an important feeding area" is not supported by data. As you know, this is a severe criticism. If MMS is going to continue time after time to cite their feeding study (Reference 19), as "proof" that the waters between Kaktovik and the U.S.-Canadian border are of little significance as bowhead feeding habitat, then the "other report" should also be cited. The "other report" is the report of our Science Advisory Committee (see Reference 15). Neither MMS nor any other group or individual has challenged the findings of our Science Advisory Committee presented in Reference 15. See also References 1, 2 and 3. NSB-20

16. In several comments above are cited several places in the DEIS where noise impacts to bowheads are mentioned but in our estimation the impacts are downplayed. Presented below in comments 16a through 16e is information that should be considered regarding long range noise impacts that the DEIS seems to ignore. Many of the comments below refer the reader to specific references which are listed separately. NSB-21

16a) Note that on page 43 of the Integration and Summary section of Reference 10 is mentioned a "strong avoidance response" of 4-7 bowheads to an approaching seismic boat 12 miles away. The whales moved strongly away. This is a seismic noise impact at 12 miles, why is it ignored by the DEIS?

16b) On page 116 of the Behavioral Observations section of Reference 10 another long range seismic noise impact is noted. The whales increased their call rate after the seismic noise stopped, and whales were 110 km (66 miles) away from the seismic boat. Here is an impact at 66 miles. Why isn't this mentioned in the DEIS?

16c) On page 47 of the Integration and Summary section of Reference 10 the "principal finding" is noted as being that no bowheads were seen closer than 9.5 km (6 miles) and few within 15 km (9 miles) of the drilling operation. Why isn't this mentioned in the DEIS?

16d) On pages 41-43 of the Integration and Summary section of Reference 10 is described the path of a bowhead whale that was followed for 6.8 hours as it was

deflected around the Hammerhead drill site. The whale kept about 23 km (12 miles) between itself and the Hammerhead drilling site as it was deflected around the noisy site. This deflection is also depicted in Figure 32 which is on page 111 of the Behavior Observations section of Reference 10. Why isn't this mentioned in the DEIS? NSB-21

16e) Regarding comments 4, 7, and 10-13 above and regarding seismic noise, there is excellent information in Reference 9 which is not cited in the DEIS. Reference 9 documents seismic noise of 120 dB (pages 172-173 and 208) at 114 km (about 68 miles) from the ship and 120 dB (pages 149-150 and 208) at 127 km (about 76 miles) from the ship. Why doesn't the DEIS include such data?

There is also "long distance" information regarding seismic noise on page 109 of the Behavior Observations section of Reference 10. In this instance measured received levels were 112-127 dB at distances of 120-135 km (72-81 miles) from the seismic vessel.

17. Very good basic information on the acoustic characteristics of a drilling platform, seismic boats, and icebreakers is in Reference 9. That 1994 report by Hall et al. describes 1993 drilling activities at ARCO's Kuvlum exploration area. NSB-22

- Information on source levels for the drilling platform (Kulluk), icebreakers, and seismic boats is well presented in several places in Reference 9 including pages 120-190 and 208-210.

- Measured received levels of working seismic boats are presented in Reference 9, such as on pages 172-173 and 193-195.

- Reference 9 also documents the long distances over which seismic noise can be heard with received levels of 120 dB (pp 149-150 and 208) at 127 km (about 76 miles) and 120 dB (pp 172-173 and 208) at 114 km (about 68 miles).

- Regarding long distance noise impacts, Reference 9 also notes (pp 210-21) that ambient noise measurements at 110-120 km (about 70 miles) from the drill site were contaminated by noise from the drill site.

- Reference 9 concludes (p 211) by saying that a drilling project similar to Kuvlum 1993 will ensonify the nearshore Beaufort waters from Harrison Bay to the U.S.-Canadian border. Why doesn't the DEIS include some of this information?

18. Very good basic information on distribution of bowhead whales and beluga whales around ARCO'S August-September 1992 drilling at their Kuvlum #1 site is presented in Reference 5. NSB-23

- Reference 5 clearly shows a displacement of beluga and bowhead whales around the site of drilling and ice-breaking.

- Call rates of beluga and bowheads were impacted at great distances as noted on pages 3 and 67 of Reference 5. Bowhead call rate peaked at 32 km (19 miles) and beluga call rate peaked at 100 km (60 miles) from the industrial activity.

- The mean closest observed position of belugas was 78 km (47 miles) and of bowheads was 40 km (24 miles) as noted on pages 3 and 33-35 of Reference 5.

- Reference 5 (page 68) suggests that "bowhead whales increased their calling rates as they approached the Kuvlum #1 location in order to maintain social spacing and group coordination until they had determined the nature of the sound sources and a travel course that would take them around the project location."

- Reference 5 (page 68) also states that "_ _ _ sightings from the aerial surveys suggested that the whales were moving to the north in arc around the Kuvlum #1 industrial activity." Why isn't some of the impact information from Reference 5 included in the DEIS?

19. Reference 16 is an MMS sponsored report on bowhead response to seismic exploration noise, however this report does not seem to be mentioned in the DEIS text and is not listed in the DEIS Bibliography and Reference sections. While Reference 16 has many technical problems, one of the things that it documents is a long range impact due to seismic vessels. Reference 16 reports a group of 20 bowhead whales responding to the noise of an operating seismic boat that is reported as being 135 or 155 km (about 81-93 miles) away (see page 25 and the 2 unnumbered pages in Appendix II pertaining to flight on September 24, 1982). NSB-24

Why isn't this long range seismic noise impact (about 90 miles) reported in the DEIS?

20. Reference 12 is another MMS sponsored report on bowhead responses to seismic exploration noise. Its data were later presented to the Scientific Committee of the International Whaling Commission (IWC) as Reference 11 and then published as Reference 13. None of these (References 11, 12, 13) seem to be specifically mentioned in the DEIS text and they are not listed in the DEIS Bibliography and References sections. Data from the basic study (Reference 12) seem to be major contributors to the MMS held view that 7.5 km is the more or less impact "dividing line" between bowheads and operating seismic vessels. NSB-25

If MMS (or anyone) goes back to the original data presented in Reference 12 you can see that there were four "experiments" to examine interaction between bowheads and seismic vessels. If one looks at the data you can see that <u>there were no "control" periods</u>, that is, there was no quiet period <u>before</u> an experimental (noisy) period. In fact in two of the four "experiments" the study ship's airguns were firing at the outset of the study, and in the other two "experiments" other operating seismic boats were making noise. In other words the "tested" whales were already being exposed to seismic noise before the "experiments" began. This may seem hard to believe, but read it for yourself in Reference 12.

Data from these four "experiments" were also presented to the IWC Scientific Committee (see Reference 11) and were criticized. The IWC sub committee that reviewed the data recommended that additional research be undertaken and that "_ _ _ the 1984 experimental results be subjected to rigorous reanalysis _ _ _." See comments by the IWC sub committee on page 116 of Reference 17.

In Reference 13 (page 184) one of two objectives is stated as being "to determine at what distance from an active vessel subtle, partial and total avoidance behaviors or other manifestations of disturbance were likely to be displayed". Such an objective is good, however the study was flawed because "_ _ _ it was assumed that overt behavior responses would not occur until the vessel had closed to approximately 10 km" (see page 185 of Reference 13). This "mind set" continued with the statement "Therefore 10 km was selected as the range beyond which behavioral responses would be negligible _ _ _?" (see page 185 of Reference 13). How could this be a valid impact assessment study when seismic noise more than 10 km away was regarded as non impacting?

21. Reference 6 (pages 27-29) also describes what seems to be another "long range" impact of a seismic vessel on a group of bowhead whales. In this instance with the approaching ship from 19-13 km (11-8 miles) away, the group of bowheads "_ _ _ first moved roughly away from the approaching vessel, and then turned and moved partly contrary to and partly away from its track." NSB-26

This report (Reference 6) does not seem to be mentioned in the DEIS text and is not listed in the DEIS Bibliography and References sections.

22. The DEIS (such as on pages IV-B-37 to IV-B-40) seems to downplay potential effects on bowhead whales of contact with spilled oil. The very brief mention, of oil possibly adhering to rough areas on the skin and the possible clumping of baleen filaments and NSB-27

ingested oil to form a gastrointestinal obstruction, is inadequate. In neither instance is any background information provided. NSB-27

The "rough areas" on bowhead whale skin do exist, with dozens to hundreds on each harvested bowhead examined by North Slope Borough personnel. While the cause of these rough areas is unknown, they do present very high surface area "spots" on the skin surface. These rough areas are variable in size and shape, often being 1-2 inches in diameter and 1-3 mm deep with numerous "hairlike projections" extending upward 1-3 mm from the depths of the damaged skin surface. Within the roughened areas is a high concentration of bacteria (as compared to the "normal" smooth skin surface), some of which are potential pathogens. As you know, we feel that oil adhering to these areas may further erode the damaged skin and allow these bacteria to gain entry to the numerous blood vessels just below.

These rough areas of bowhead skin were long ago noted as being possible sites of oil adherence (Reference 4) and a laboratory study using preserved bowhead whale skin showed that oil would adhere to the rough areas (Reference 7, pages 551-552). The structure of bowhead skin has been characterized (Reference 8) and the presence of large numbers of potentially pathogenic bacteria in the roughened areas of skin has been documented (Reference 20).

The presence in the stomach of many broken off baleen filaments is a common finding in harvested bowhead whales examined by North Slope Borough personnel. Also frequently seen on baleen plates are baleen filaments that are tangled into "ball like" structures (1-4 cm by 3-10 mm), while still attached to the baleen plates. These filament "tangles" would likely be sites of oil adherence and when dislodged would probably be swallowed with prey items as are so many other dislodged filaments.

As has been suggested (Reference 4) the dislodged and swallowed filaments may combine with ingested oil (especially the somewhat solidified oily components such as "tar balls") to form a ball like mass that is too large to pass through the narrow third section of the four sections (chambers) of the bowhead stomach. This narrow connecting channel as usually seen is about 1-2 inches in diameter and is described in Reference 21.

In view of information such as presented here we feel that contact with spilled oil poses a major threat to bowhead whales.

23. Stipulation #5 (Subsistence Whaling and Other Subsistence Activities) as mentioned on DEIS pages II-5 and II-6 is stated as also being a mitigating measure (last para., page II-3). While the wording used seems good "_ _ _ operations shall be conducted in a manner that minimizes any potential for conflict between the oil and gas industry and subsistence activities _ _ _" our experience has been that there has been much interference in the past. NSB-28

The stipulation also states that "_ _ _ the lessee shall contact the potentially affected communities _ _ _ to discuss potential conflicts _ _ _". In the past there has been "consultation", however, our words and requests have counted for little, as the activities have gone on and the interference continued. NSB-28

If this stipulation is to be of any real use, there must be some "teeth" in it. In order for us to have any confidence there must be a provision to assure that industry does more than just "consult" with villages, the Borough, and the AEWC. What is the mechanism that MMS proposes to resolve differences between what industry wants to do and what local people do not want done? As an example, how will differences regarding seismic exploration (area and timing) be resolved?

References

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3. Ahmaogak, G. 1995. Concerns of Eskimo people regarding oil and gas exploration and development in the United States Arctic. Presented at the Workshop on Technologies and Experience of Arctic Oil and Gas Operations, held April 10-12 1995 in Girdwood, Alaska. The workshop was sponsored by various U.S. and Russian government agencies and groups. The workshop provided an opportunity for U.S. and Russian personnel to discuss the technologies and methods they use to ensure environmentally responsible oil and gas extraction and transportation in the Arctic.

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5. Brewer, K., M. Gallagher, P. Regos, P. Isert, and J. Hall. 1993. Kuvlum #1 Exploration Prospect Site Specific Monitoring Program. 80 pp. Report to ARCO Alaska, Inc.,

P.O. Box 100360, Anchorage, AK 99510 from Coastal and Offshore Pacific Corporation, P.O. Box 31554, Walnut Creek, CA 94598.

6. Fraker, M., D. Ljungblad, W. Richardson, and D. Van Schoik. 1985. Bowhead Whale Behavior In Relation To Seismic Exploration, Alaskan Beaufort Sea, Autumn 1981. 40 pages. Report (MMS 85-0077) to Minerals Management Service, 12203 Sunrise Valley Drive, Reston, VA 22091 from LGL Ecological Research Associates, Inc., 1410 Cavitt St., Bryan, TX 77801 and Naval Ocean Systems Center (code 5141), San Diego, CA 92152.

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8. Haldiman, J., W. Henk, R. Henry, T. Albert, Y. Abdelbaki, and D. Duffield. 1985. Epidermal and papillary dermal characteristics of the bowhead whale, Balaena mysticetus. Anatomical Record 211: 391-402.

9. Hall, J., M. Gallagher, K. Brewer, P. Regos, and P. Isert. 1994. 1993 Kuvlum Exploration Area Site Specific Monitoring Program. 219 pp. Report to ARCO Alaska, Inc., P.O. Box 100360, Anchorage, AK 99510 from Coastal and Offshore Pacific Corporation, P.O. Box 31554, Walnut Creek, CA 94598.

10. LGL Environmental Research Associates, Ltd. and Greeneridge Sciences Inc. 1987. Responses Of Bowhead Whales To An Offshore Drilling Operation In The Alaskan Beaufort Sea, Autumn 1986. 371 pages. Report submitted to Shell Western E&P Inc., 601 West Fifth Avenue, Anchorage, AK 99501. (This is often referred to as the "SWEPI report".)

11. Ljungblad, D., 1986. Observations On The Behavior Of Bowhead Whales (Balaena mysticetus) In The Presence Of Operating Seismic Exploration Vessels In The Alaskan Beaufort Sea. 78 pages. Paper SC/38/PS1 presented to Scientific Committee of International Whaling Commission at its 1986 meeting.

12. Ljungblad, D., B. Wursig, S. Swartz, and J. Keene. 1985. Observations On The Behavior Of Bowhead Whales (Balaena mysticetus) In The Presence Of Operating Seismic Exploration Vessels In The Alaskan Beaufort Sea. 78 pages. Report to Minerals Management Service, Alaska OCS Region, P.O. Box 101159, Anchorage, AK

99510 from SEACO Inc., 2845-D Nimitz Blvd., San Diego, CA 92106. (Note that References 11, 12, 13 are basically the same data. Reference 12 is the "original" document.)

13. Ljungblad, D., B. Wursig, S. Swartz, and J. Keene. 1986. Observations on the behavioral responses of bowhead whales (Balaena mysticetus) to active geophysical vessels in the Alaskan Beaufort Sea. Arctic 41: 183-194.

14. Miles, P., C. Malme, W. Richardson. 1987. Prediction Of Drilling Site-Specific Interaction Of Industrial Acoustic Stimuli And Endangered Whales In The Alaskan Beaufort Sea. 341 pp. Report to Minerals Management Service, Alaska OCS Region, Anchorage, AK from BBN Laboratories Inc., 10 Mouton St., Cambridge, MA 02238 and LGL Ltd. Environmental Research Associates, 22 Fisher St., King City, Ontario, Canada L0G 1K0.

15. North Slope Borough Science Advisory Committee. 1987. A Review of the Report "Importance Of The Eastern Alaskan Beaufort Sea To Feeding Bowhead Whales, 1985-86". 53 pages. Report to Mayor of the North Slope Borough, Box 69, Barrow, AK 99723 from North Slope Borough Science Advisory Committee.

16. Reeves, R., D. Ljungblad, and J. Clarke. 1983. Report on Studies to Monitor the Interaction Between Offshore Geophysical Exploration Activities and Bowhead Whales In the Alaskan Beaufort Sea, Fall 1982. 38 pp. (plus 70 unnumbered pages of Tables, Figures and Appendices). Report to Minerals Management Service, Alaska OCS Region, Anchorage, AK from Hubbs-Sea World Research Institute, 1700 South Shores Road, San Diego, CA 92109 and Naval Ocean Systems Center (code 5131), San Diego, CA 92152.

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18. Report of the Scientific Committee. 1995. Report of the International Whaling Commission. 45. (See page 145 regarding bowhead population size and page 149 for rate of increase).

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NSB-01
All of the comments received from the NSB have been responded to in the text in Section IV.B.6 in the FEIS.

NSB-02
Most of the studies referenced in the NSB comments have been included in the text in Section IV.B.6 in the FEIS.

NSB-03
All of the comments received from the NSB have been responded to, and most of the studies referenced in the NSB comments have been included in the text in Section IV.B.6 in the FEIS.

NSB-04
The NSB's concerns about noise interference are addressed, and additional information regarding distances at which whales may respond to seismic noise are included in the text in Section IV.B.6 in the FEIS.

NSB-05
In the FEIS, the stipulations dealing with bowhead whale monitoring, subsistence whaling, and other subsistence activities have been rewritten from the DEIS. In Stipulations No. 4 and No. 5, the role of various North Slope communities and organizations in the review and formulation of monitoring plans as well as exploration plans has been expanded.

NSB-06
There was no attempt to "downplay" potential impacts to bowhead whales due to noise and contact with spilled oil. Section IV.B.6 of the FEIS has been expanded to include more detailed information on potential impacts from noise and spilled oil. More references have been added and in many cases, a range of distances at which bowheads have reacted to noise rather than just the distance at which most bowheads react has been added.

NSB-07
There was no attempt to "downplay" impacts on the subsistence bowhead whale hunt. In fact, the level of effect for subsistence in the base case in the FEIS has been raised based on the biological analyses that states that bowhead population recovery from oil-spill effects could last up to 3 years. Even a perceived effect to the bowhead whale population by subsistence users could have a consequent impact of the subsistence harvest. Also note that the FEIS now contains a Nuiqsut Deferral Alternative that was proposed to defer the primary subsistence-whaling area of the community of Nuiqsut.

NSB-08
The MMS supports impact assistance to States and localities that have incurred costs greater than their share of the national benefits of offshore energy development. There are a number of issues that must be resolved before the Administration can back any particular bill including how amounts would be calculated, how they would be distributed among States and/or localities, and what the effect would be on the U.S. Treasury. The MMS cannot implement impact assistance without approval from Congress.

NSB-09
Distances referenced in the DEIS are general distances at which most bowheads are expected to react to a particular stimuli and were not intended to be all inclusive. Obviously, some whales will react at much greater distances and some react at shorter distances than others. A broader range of distances at which bowheads may react to a particular stimuli has been entered into the text in section IV.B.6.

NSB-10
An example of small deflection would be the whales in the study by Fraker (1985), where the net movement was about 3 km. An example of a larger deflection would be the whales in the study by Koski and Johnson (1987) that passed by the drilling operations 10 to 15 km to the north and to the south and the single observed whale that apparently adjusted its course to maintain a distance of 23 to 27 km from the center of the drilling operations. The study concluded that there was no evidence that the drilling operation either acted as a barrier to the migration or

delayed the migration. The study also concluded that the offshore drilling apparently did not interfere with the 1986 subsistence-whale hunt, based on the success of the hunt that year.

NSB-11
Additional information has been added to the text in Section IV.B.6 in the FEIS.

NSB-12
Additional information has been added to the text in Section IV.B.6 in the FEIS.

NSB-13
Equipment used to conduct high-resolution seismic surveys/shallow-hazard seismic surveys include side-scan sonar, sub-bottom profiler, boomers, sparkers, gas exploders, water guns, air guns, etc. The energy level of many of these are from one to three orders of magnitude less than for some of the equipment used in deep-seismic surveys. For example, a 2000 in^3 airgun used in deep-seismic surveys has approximately $2x10^6$ foot-pounds of energy compared to an 80 in^3 airgun that likely would be the largest that may be used in high-resolution seismic surveys, which has approximately $9x10^4$ foot-pounds of energy. Boomers, sparkers, and gas exploders range from about $8x10^2$ to $9x10^4$ foot-pounds of energy. The majority of equipment used in these surveys have less than $5x10^3$ foot-pounds of energy. For additional comparison, the 2000 in^3 airgun has an energy equivalent of slightly more than 1 pound of 60 percent dynamite at 30 foot depth, while the 80 in^3 airgun has energy equivalent of .06 pound of 60 percent dynamite at 30 foot depth. The source for this information is Applied Geophysics published in 1976.

NSB-14
The BBN study by Miles, Malme, and Richardson (1987) is the reference used for icebreaker information. The text in Section IV.B.6 in the FEIS has been expanded to provide more information on icebreakers and potential effects on bowhead whales. The portion of the table presented on page 317 of Miles, Malme, and Richardson (1987) is the estimated range at which noise levels would be received if the icebreaker *Robert Lemeur* were conducting activities at the Corona location. The estimated range at which noise from an icebreaker pushing ice would be received at a 20 dB S:N ratio (using 250 Hz and East/West distance values) is 42 km. This exceeds the maximum range at which the propagation model is believed to be reasonably reliable, which is 30 km. The value of the 42-km figure isn't clear considering that it falls outside the reliability range of the model. The estimated range at which noise from an icebreaker pushing ice would be received at a 30 dB S:N ratio (using 250 Hz and East/West distance values) is 18 km, which is within the maximum range at which the propagation model is believed to be reasonably reliable. This 18-km distance falls within the 4.6- to 20-km distance listed in the text.

NSB-15
Information from Richardson et al. (1995), which discusses acoustic effects in the lead system during the spring migration, has been added to the text in Section IV.B.6 of the FEIS. It also should be noted that NMFS, in the Arctic Region Biological Opinion, concluded that leasing and exploration activities are not likely to jeopardize the continued existence of the bowhead whale. The conclusion is based on the assumption that exploratory activities will not occur in the spring lead system during the bowhead migration. A proposal to conduct exploratory activities in the spring lead system during the migration would require reinitiation of consultation with NMFS.

NSB- 16
Additional information has been added to the text of Section IV.B.6 in the FEIS. A detailed discussion on spilled oil and clean-up technology can be found in Section IV.A.3.

NSB-17
The mitigating measures are effective to the extent that they may provide additional protection to whales but will not eliminate all potential effects. The stipulation on the Industry Site-Specific Bowhead Whale Monitoring Program would provide information on the presence of whales in the vicinity of the leases during exploratory drilling operations and on the effects of those activities on the behavior of bowheads. It also provides protection to whales from serious, irreparable, or immediate harm such as a blockage or delay of the migration due to exploratory activities. It does not prevent or prohibit activities that may cause whales to slightly change their course to divert around the activities. The ITL's advise lessees of areas/situations where they need to exercise caution, adhere to guidelines, provide protective measures, etc., all of which provide some degree of additional protection to bowhead whales. While fewer whales may be affected by activities due to these measures or affected to a lesser extent, the overall effects on bowheads are likely to be little different than if the measures were not in place. Whales are still expected to experience primarily temporary, sublethal effects as a result of exposure to oil and gas activities, with potential for some mortality if whales are exposed to freshly spilled oil over a prolonged period.

The stipulation on Industry Site-Specific Bowhead Whale Monitoring Program pertains only to exploratory drilling operations. However, all OCS oil and gas activities, including geophysical activities, are subject to NMFS incidental take regulations for marine mammals. The NMFS final rule dated July 18, 1990, states that "A take was requested incidental to exploration activities that would include geological and geophysical surveys, drilling of stratigraphic test wells, exploratory drilling for oil and gas, and associated support activities." The final rule authorized an incidental nonlethal take of six species of marine mammals in the Beaufort and Chukchi Seas from 1990-1995 by individuals who are conducting prelease and postlease oil and gas exploratory activities. That final rule has expired, and there are currently no valid regulations governing the incidental take of these marine mammals. The final rule for the next 5-year period has not been published yet, but presumably will be similar in terms of activities covered as the previous rule.

In the proposed rule concerning incidental taking of marine mammals published May 31, 1995, the NMFS proposes to require applicants to monitor the impact of their activity on marine mammals and to submit monitoring plans for all applications for incidental harassment authorizations. The NMFS will require peer review of proposed monitoring plans or other research proposals where the proposed activity may affect the availability of a species or stock for taking for subsistence uses. The NMFS would establish an independent peer-review panel and schedule a workshop for the peer-review process. Panelists would be selected by NMFS, in consultation with the Marine Mammal Commission, the Alaska Eskimo Whaling Commission, and/or other Alaskan native organizations, as appropriate. The NMFS would require the applicant to submit a draft plan no later than 120 days prior to the date an incidental harassment authorization is expected to be issued. It is uncertain when the final rule will be published.

NSB-18
Additional information has been added to the text in Section IV.B.6 in the FEIS.

NSB-19
The text of Section III.B.5 in the FEIS has been updated to reflect the new population estimate. The rate of population growth of approximately 3 percent/year already is present in the text in Section III.B.5 in the FEIS.

NSB-20
The Science Advisory Committee report has been cited in the discussion about the feeding study in Section IV.B.6 in the FEIS.

NSB-21
It should be noted that the reference in part b of this comment pertains to only one whale, and the whale also was in close proximity to an active drilling operation. It also should be noted that few, if any, calls were recorded during the 2 hours prior to startup of the seismic activity. It isn't clear whether the increase in call rate was related to cessation of the seismic activity, the presence of an active drilling operation, the combination of the seismic activity and the drilling activity, or some other factor. Additional information has been added to the text in Section IV.B.6 in the FEIS.

NSB-22
Additional information has been added to the text of Section IV.B.6 in the FEIS. Although this specific reference is not included, there are other references that provide similar information.

NSB-23
Additional information has been added to the text of Section IV.B.6 in the FEIS.

NSB-24
Additional information has been added to the text of Section IV.B.6 in the FEIS. Although this specific reference is not included, there are other references that provide similar information.

NSB-25
Additional information has been added to the text of Section IV.B.6 in the FEIS.

NSB-26
Additional information has been added to the text of Section IV.B.6 in the FEIS.

NSB-27
Additional information has been added to the text of Section IV.B.6 in the FEIS.

NSB-28
In the FEIS, the stipulations dealing with bowhead whale monitoring, subsistence whaling, and other subsistence activities have been rewritten from the DEIS. In Stipulations No. 4 and No. 5, the role of various North Slope communities and organizations in the review and formulation of monitoring plans as well as exploration plans has been expanded.

2051 Barter Avenue
P.O. Box 27
Kaktovik, Alaska 99747

City of Kaktovik
Office of the Mayor

(907) 640-6313
(907) 640-6315
Fax (907) 640-6314

Ms. Judith C. Gottlieb
Regional Director
Mineral Management Service
Anchorage, Alaska

Dear Ms. Gottlieb,

I am enclosing herewith the response of the City of Kaktovik to the Draft EIS for the Beaufort Sea Planning Area Oil and Gas Lease Sale 144.

I have reviewed with Dr. Francis the substance of your talks with him and with Mr. Richardson. We are grateful for your kind efforts to work with us in the pursuit of our perhaps different goals with respect to OCS oil and gas exploration and development in the Beaufort Sea.

What we share is this:

1. A commitment to minimal and acceptable environmental and social impact.
2. A commitment to an orderly and effective regulatory environment, and
3. A commitment to work together towards these goals.

So that we can better present to you a coherent and professional interface and to facilitate and ease your work, I have asked Dr. Francis to work closely with you. It is his job to bring together the diverse views of our citizens on this matter, to inform us and to offer you that coherent interface.

KAK-01

In the future we hope to establish the Kaktovik Impact Office mentioned in our documents on this matter. We urge you to read carefully those documents and to respect the position there represented. In these documents we propose that anyone who expects to work here share the cost of this Kaktovik Impact Office. We ask that you follow the precedent in present ANWR legislation to fund our work through this office from lease sale money. Our first step towards that objective was to ask Dr. Francis to serve as the interim interface between the City and such agencies as MMS. We think this will help you and it will surely help us to minimize the impacts of all those forces bearing on us even now.

You are, of course, free to contact my office directly should you feel the need. I would ask you, however, to coordinate all your work here very carefully with us so that the people of Kaktovik are sheltered from the overbearing effects of interest in their country while given the chance and the power to protect their interests here.

We are committed to a good working relationship with you and all Interior agencies.

Yours respectfully,
Lon Sonsalla
Lon Sonsalla, Mayor

RECEIVED
NOV 27 1995
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

We offer that plan, IN THIS PLACE: An Operational Guide for Those Wishing to Work in the Country of the Kaktovikmiut to everyone who comes here with a scheme. We offered it to MMS, twice now, and we offered it to Deputy Secretary of Interior John Garamendi and to Special Assistant to the Secretary for Alaska Deborah Williams. All promised to read it and to heed it. And yet we see no evidence that anyone has done so. Modest as this document may appear, it was a serious effort on our part, and we hoped it would be of some help to people wanting to work here.

KAK-01

At the center of it is our proposal that there be established and funded by those wishing to work here a Kaktovik Impact Office. In its design we borrowed from successful experience around the world and drew on our own experiences here. We are confident it will work and that it will serve not only our purposes but also the purposes of any outsidersw proposing to work here. Properly executed it would preclude such problems as those we see in OCS EIS/EA. MMS 95-0043, and were in put in place now, as late as it is, we believe it might still remedy those problems. We have proven ourselves diligent and responsible, and we can do this thing given the chance.

For now, without such an office and such capacity to protect our lands, waters and the future of our people here, we have no other choice but to suggest you go to the last two paragraphs of the section of IN THIS PLACE we have called "Mind of the Kaktovikmiut" and read it. [We enclose as part of this response yet another copy of these documents, with the hope that they may yet have the effect we intend.] For now, since we do not yet see the good faith response to our offer, we must ask you to take your schemes and to leave.

That is our response to the draft EIS; we see it to be pitifully insufficient and dangerous to us and to our traditional lands and waters. If you really do want to work here, then we urge you to read carefully what we have suggested and to give us your response. As others have discovered, it is not hard to work here, but you can not work around us. We are here, and we count...we think for much more than any of the schemes set upon us. However, enlist us to your purposes and we would be glad to join with you to see that whatever reasonable things you propose are done and done properly.

On another front we have been working diligently with the Congress of the United States to see that our interests are protected with respect to on-shore oil and gas exploration and development, which we see to be far less dangerous because of the proven technologies and strict regulatory environment in which these actions would be taken. And so we are concerned and well aware of the charges, restraints and threats under which such agencies as MSS are currently working. Our position, one we are urging of the Congress and one we believe we can help assure, is that these regulatory agencies be preserved and their work made more effective. In the end it is good work that will count and it is good work that will survive. We would be pleased to join with interior Departments agencies to see to it.

Work with us and not against us, and we shall all be better off for it.

Lon Sonsalla, Mayor
Lon Sonsalla

CITY OF KAKTOVIK
RESPONSE TO DRAFT EIS
BEAUFORT SEA PLANNING AREA
OIL AND GAS LEASE SALE 144

The central point of this response is to make our strongest protest that this proposed action within the traditional homelands and waters of the Kaktovikmiut appears to be ill-conceived and dangerous to our people, to the resources on which we depend for life as we know it and to the values on which our culture and identity depend. Moreover, we firmly believe and declare that our lives, these traditional lands and waters by which we survive and take our identity, our culture and our continued presence and well-being here gave far more value to all people than does any other consideration. We urge that these things not be put at risk as the casual and superficial manner by which these matters are treated in this document suggest.

We state further that while we have no proper and professional capacity to evaluate this document nor the data on which its conclusions are based, we never-the-less find in it sufficient and significant errors, inconsistencies and oversights to suggest to us that the document can not be used as it stands for the purpose it purports to serve, ie., to assess the environmental and social impact of these several scenarios of oil and gas exploration and development. In short, it is faulty and dangerous.

However, we say this with all due respect to the authors of the document, who we believe tried to do their job as best they know how within the terms of reference by which they had to work. We are not dealing with bad of incompetent people but with a faulty system. It is faulty because it presumes that such a document as this can be drawn up outside the area of concern and without real input from the people native to and knowledgeable of this place. It presumes that the requisite public input is but to respond to this faulty document rather than to have real input in its conceptualization, design and execution. We believe otherwise, and we see this document as proof of our position that there needs to be real input from the people native to this place throughout the process and not just at the end of it.

Furthermore, we offer a means by which this problem can be corrected, both in this instance and in the future.

We note with appreciation the openings which have been offered for some degree of real participation, the opportunities, particularly for State and Borough agents, to serve on critical committees and inter-agency teams. The problem is we who are the heart of the matter and best able to help develop proper design and performance criteria lack the resources to do that. It is great to be invited to the party, but it is difficult to come without the bus fare and decent clothing.

And yet we do have that experience, of fully participating in a major project, and when we did that, with the Alaskan Arctic Gas project, it worked beautifully, both for us and for them. It was with that experience in mind and supported by grants from the Alaska Legislature, the Alaska Department of Community and Regional Affairs and the North Slope Borough, that we sat down together several years ago to reach a consensus and to suggest a procedure for anyone with plans to do things here.

KAK-01
The establishment and/or funding of a "Kaktovik Impact Office" is beyond the administrative purview of the MMS. The MMS has neither the funding for such an effort nor the authority to compel industry to fund an "Impact Office." The funding for such an office would have to come either from Congress (or some other governmental entity), private industry sources, or both.

November 21, 1995

United States Department of the Interior
Mineral Management Service
Alaska OCS Region
949 E. 36th Avenue
Anchorage, Alaska 99508-4302

RECEIVED
DEC 4 1995
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Re: Comment on Draft Environmental Impact Statement for Proposed Beaufort Sea OCS Lease Sale 144

To Whom It May Concern:

A brief background to these comments are appropriate. In June 1995 a "first" in the history of the village of Nuiqsut took place. Representatives of the City of Nuiqsut, the Native Village of Nuiqsut and Kuukpik Corporation gathered together to respond to the near certainty that in near future oil and gas exploration and very likely development and production would be occurring in the close proximity to and upon the lands of the Kuukpikmiut ("the people of the Colville"). The assembled group recognized that development in the Colville, along the river and its environs represent both an opportunity and a grave risk. The purpose of the meeting was to seek a common response and to establish a framework in which to review the opportunities and to assess the risks on behalf of all of the people living in Nuiqsut and for those whose ancestral home was along the Colville River.

The outcome of that meeting was the adoption of a document that identifies and emphasizes the core elements of the common heritage of the Kuukpikmiut. Nuiqsut Paisanich: A Cultural Plan provides the people of Nuiqsut with a lens with which to view the changes to the environment, the land and the livelihood of the people, that are inevitable if there is to be oil and gas development in the Colville.

At the June meeting there was no discussion of drilling on the Outer Continental Shelf as proposed by Lease Sale No. 144. The focus of the concerns of the representatives attending the meeting was directed to the on shore plans for continued drilling, and for the construction of production facilities in the Colville on the east side of the Nechelik Channel and, upon proposals for a surface use agreement that would encompass lands on the west side of the channel into NPR-A. As a result of this different focus, the proposed Lease Sale 144 that contemplates off shore exploration, drilling and development for over two hundred miles of the outer continental shelf in the Beaufort Sea, was not discussed. The representatives of the City of Nuiqsut, the Native Village of Nuiqsut and Kuukpik Corporation assembled again during the week of November 13, 1995 to discuss the proposal and to evaluate it.

The result of the second joint meeting is the attached joint resolution in which the assembled group opposes drilling on the outer continental shelf. In the alternative, if there is to be drilling, the assembled group believed that there should be a NUIQSUT deferral area, similar to that for Barter Island in order to protect the traditional Nuiqsut whaling grounds and the subsistence resources on the Colville River Delta. NQ-01

We were disappointed to learn that the MMS did not consider an alternative that would have created a Nuiqsut deferral, in the same manner that a deferral was created for the offshore areas around Kaktovik and now, we understand, for Barrow as well. Although this suggestion was made by Delbert Rexford at an early scoping session there was no follow through. The reason offered is that Mr. Rexford was not a Nuiqsut resident and no one from Nuiqsut repeated his call. The persons at the meeting representing MMS took no notice of the fact that Mr Rexford is the president of the Inupiat Whaling Commission. Mr. Rexford is a distinguished and respected whaling captain, when he speaks in a public forum such as yours, he is not simply speaking for himself but for the interests of other whaling captains, including those of Nuiqsut who, if present, felt them spoken for and for those captains who were not present. A deferral area for the Nuiqsut whaling grounds around Cross Island was an obvious alternative for which the MMS should not have had to have been prodded, you should have suggested it on your own. This failure, along with language that appears to minimize adverse consequences, suggests that the MMS was attempting to justify a foregone conclusion, that there would be a lease and that it would include Nuiqsut subsistence areas and lands.

Our overriding belief is that the report which flatly states that there is a 100% chance of an oil spill and an 85% chance of a major spill, is candid on this point only. The EIS underestimates the magnitudes of both major and catastrophic spills and dramatically underestimates its impact on both our subsistence harvest and upon our society. NQ-02

The oil companies admit that they have no proven technique for drilling in the heavy ice conditions of the Beaufort Sea. The Beaufort Sea with its ice, weather and very small drilling window, poses new risks and possibilities for disaster that have never been encountered, the size and frequency of which cannot be predicted. This offshore development is new. What if there is a blowout that can't be capped, for one reason or another, on account of the ice? Couldn't the magnitude of the disaster be much greater than predicted? Where else has oil development taken place under such extreme conditions? The study makes it clear, there will be spills, but how many and how large can't really be estimated when there is new drilling in severe situations with no proven technology. NQ-03

The people of Nuiqsut are not opposed to oil production. The people have benefited from having a stable source of cash income and there have been important capital projects that could never have taken place without the presence of the oil industry. We have agreed to and participated in oil development on the North Slope many times and in many ways over the years. The development of on shore oil has grown and matured to the point where the technology employed can be considered to be proven. The frequency and risks of spills can be estimated and controlled in ways which are not available to off shore development. The risks of on shore spills NQ-04 are local. They can be geographically contained and in the end, can be cleansed. This is not true off shore, particularly far off shore. The possibility of containment is remote. The effects of a spill off shore will be far more widespread, the report suggests well over two hundred miles of coastline could be impacted. NQ-04

What was particularly chilling about the study was that it presumed a major spill not far from the Colville Delta near the Kuukpikmiut traditional whaling grounds and subsistence area. The impact on the fish stocks would be devastating. Fish make up a very important part of our subsistence resources, it is a dependable source of food while other resources vary from year to year. The study estimates that in the event of a major oil spill around, Oliktok fish stocks would recover in seven years or less. This seems too short a period. Even if this were true for the two hundred plus miles of coastline, it is likely that the effects of an oil spill off Oliktok Point would be more lethal and longer lasting in the Colville Delta than in other places. NQ-05 And while the fish may recover in 7 or 10 or 15 years, a generation of children of Nuiqsut will not learn what they need to know to live as Inupiat. Our culture must be transmitted through every generation, we cannot "skip" a generation. It is true that the availability of various subsistence resources vary in quantity from year to year and, the Inupiat have had to be flexible in harvesting resources, but the prospect of a major oil spill threatens not just one, but many of the subsistence resources. In the case of a major oil spill the impact would be greatest on the most dependable of our resources, fish and birds would be gravely threatened. NQ-06

Whaling is a central fact in the lives of the Inupiat. Oil development in the OCS would have an impact that it is not yet known on the bowheads. The impact of a major oil spill around Oliktok would be worse than the report indicates particularly on the Nuiqsut whalers.

Nuiqsut Paisanich contains the following objectives.

1. Control the pace and magnitude of change to promote stable and beneficial socioeconomic condition in the village.
2. Protect the natural environment and wild resources from adverse effects of industrial and technological activities.
3. Establish the historical/cultural/susbsistence resources and values of the village as major consideration in land use planning, development and operations.
4. Adapt imposed landownership and jurisdiction to the traditional law of free access and use by the homeland people.
5. Perpetuate traditional activities to assure transmission of cultural values to future generations. cultural plan

When the draft environmental impact statement is viewed against these goals, the people of Nuiqsut assembled, conclude that the drilling on the outer continental shelf as proposed by Oil and Gas Lease Sale 144 poses unacceptable risks and should not be pursued. On shore exploration activity should be encouraged instead. In the event that Lease Sale 144 does occur there should be a deferral area created for the traditional whaling area around Cross Island and the primary subsistence area around the Colville Delta. NQ-07

These are the collective comments of over 400 people directly affected by the proposed lease sale.

NATIVE VILLAGE OF NUIQSUT

Thomas Napageak
President Thomas Napageak

Assent:
Frank K. Long Jr.
Secretary

CITY OF NUIQSUT

Gordon Brown
Mayor Gordon Brown

Assent:
Ray Oyagak City Clerk

KUUKPIK CORPORATION

Joseph Nukapigak
Joseph Nukapigak

Assent:
Secretary

A JOINT RESOLUTION OF THE NATIVE VILLAGE OF NUIQSUT, THE CITY OF NUIQSUT AND KUUKPIK CORPORATION IN RESPONSE TO THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR PROPOSED OIL AND GAS LEASE SALE 144

WHEREAS the Native Village of Nuiqsut is the federally recognized tribal government of the Native people of the Village of Nuiqsut and,

WHEREAS, the Native Village of Nuiqsut believes that maintaining the integrity of the Inupiat way of life and culture is one of its core functions and;

WHEREAS the City of Nuiqsut is a second class city, established pursuant to Title 29 of the Alaska Statutes and is dedicated to the public welfare of its residents and.

WHEREAS, Kuukpik Corporation is a village corporation incorporated under the laws of the State of Alaska pursuant to the provisions of the Alaska Native Claims Settlement Act (43 USC §1601 et. seq.) and is the largest surface owner in the Colville River Delta and;

WHEREAS, the United States government is planning to lease for oil and gas exploration and development 9.8 million acres of the Outer Continental Shelf in Lease Sale No. 144 encompassing the off shore area between Kaktovik and Barrow and;

WHEREAS, the proposed area includes Cross Island and the traditional whaling grounds of the Nuiqsut people and;

WHEREAS the Colville Delta is a major fishing area for the Nuiqsut people and provides food and habitat for over 20 species of migrating fish and;

WHEREAS, the Colville Delta is the prime onshore subsistence area for the Nuiqsut people and;

WHEREAS, there is no proven technology for oil drilling in the ice-pack conditions as they exist in the Beaufort Sea and;

WHEREAS, the Minerals Management Service has prepared a draft Environmental Impact Statement ("draft EIS") that explores the effects of oil exploration and development and the impacts of oil spills and;

WHEREAS, the draft EIS regards the likelihood of some oil spills as 100% likely and a major spill as 85% likely and;

WHEREAS, the Native Village of Nuiqsut, the City of Nuiqsut and Kuukpik Corporation all believe that the draft EIS understates the impact a spill would have on the Native people of Nuiqsut and;

WHEREAS, the Minerals Management Service is considering deferring areas around Kaktovik and possibly Barrow from the lease area in order to minimize impacts;

WHEREAS, the Native Village of Nuiqsut strongly believes that a deferral area around the Colville Delta and Nuiqsut whaling grounds is necessary to safeguard the traditional activities around which Inupiat culture is centered;

NOW THEREFORE BE IT RESOLVED that the Native Village of Nuiqsut, the City of Nuiqsut, and Kuukpik Corporation have jointly passed this resolution to oppose Lease Sale 144. The grounds for this opposition is that drilling on the Outer Continental Shelf of the Beaufort Sea poses new risks and a much greater threat to the environment, wildlife and subsistence resources than any other type of existing oil drilling or production.

BE IT FURTHER RESOLVED that in the alternative, if in spite of the considered judgment of the assembled group, Oil and Gas Lease Sale 144 goes forward, a new deferral area be created for the Colville Delta and the Nuiqsut whaling area around Cross Island of a size adequate to protect the traditional use of these areas for subsistence activities.

BE IT FINALLY RESOLVED; that we write to the Minerals Management Service and inform it of the position of the Native Village of Nuiqsut on Lease Sale 144 and provide it with reasons therefore in greater detail and request the inclusion of a Nuiqsut deferral area within the proposed lease sale.

DATED this 13th day of November, 1995.

NATIVE VILLAGE OF NUIQSUT

Thomas Napageak
President Thomas Napageak

Assent:

Secretary

CITY OF NUIQSUT

Gordon Brown
Mayor Gordon Brown

Assent

City Clerk

KUUKPIK CORPORATION

Joseph Nukapigak

Assent:

Secretary

NUIQSUT JOINT RESOLUTION
NOVEMBER 13, 1995
PAGE 3

NQ-01
Alternative IV, the Nuiqsut Deferral Alternative, has be added to the FEIS and subjected to an environmental analysis equal to other alternatives to the proposed action.

NQ-02
The DEIS states that there is a 100-percent chance of small spills occurring during production. These small spills should average between 5 and 160 bbl. In the base case, it is estimated that there is an 88-percent chance of a spill ≥1,000 bbl occurring, and two spills are estimated. We believe that the analysis within the FEIS adequately analyzes the potential effects of the proposed action. The MMS staff reviewed the results of the oil-spill model and incorporated those findings into their analyses of effects.

NQ-03
The development of strategies and technologies to exploit resources in areas with extreme environmental conditions is, and has been, an evolutionary process. Historical oceanographic, sea ice, and meteorological data are used to predict conditions that might be expected during the operating life of a project; these conditions also include events that occur infrequently such as once every 25 or 100 years. The environmental conditions are used to develop strategies and design facilities to operate in any environment. For the most part, the design of new facilities is based on concepts that have been used to safely and efficiently produce oil in other areas. In the Alaskan Beaufort Sea exploration for offshore petroleum resources has progressed from the shallow, nearshore environment to deeper waters. Natural islands, manmade gravel and ice islands have been used in waters up to about 60 m deeps. Mobile bottomfounded drilling units, such as the Concrete Island Drilling System (CIDS) and the Single Steel Drilling Caisson (SSDC), have been used in waters up to 25 m deep. Except for the manmade ice islands, these structures could be used year-round. With Icebreaker assistance, floating vessels, such as ice-strengthened drillships or the Conical Drilling Unit (CDU), are capable of operating in limited sea-ice conditions; drillships can be used in waters as deep as 300 m and the CDU in waters as deep as 180 m.

From 1956 through 1990, there were approximately 180 blowouts associated with exploration or production operations (Tacey, 1992). About 80 percent of the blowouts were gas blowouts, and no oil was spilled into the marine environment. The amount of oil spilled into the environment from oil and gas and oil blowouts ranged from < 1 to 53,000 bbl. A blowout is more likely to be a gas blowout than an oil blowout. If there is an oil or gas and oil blowout, the amount of oil that might be spilled is more likely to be less than the 30,000-bbl amount assumed for analysis in Section IV of EIS than greater.

About 55 percent of the blowouts lasted 1 day or less; only about 10 percent of the blowouts lasted for more than a month. Relief wells had to be drilled for only about 5 percent of the blowouts. Most of the wells stopped flowing naturally or were brought under control by pumping mud and/or cement down the well, by well-control equipment, or some combination of the above.

As noted Section IV.A.2 of the EIS, the historical oil-spill rate has been used to estimate the number of oil spills that might occur for Sale 144 oil exploration, development and production, and transportation.

NQ-04
Please see the response to Comment AEWC-05.

NQ-05
The comment is that the effects of an oil spill in an arctic river delta are likely to persist longer than 7 years. It is true that if oil became buried in deltaic sediment, it would persist much longer than 7 years. For perhaps twice that long, the oil would affect the organisms that live primarily on or in the sediments—effects that are assessed in the section on lower trophic-level organisms. However, the effects on the pelagic organisms, including the fish, probably would not last that long. All of the fish year-classes that were present during a spill and the following winter probably would be affected; but the annual spring discharge probably would flush most of the contaminated water out of the delta, so subsequent year-classes would not be affected.

NQ-06
The MMS agrees that a major oil spill off the Colville Delta would produce major effects to Nuiqsut's subsistence harvests of fish, but we also acknowledge the probability of an oil-spill event ≥1,000 bbl occurring. One effort at mitigating effects to Nuiqsut's subsistence hunts from such an event as well as from base- and high-case oil-spill impacts was to introduce the Nuiqsut Deferral as an alternative in the Sale 144 FEIS. This alternative would defer primarily Nuiqsut's traditional subsistence-bowhead whaling area from oil-industry activity. The OSRA probabilities for the Nuiqsut Deferral Alternative indicate a 45-percent chance of one or more spills ≥ 1,000 bbl occurring and contacting Subsistence Resource Area C within 30 days during the winter and open-water seasons and a 51-percent chance within 180 days. This represents a 23-percent reduction from current base-case 30-day probabilities and a 22-percent reduction from current base-case 180-day probabilities.

NQ-07
Alternative IV, the Nuiqsut Deferral Alternative, has be added to the FEIS and subjected to an environmental analysis equal to other alternatives to the proposed action.

Alaska Eskimo Whaling Commission

P.O. Box 570 • Barrow, Alaska 99723 • Phone: (907) 852-2392

November 17, 1995

RECEIVED
DEC 1995
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Ms. Judith Gottlieb
Alaska Regional Director
Alaska OCS Region
949 E. 36th Avenue Rm. 603
Anchorage, AK. 99508

Dear Ms. Gottlieb:

The purpose of this letter is to provide comments on behalf of the Alaska Eskimo Whaling Commission (AEWC) on the Draft Environmental Impact Statement (DEIS) for the Beaufort Sea Planning Area Oil and Gas Lease Sale 144.

AEWC-01

The AEWC joins in the comments submitted by the North Slope Borough on the defects in the DEIS. The AEWC is particularly concerned with MMS' failure to include many of the past comments made by North Slope residents, including many whaling captains, on the impacts of OCS operations on bowhead whales, the bowhead migration and the traditional bowhead subsistence hunt. In addition, MMS has chosen to ignore studies showing adverse bowhead whale responses to industrial noise during the fall migration. Finally, several of the mitigation measures contained in the DEIS fall far short of what is necessary in order for our communities to have any reasonable expectation that activities under this lease sale can co-exist with our subsistence hunting.

Our subsistence whaling captains strongly object to the current proposal for mitigation measures related to site-specific monitoring, consultation with affected communities and oil spill containment and clean-up.

AEWC-02

Monitoring Plans Must Be Required for Any Activity that Could Affect Marine Mammals or Interfere with Subsistence Whaling

The DEIS recommends site-specific monitoring only in the area of the "drill site." However, some of the most severe noise impacts from exploration activities come from seismic work, which is not necessarily limited to the area of the drill site. Therefore, impacts from these activities will not be picked up by the monitoring plans required under this mitigation measure. Monitoring plans must be required for any activity that might affect marine mammals or interfere with subsistence hunting. Neglecting seismic work, as this DEIS does is a serious omission.

Fax: (907) 852-2303 • Toll Free: 1-800-478-2392

Extended Abstract from BEHAVIORAL RESPONSES OF BOWHEAD WHALES TO DISTURBANCE: INTERPRETATION AND IMPLICATIONS by W. John Richardson, LGL Ltd.

"Sound is transmitted very efficiently through water. Underwater noise created by ships and other human activities often can be detected many kilometers away, far beyond the distances where human activities would be detectable by other senses. The long distances over which calls and other natural underwater sounds can be detected are doubtless a major reason by many marine mammals, including bowhead whales, use calls to communicate. They probably also listen to natural sounds to obtain information about their environment. Relevant natural sounds might include surf noise, indicating the presence of a shoreline or shoal; ice noise; and sounds from killer whales.

Concern has arisen that man-made noise may have a negative effect on marine mammals. It might do so by raising the background noise level, thus interfering with detection of calls from conspecifics or other important natural sounds. Man-made noise can also lead to disturbance reactions, ranging from brief alterations in behavior to short- or long-term displacement. There has also been speculation that extremely strong noise might cause hearing impairment, as occurs in terrestrial mammals under some conditions.

The major source of industrial noise to which bowheads are exposed are aircraft and ship traffic, icebreaking, seismic exploration, marine construction, and offshore drilling."

AEWC-03

Monitoring Plans Must Be Subject to Peer Review

The AEWC, with the North Slope Borough, has worked for many years at the International Whaling Commission (IWC) to gain a subsistence hunting quota for our communities. Every scientific study submitted to the IWC Scientific Committee is subjected to the most rigorous peer review possible before we can rely on it to support our quota request. The AEWC also has extensive experience working on other issues where scientific research is required. It is standard practice for scientific proposals and research reports to be subject to peer review by an independent panel of experts. NMFS has chosen to require this type of review of monitoring plans submitted as part of its letter of authorization process. The AEWC strongly recommends that MMS apply the same rigor to the review of its monitoring plans. Without independent peer review, these monitoring plans and their results will not be considered reliable.

Page Three
Ms. Judith Gottlieb
November 20, 1995

For monitoring plans under this lease sale, the AEWC also recommends that a peer review panel be convened with experts recommended by interested parties, including the North Slope Borough, the AEWC, industry, the environmental community and MMS. This way, the possibility of controversy arising over the monitoring plan is even less likely, since all interested parties will feel that their concerns have been represented. AEWC-03

The "Consultation Process" Should Involve Local Communities in a Formal Way and Should Provide for Conflict Resolution AEWC-04

MMS proposes to require that OCS operators consult with local communities by meeting with them and informing them of planned operations. In the AEWC's experience, this type of consultation provides no real opportunity for addressing the concerns of our communities, and can actually lead to serious tensions between operators and subsistence hunters.

We have had many experiences where an operator's representatives have gone to our villages, hosted a dinner, shown the people maps and left, later to report that they had "consulted" with the community. Our hunters also have attended many meetings like this where they have spoken up and said that the planned operations would interfere with hunting because of the timing and location, only to have these concerns ignored. In order to ensure that these past experiences are not repeated, the AEWC recommends that MMS involve our communities in the consultation process in a formal way, allowing us to comment formally on plans of operations. Then, MMS should oversee the resolution of any conflicts related to a plan of operation.

By involving our communities in a formal way and providing for conflict resolution, MMS will be able to ensure that the consultation process actually helps to minimize impacts on subsistence resources and subsistence hunting. In addition, MMS will be able to facilitate the development of compromises that address one of the most controversial issues between hunters and operators right now -- noise impacts. Issues like this are unlikely to be resolved without some form of conflict resolution process.

Page Four
Ms. Judith Gottlieb
November 17, 1995

OCS Operators Working in the Beaufort Sea Should Be Required to Demonstrate Their Oil Spill Containment and Clean-up Capability AEWC-05

MMS proposes to require that operators submit a written report of their oil spill containment and clean-up capabilities. The AEWC does not believe that this is sufficient. Our people are very familiar with this environment and we have no confidence that an oil spill or blowout in broken ice conditions could be contained or cleaned up. We feel that this is an extremely serious issue. The arctic OCS, where this lease sale is being held is one of our people's principal sources of food. The potential damage to our subsistence resources, our people and our subsistence culture from an oil spill in these waters could be devastating.

The AEWC strongly recommends that MMS require operators to demonstrate in a verifiable way their ability to contain and clean-up an oil spill in broken ice under the arctic weather conditions.

Conclusion

The AEWC encourages MMS to give serious consideration to the concerns and recommendations set forth in these comments and in the comments submitted by the North Slope Borough. The AEWC would be happy to meet with representatives of MMS to discuss these issues at any time. The subsistence hunters of the AEWC strongly believe that sustainable development of natural resources can be achieved in the Arctic if care is taken to respect the unique environmental characteristics of the Arctic and the subsistence uses that have sustained our people for centuries. If our concerns cannot be addressed, however, the subsistence whaling captains of the AEWC will strongly oppose this lease sale.

Thank you for this opportunity to comment.

Sincerely,

Burton Rexford

Burton Rexford
Chairman

cc: Senator Ted Stevens
Senator Frank Murkowski
Congressman Don Young
Cynthia Quarterman, MMS Director

AEWC-01
The revised text in the FEIS includes many of the references suggested by the North Slope Borough regarding studies on the effects of noise on bowhead whales. Please see section IV.B.6 for a further discussion of studies on noise.

AEWC-02
Additional text has been added regarding monitoring and exploration plans, peer review, and the inclusion of the residents of the North Slope in the consultation process. Please refer to Stipulations 4 and 5 in Section II.E.

AEWC-03
Please see the response to Comment AEWC-02.

AEWC-04
Please see the response to Comment AEWC-02.

AEWC-05
The MMS acknowledges that there are limits to current technology for responding to spills in certain conditions, particularly, a large oil spill in the Arctic in moving broken ice would be difficult to contain and clean up. Cleanup in broken ice as well as newly forming ice in dynamic sea states is a difficult task. Section IV.A.4.b.(2) of the EIS includes a discussion of spill-response technology that could be used in the sale area and the anticipated effectiveness of these response efforts under various conditions.

Industry's preferred response method under these conditions is to use in-situ burning. In-situ burning has shown to be very effective in field and laboratory tests. While there has not been a major demonstration of the technology in moving broken ice, we believe that there is sufficient evidence that in situ burning will work effectively in many circumstances. In-situ burning is a viable alternative to mechanical containment and recovery and has the potential to remove a large percentage of the spilled oil from the water. In-situ burning can be used throughout the year on nonemulsified oil when ice is present when the wind is less than 20 knots. Where oil is concentrated and nonemulsified, in situ burning can be a very effective response technique. However, in situ burning does pose tradeoffs between air quality and potential contamination from a slick to shoreline and other biologically sensitive areas. In situ burning likely would be used for a large spill in the Sale 144 area, so long as the trajectory from the smoke plume is not likely to move toward populated areas. This will largely depend on the distance of the spill from the shoreline.

Operators will be required to demonstrate their ability to respond to spills by submitting spill-response plans and by conducting spill-response drills. In the past, many have suggested that an-oil-spill response cleanup demonstration be held in broken ice using oil before any drilling activities be allowed. Although it would be ideal to use oil during these drills, it is very difficult to work through the many legal and regulatory issues that surround intentionally spilling oil at sea for the purposes of demonstrating response preparedness. For now, MMS must rely on the extensive base of existing knowledge regarding spill response.

Offshore spill response can be successful when oceanographic conditions are favorable and when response crews and equipment are adequately prepared and immediately available to respond to a spill. However, even under ideal conditions, not all of the spilled oil will be recovered.

Most agree, however, that spill response during the open-water season or winter season is feasible under most circumstances.

Post Office Box 1232 • Barrow • Alaska • 99723-1232 • (907) 852-2762 • FAX (907) 852-2763

Arctic Slope
Native Association Limited

RECEIVED
NOV 21 1995
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

November 20, 1995

Judith Gottlieb, Regional Director
Minerals Management Service
Alaska OCS Region
949 East 36th Avenue
Anchorage, Alaska 99508-4302

Dear Ms. Gottlieb:

Please find enclosed the Arctic Slope Native Association, Limited's comments on the Minerals Management Service's Draft Environmental Impact Statement for the Beaufort Sea Planning Area Oil and Gas Lease Sale #144. These comments were also provided as oral testimony at the Public Hearing held in Barrow, Alaska on November 8, 1995. This written statement is supplemented by my oral testimony.

Thank you for allowing us to provide our comments on this very important issue. I hope that this will help in your evaluation of the potential effects of the proposed lease sale.

Sincerely,

Michael

Michael D. Pederson
Natural Resources Specialist

Post Office Box 1232 • Barrow • Alaska • 99723-1232 • (907) 852-2762 • FAX (907) 852-2763

Arctic Slope
Native Association Limited

COMMENTS TO THE MINERALS MANAGEMENT SERVICE ON THE

BEAUFORT SEA PLANNING AREA OIL AND GAS LEASE SALE #144

November 20, 1995

Prepared By:
Michael D. Pederson
Natural Resources Specialist

Anaktuvuk Pass • Atqasuk • Barrow • Kaktovik • Nuiqsut • Point Hope • Point Lay • Wainwright

The Arctic Slope Native Association, Limited (ASNA), is a non-profit tribal consortium dedicated to and striving for Native self-determination with headquarters in Barrow, Alaska. ASNA provides services under a Public Law 93-638 contract to the tribal members in the following communities: Anaktuvuk Pass, Atqasuk, Kaktovik, Nuiqsut, Point Lay and Wainwright.

ASNA supports the comments from tribal communities located on the North Slope as well as from the Alaska Eskimo Whaling Commission and the local municipal government, the North Slope Borough.

THE BEAUFORT SEA

Several species of marine mammals, fish and waterfowl are the main biological products of the Arctic Ocean and are used as subsistence resources. The indigenous population in the coastal communities are dependent upon the subsistence resources for their food as well as their cultural continuity. An oil spill can threaten the Arctic marine ecosystem primarily through effects on marine mammals, migratory waterfowl and coastal stocks of migratory fish.

ASNA-01

Out of 28 exploratory wells that have been drilled, nine have been determined to be producible, none of which is considered commercially viable under current economic conditions. This appears to be some reasoning to explore elsewhere, such as potential onshore resources, including the Arctic National Wildlife Refuge and the West Sak Field near Prudhoe Bay.

ASNA-02

ASNA disagrees with the draft environmental impact statement (EIS) identifying the Beaufort Sea as having average marine productivity, environmental sensitivity to coastal habitats and sensitivity to marine habitats and marine biota. The Beaufort Sea ecosystem is one that is depended on by subsistence users from the communities of Barrow, Nuiqsut and Kaktovik. Residents from these communities also share their subsistence resources with other coastal communities as well as communities located inland and with relatives who live in the urban areas of Alaska.

ASNA agrees with the U.S. Environmental Protection Agency in identifying this area as having high environmental hazards, and agrees with the U.S. Fish & Wildlife Service to create a coastal buffer, in case you decide to hold a lease sale, to protect coastal resources such as fish stocks.

ASNA-03

ASNA agrees with other organizations that there is a high potential for oil spills in the Arctic, and that there is inadequate oil spill clean-up technology available at this time. Winter ice conditions are severe and unpredictable.

ASNA agrees with the State of Alaska and the North Slope Borough to exclude lease blocks off of Point Barrow, which is a bowhead whale migration corridor. Migration occurs in both the spring and fall. This has been done in the past, and it is recommended that this area continues to be off limits to lease sales. The Kaktovik Deferral Area should also be off limits to lease sales, as has been done in the past. This area is a known bowhead whale feeding area. Scientific research has shown that bowhead whales caught by residents of Kaktovik have been feeding as they migrate from the eastern Beaufort Sea. The Inupiat residents of Kaktovik use this deferral area to hunt for bowhead whales, seals, fish and migratory waterfowl for subsistence purposes.

GENERAL COMMENTS

Inupiat culture and our way of life needs to be protected from the effects associated with petroleum development activities including the subsistence lifestyle.

ASNA-04

An increased effort needs to be occurring to provide for impact funds and distributed to the affected communities.

ASNA-05

ASNA is pleased to see that the Barrow Deferral Area is outside the proposed sale area, but the area north of Dease Inlet is critical habitat for several species of marine mammals, and is an area that is heavily traveled by, and used by subsistence hunters from Barrow. Several fish camps are located downriver from Dease Inlet.

It is true that ice hazards are present in the Beaufort Sea throughout the year.

ASNA-06

The alternatives not included in the draft EIS are concerns that the subsistence users have, including all the deferrals listed. They should have been adequately addressed.

No matter what happens in the Beaufort Sea, the adoption of mitigation measures affecting the potential for oil spills and noise has to reduce the risks to bowhead whales during the spring and fall migration. ASNA agrees with your mitigation measures and stipulations, but to reiterate our point that in our culture, the subsistence mainstay is the bowhead whale. MMS must have the input of those people that will be directly impacted by oil development, the whaling captains and subsistence users.

ASNA-07

In addition, ASNA believes that the MMS should have considered a seasonal drilling restriction in the draft EIS.

On March 28, 1994, a scoping meeting was held in Barrow. Some of the concerns that I addressed at that time included the following relating to Lease Sale #144.

➔ In Lease Sale #144, the communities whose subsistence activities will be affected are Nuiqsut, Kaktovik and Barrow. Each fall, whaling crews from Nuiqsut travel to Cross Island to hunt for bowhead whales. This is the only location available to the Nuiqsut whalers besides Narwhal Island where they can hunt for bowhead whales. Residents from Nuiqsut travel to the coast to hunt for seals and migratory waterfowl.

➔ In Kaktovik, the whaling crews venture out to sea to hunt for bowhead whales too. They also hunt bearded seals, beluga whales and fish for arctic cisco, arctic char and salmon. All these animals are hunted for subsistence purposes.

➔ The area in Lease Sale #144 is also an area used by spring and fall migrating bowhead and beluga whales. Areas such as Camden Bay have been identified as feeding areas for bowhead whales. Beluga whales have been observed following the bowhead whales during the spring migration. Beluga whales stay closer to the shore than bowhead whales do, but both bowhead and beluga whales migrate in the open leads along the coastline during the spring migration. This area is also home to polar bears, bearded, ringed and spotted seals and walrus which the Inupiat people hunt for subsistence purposes. In the past several years this area has also seen exploration activities come and go such as the Kuvlum Prospect and ARCO's Cabot site, which did not yield any significant finds.

ASNA-08

➔ Any obstacles such as exploratory drilling rigs will affect the migration routes of the marine mammals which our communities depend on for subsistence purposes. It is not just the food, but we use other portions of the animals for eskimo drums and bearded seal skins to cover our traditional umiaqs during the spring bowhead whale hunt. Local arts and crafts are also made with certain parts of the animals we hunt. It is not only from the sea in which we gather our food, but on the land as well where we hunt for caribou, moose, wolves, wolverines and foxes. When development begins, displacement will occur. Our native hunters will have to travel long distances to provide the traditional foods for their families. We have seen this happen to the Nuiqsut whaling crews at Cross Island when exploration activities such as seismic testing forced the whaling crews to travel more than 30 miles in search of bowhead whales, at times running into stormy weather as they returned from a successful hunt, and in the end, only being forced to cut loose a bowhead whale they had been towing so they can make it back to Cross Island safely.

ASNA-09

➔ What concerns us the most is, if development proceeds, how will the people living on the coast survive if there is an oil spill of any kind, or even a major blowout? We all know the results of the *Exxon Valdez* oil spill in Prince William Sound. Some communities down there have had to forgo their subsistence lifestyle immediately after the oil spill. I have heard this frustration firsthand from the people living in the communities *directly in the wake of the oil spill. We have been told time and time again that the necessary equipment will* be available in case of an oil spill. <u>That is not good enough.</u> The Beaufort Sea is very unpredictable both during the summer and winter. Icebergs and the ice-pack itself is a dangerous force to reckon with. Dangerous conditions exist and we feel that offshore exploration is not a possibility that should be further explored. Other alternative sources of fuel should be explored first, such as developing potential onshore resources.

ASNA-10

Comments to the Minerals Management Service
Beaufort Sea Planning Area Oil and Gas Lease Sale #144

ASNA-11

It appears that none of the concerns that were aired in the Scoping Meeting in Barrow last year are addressed in the current Draft EIS. None of the North Slope Borough's Department of Wildlife Management's scientific research on bowhead whales appears in the Draft EIS, and that research is scrutinized at the international level, and has been well regarded. Additionally, whaling captains from the whaling communities have testified at public hearings several times, reiterating their experiences out on the ice during the spring bowhead whale hunt, as well as during the fall hunt, which occurs in open water. The whaling captains have stressed the interference of subsistence whaling activities due to seismic work during the fall open water season. Seismic work in Camden Bay and in the area directly north of Dease Inlet interfered with bowhead whaling activities. Again, whaling captains have stated that drilling operations, such as those at the Kuvlum sites and the Cabot site off of Point Barrow had direct impacts on our whaling captains abilities to hunt the bowhead whale in areas where whales have been known to migrate through. Several other seismic activities and drilling operations have occurred in the Beaufort Sea, but I mention the Kuvlum, Cabot and Camden Bay incidents as examples. When seismic and drilling operations occur, the whales are displaced, and whaling captains venture further and further out to sea. The traditional ecological knowledge about bowhead whales and ice conditions is an important and useful tool that should be considered in the final EIS.

ASNA-12

ASNA-13

CONCLUSION

In closing, ASNA opposes oil and gas exploration and development in the Arctic OCS. ASNA prefers Alternative II, which is NO SALE. ASNA prefers that oil development occur onshore.

The marine mammals that live in the Beaufort Sea provides for our sustenance, as well as terrestrial animals. The sea is our garden, and that is true. It's been said again and again, so how many times are we going to have to repeat it.

The MMS went to great lengths to develop this draft EIS, but in the end, the impacts of any decision that is made will be on our doorstep, so I urge you to take the necessary steps, if the MMS decides to proceed with a lease sale, to provide for the protections we need to continue our subsistence lifestyle across the Beaufort Sea, from Barrow to Kaktovik.

cc: **Mayor George N. Ahmaogak, Sr., North Slope Borough**
North Slope Borough Department of Wildlife Management
Alaska Eskimo Whaling Commission
Archie Brower, President - Kaktovik Native Village of Barter Island
Thomas Napageak, President - Native Village of Nuiqsut
Senator Ted Stevens
Senator Frank Murkowski
Congressman Don Young

ASNA-01
Exploratory wells have tested a small fraction of potential prospects in the Beaufort Sea OCS. While economic conditions are critical to short-term development plans, present conditions cannot be used to predict long-term exploration and development potential. Onshore and offshore exploration and development complement each other and cannot be considered to be mutually exclusive.

ASNA-02
Section III.B.1.a has been rewritten to respond to the ASNA comment regarding the productivity of the Beaufort Sea.

ASNA-03
Historically, severe weather has been a principal causal agent in about 10 percent of the major OCS spills. In addition, no major oil blowouts have occurred in either Canadian or U.S. arctic waters in over a decade of exploration and discovery, although one major fuel spill of at least 1,000 bbl occurred during Canadian exploration.

However, because there is a potential for oil spills and cleanup of such spills is difficult, MMS strongly and consistently emphasizes oil-spill prevention through the review of drilling and development and production plans, oil-spill-contingency plans, and safety compliance inspections. Based on the historical record of ice conditions, the operators have developed strategies to mitigate, manage, or avoid ice conditions that might threaten operations and cause an oil spill. These ice-management strategies include forecasting ice conditions and strategies to shut down operations in a step-wise manner to avoid oil spills.

If prevention of oil spills were to fail, oil-spill cleanup would occur. The reader is referred to the response to Comment AEWC-05 and Section IV.A.4 of the text for the discussion on oil-spill cleanup.

ASNA-04
Please see response to comment NSB-08

ASNA-05
There is a 4-percent chance of one or more oil spills $\geq$ 1,000 bbl occurring and contacting the coastal area at the mouth of Dease Inlet in both the winter and open-water seasons. The summer fish camps at the head of the inlet would stand even less of a chance of oil-spill effects. Also, while Dease Inlet is heavily used by subsistence hunters, overall fish resources would not become unavailable, even with effects to Dease Inlet.

ASNA-06
As a result of concern raised during the public hearings process, the Nuiqsut Deferral was added to the FEIS and subjected to an environmental analysis. Also, the MMS has reevaluated and reworded its Subsistence Whaling and Monitoring Stipulations to allow for greater input from the North Slope communities. Please compare the versions of Stipulation 4 and 5 contained in the draft statement with the version in the FEIS.

ASNA-07
The issue of spilled oil during periods of bowhead whale migration and the need for a seasonal drilling restriction to protect the bowhead whale were addressed by the NMFS in their Arctic Biological Opinion. In their opinion, NMFS stated that the seasonal restriction of drilling "may not be necessary". However, Stipulation No. 5 states that "In enforcing this stipulation, the RS/FO will work with other agencies and the public to assure that potential conflicts are identified and efforts are taken to avoid these conflicts (for example, timing operations to avoid the bowhead whale subsistence hunt). These efforts might include seasonal drilling restrictions, seismic and threshold depth restrictions, and requirements for directional drilling and the use of other technologies deemed appropriate by the RS/FO."

ASNA-08
The potential for effects on bowhead whales from exploration activities, including possible displacement of the bowhead whale migration route farther offshore, is discussed in Section IV.B.6 in the FEIS. Should development occur, consultation with the National Marine Fisheries Service would be reinitiated, a development EIS would be prepared, and all interested parties would have an opportunity for input into the project.

Further, the Nuiqsut Deferral Alternative, as well as revised Stipulations and ITL's providing greater public input for monitoring and conflict resolution included in the FEIS, would serve to mitigate any possible displacement of Native subsistence hunters, particularly those from Nuiqsut, from oil-industry development activities.

ASNA-9
The potential effects of a major oil spill or blowout on the marine resources of the Beaufort Sea, the economy of the North Slope Borough, and on sociocultural systems and subsistence-harvest activities are analyzed in Section IV.B of the EIS. Oil-spill and sea-ice concerns expressed in this comment are addressed in the response to Comment ASNA-03.

In addition, Section IV.M.10, Effects on Subsistence-Harvest Patterns, concedes disruptions lasting from 2 to 5 years to subsistence resources would occur from a major blowout or oil-spill event. The OPA legislation does provide a $150 million fund for restitution for such impacts.

ASNA-10
Please see the response to Comment AEWC-05.

ASNA-11
Several studies from the North Slope Borough are included in the FEIS, and the majority of references provided with the North Slope Borough's comments have been included. Please see section IV.B.6.

ASNA-12
Testimony, including much traditional ecological knowledge, from whaling captains and whaling captains' wives as well as elders from the three affected communities concerning their observed behavior and effects to bowheads from drilling and seismic activities, has been in included in the subsistence-harvest patterns description in Section III and in the subsistence effects analyses in Section IV of the FEIS.

ASNA-13
Please see the response to Comment ASNA-13.

Indigenous People's Council for Marine Mammals

P.O. Box 200908
Anchorage, Alaska 99520
(907) 279-2511
Fax (907) 279-6343

MEMBERS:

Alaska Eskimo Whaling Commission

Alaska & Inuvialuit Beluga Whale Committee

Alaska Sea Otter Commission

Arctic Marine Resources Commission

Assn. of Village Council Presidents

Bristol Bay Native Association

Eskimo Walrus Commission

Inuit Circumpolar Conference

North Slope Borough Dept. of Wildlife Mgmt.

Pribilof Aleut Fur Seal Commission

Southeast Native Subsistence Commission

RurAL CAP STAFF:

Carl Jack
Subsistence Director

Carol Torsen
Subsistence Coordinator

Carl Hild
Marine Mammal Biologist

9 November 1995

Judith C. Gottlieb
Regional Director
Minerals Management Service, Alaska Region
949 East 36th Avenue
Anchorage, AK 99508-4302

RECEIVED
NOV 13 1995
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Dear Judith C. Gottlieb:

I participated in the Public Hearing on the draft Environmental Impact Statement (EIS) of the Beaufort Sea Planning Area Oil and Gas Lease Sale #144 on 26 October in Anchorage and made a statement for the record. I have had a bit more time to look at the balance of this document and would like to provide these written comments.

I will begin my comments with three issues which are of concern throughout the entire document.

IPC-01

The first is the area of the sale. The EIS should make it very clear that there is currently an international boundary dispute between our nation and Canada regarding the eastern definition of this lease sale area. The Canadians contend that the international boundary runs along the 141° West Longitudinal line. The U.S. contends that the Exclusive Economic Zone (EEZ) is based on the shoreline at the land terminus and therefore claims territory east of the 141° line. The EIS should clearly outline this dilemma and state that if an area is leased in the far eastern section that it may become tied up in international negotiations that could 1. prevent development of the property in a timely fashion, 2. totally exclude it from U.S. jurisdiction at all thereby requiring the return of any funds expended on acquisition. Bidders need to know that they could have their funds tied up for years in this process. This may appear in other legal instruments prepared by the Minerals Management Service (MMS), however the EIS cannot be prepared without first defining the environment which is to be impacted.

IPC-02

In addition, if there is not clear title to the land then this may be cause to revise the entire EIS to look at a forth option. Currently there is the full sale, no sale, and the sale with the Barter Island Deferral. Perhaps there should be added an option for a modified full sale from 141° to the west. If this is not possible then it appears that there are only two appropriate options, either no sale or the sale with the Barter Island Deferral. I have attached a page from a U.S. State Department memo from 15 June 1995 which in item #7 it states clearly that this area is in dispute and being discussed in conjunction with the U.S. involvement with the development of the proposed international Arctic Council.

IPC-03

The second point that will require corrections throughout the entire draft EIS is the change of status of the Gray Whale. Since it is no longer an endangered species it was obviously dropped from those sections of the report. However, it was not then picked up and mentioned in any of the sections dealing with marine mammals. This is particularly evident on page III-B-7 where it mentions that Gray Whales will be described below, but they are not mentioned in the following pages. Clearly the Gray Whales belong in IV-B-26 #5 and in many other sections. This is a serious oversight and needs to be corrected.

IPC-04

The third point that will need to be corrected throughout the draft EIS is the spelling of the name of the small toothed white whales. The National Marine Fisheries Service has recently completed Stock Assessment Reports for every marine mammal which resides in Alaskan waters. They have a report on the Beluga Whale (*Delphinapterus leucas*). They do not have a report on Belukah, which according to my dictionary is a white sturgeon, a fish from Russia. Since this is a federal document on environmental impacts it is important to be consistent in the proper identification of the species which are being considered. I realize that some researchers do use this other term, however the official federal and most common name should be used, Beluga Whale.

Specific comments.

IPC-05

Page II-4 has a list of Stipulations. These are then expanded upon in other sections. In No. 1 lower on the page, its item 4 is weak. In light of the Marine Mammal Protection Act the definition of "take" is quite broad and includes activities which change the animals behavior such as swimming direction or normal breathing patterns. This is applied to endangered species such as the Bowhead Whale as well as to all marine mammals such as Polar Bears, seals, Walrus, and other whales. IPC-05

I understand that the oil and gas companies have applied for a national blanket permit for the incidental, non-lethal take of National Marine Fisheries Service marine mammals. They already have received a similar, albeit on a smaller geographical area, permit from the U.S. Fish and Wildlife Service for Polar Bears and Walrus that would apply for this sale area. It is clear that before any development could realistically occur that industry will have to obtain permits for each activity in which there may be interaction with a marine mammal, or receive a blanket permit for such interactions. If they do not they would be in violation of the current law. I believe that this should be clearly stated in this section of the EIS so that everyone knows up-front what requirements are in place to assure the protection of marine mammals from human activities.

Page II-5 Industry Site-Specific Bowhead Whale - Monitoring Program should be expanded. Due to the paucity of data on all Arctic marine mammals this program should mention not only the endangered Bowhead Whale but also all other marine mammals which are sited during the monitoring effort. They are reported in the charts but rarely mentioned in summary. IPC-06

Page II-5 Subsistence Whaling and Other Subsistence Activities should be expanded to include that any permits for the take of marine mammals require that the industry meet with local subsistence hunters to discuss the process and what expectations they may have for the impact to marine mammals. Again this statement would clarify the roles of industry, government, and local subsistence hunters for environmental impact. IPC-07

Page III-B-7. I would recommend that MMS obtain copies of all of the Alaskan marine mammal Stock Assessment Reports (SARs) which are now available from both the National Marine Fisheries Service and the U.S. Fish and Wildlife Service. These have the latest population estimates, ranges, and definitions of stocks which would be found in this proposed lease sale area. These have been finalized since the drafting of this document, but clearly now should be included in its revision. Likewise on page III-C-9 the subsistence patterns could be updated with information either from the SARs or from those who were involved in preparing them. IPC-08

Page IV-A-28 and associated references in the balance of the document discuss the impacts of under sea pipes. These pipes will be carrying hot oil. The heat from these pipes, no matter how well insulated will impact the surrounding environment. There is no mention in this draft EIS of thermal concerns. It is known that permafrost on the ocean bottom is different than fresh water permafrost and is less stable to thermal erosion. Any small elevation in temperature in the surrounding water may lead to biotic changes for organisms that are already living on the edge. The slightest advantage could be very significant to the success of micro to macro, floral or faunal, life forms. IPC-09

There is also no mention of what very slight heating, year round, may do to the water column and surface ice. Could the positioning of the pipe influence the strength of the ice and therefore the formation of pressure ridges in the winter or leads in the spring, both of which are significant to the level of effort expended by subsistence hunters? This needs to be understood and therefore should be mentioned as a concern for environmental impact.

The protection of any under sea pipeline needs to be discussed from a variety of perspectives. At some point the line must come to shore. How will the area be evaluated to make that determination? At what point does the pipe need additional protection from gouging, ice impact from overhead weight, permafrost interface movement from sea bed to terrestrial structures? How will the pipe be insulated, refrigerated, or maintained as being thermally neutral to changing environments along its route?

Page IV-A-21 begins the section on oil spill response. This does not make the reader confident that this work can be done without some form marine mammal take. The clean-up capability of under ice leaks, spills in broken ice or rough seas is not tested technology. In the area proposed under this EIS there are only a few days each year when one of these three conditions are not met. Therefore the bulk of the time there will be industrial activity in this area with only untested clean-up capabilities available. IPC-10

Page IV-A-26 begins the section on the role of the Federal Government in spill response. There is no mention of assessing the levels of marine mammal take which would most likely be occurring due to the presence of year round resident stocks, in particular seals. This should be mentioned in this section. IPC-11

The information provided paints a picture of quite a high likelihood that any spill will impact some marine mammals throughout the year therefore constituting take for which there is no permit at this time except for Polar Bears and Walrus from the U.S. Fish and Wildlife Service. IPC-11

Page IV-C-1. This section is poor. If there is no sale there will be impacts as many of the local communities and the State are looking forward to and project income based on continuing oil revenues. There would be social and economic impacts and these need to be listed. The bonds which are sold to support current community development are paid off in time. If this sale does not move forward what liability do these communities face without income? What social impact will occur if these liabilities are not met? IPC-12

Page IV-E-2 and other similar areas need to have a section on lower trophic level organisms to address the thermal impact of the heated pipeline as mentioned above. Also the lower trophic organisms are the base for the food chain. They inhabit the region on the bottom surface of the ice as well as the ocean floor. There are species that are quite rare and a full accounting of their variety is lacking as well as any real understanding of the dynamics of those aspects of the ecosystem. IPC-13

Page IV-G-1 begins a discussion of habitat alteration. This section needs to address the thermal impacts of the pipelines which are proposed. This can include their direct heat loss into the ocean or its floor, the impact on oceanic permafrost, the influence on under sea ice biota, the impact on ice strength, the impact of burying the pipe completely and what effects that may have on the bottom, the impact on sea floor biota, the impact on predators who use these basic biota, and the potential impacts of insulation or refrigerant systems to the ocean especially if they have an uncontrolled release. IPC-14

Page IV-H-1 states that "most oil spills are considered unavoidable." This then leads the reader to conclude there will be incidental take of marine mammals. It does not state that this is illegal, just that it will occur. Again there needs to be mention of the take permit requirements. There should also be some estimate of the "cost" associated with such incidents in the terms of known average spills, proximity of animals, and therefore the number of non-lethal and lethal takes that are projected. IPC-15

Section VI should list the Inuvialuit Game Council of Canada and the Indigenous People's Council for Marine Mammals / Rural Alaska Community Action Program as these two groups did provide testimony at the Anchorage Public Hearing. IPC-16

Additional Comments.

I recommend the production of a subsistence use map as a graphic with both a space and time scale. This should include the designation of Alaska Native traditional subsistence use areas for all marine resources (vertebrate, invertebrate, and plant). There should then be some basic buffer in either space or time allowed around these harvests to offer a subsistence protection from possible spills or development degradation of the area. Such buffers should be decided upon through the direct involvement of local residents. IPC-17

Add to the concerns regarding marine mammals and endangered species some other natural factors and there is more evidence to make major changes in this draft EIS. There should be a map of surface and sub-surface currents for the lease area. There was not significant mention of the wind. This area is famous for its winds. As ice is driven by surface conditions it would be critical to know the extent and direction of winds in regard to critical habitats and subsistence use areas as they will move spilled oil as well. A graphic of several wind roses with maximum-average and storm conditions would be helpful for sites along the lease areas. IPC-18

It is the charge of the Mineral Management Service to provide recommendations on development of the outer continental shelf. From the materials presented in this draft EIS for proposed Lease Sale 144 it appears that the EIS should recommend extreme caution in the development of such a lease. It appears that the conditions are such that spills will occur, there is not the technology to clean them up during most of the year, and the take of marine mammals appears imminent. IPC-19

A final EIS should be developed, but this draft EIS needs major revisions. In light of the question over ownership of some of the sale area it should be at least modified to remove that territory at this time. The missing reference to the Gray Whale must be corrected. The lack of mention of the incidental take regualtions for marine mammals is a major point which is missing. The thermal impact of an under water oil pipeline in the Arctic was not mentioned. Considering all of these significant points I would recommend that MMS prepare a second draft EIS due to these necessary changes and delay, until there is proper review of that draft, the distribution of a final EIS and the dates of this proposed lease sale.

Thank you for this opportunity to comment. I look forward to your response, the incorporation of the comments you receive, and the development of the final EIS.

Sincerely,

Carl M. Hild

Carl M. Hild, M.S.Sci.Mgmt.
Biologist / Planner

enclosure: U.S. State Department 15 June 95 memo p. 5

UNCLASSIFIED

Printed By: Robert S. Senseney 73264

THE UNITED STATES WILL HOST A SECOND SESSION ON THE ARCTIC COUNCIL IN WASHINGTON, SEPTEMBER 6-8, 1995. THE PURPOSE OF THE MEETING, INTER ALIA, WILL BE TO REVIEW A DRAFT DECLARATION WHICH CANADA IS PREPARING BASED ON THE CONSENSUS POINTS CONTAINED IN PARA 1, ABOVE. IN VIEW OF THE PROGRESS MADE TO DATE, THE U.S. EXPECTS A DECLARATION WILL BE READY FOR SIGNATURE BY SENIOR OFFICIALS OF THE EIGHT ARCTIC STATES AT THE AEPS MINISTERIAL SCHEDULED FOR MARCH 1996 IN INUVIK, CANADA.

6. U.S. DELEGATION TO THE MEETING INCLUDED:

ROBERT SENSENEY, CHIEF OF POLAR AFFAIRS, OES, DOS;
JOANN SEBASTIAN MORRIS, SPECIAL ASSISTANT, OFFICE OF THE ASSISTANT SECRETARY OF INDIAN AFFAIRS, DOI;
ROBERT HOFMAN, MARINE MAMMAL COMMISSION, AND
KURT PARKAN, OFFICE OF THE GOVERNOR STATE OF ALASKA.

7. BEAUFORT SEA:

IN SIDE DISCUSSIONS WITH AMBASSADOR MARY SIMON, POLAR AFFAIRS CHIEF SENSENEY REMINDED CANADA (AGAIN) OF U.S. INTEREST IN RESOLVING THE MARITIME BOUNDARY IN THE BEAUFORT SEA. HE REMINDED CANADA OF IT
S COMMITMENT TO
ADDRESS THE LONG-STANDING BOUNDARY DISPUTE DURING THE STATE VISIT WHEN THE U.S. AGREED TO THE FORMATION OF AN ARCTIC COUNCIL. THE U.S., SENSENEY SAID, WILL CONTINUE TO NEGOTIATE THE FORMATION OF AN ARCTIC COUNCIL IN GOOD FAITH, BUT WOULD LIKE TO SEE SOME MOVEMENT ON CANADA'S PART WITH REGARD TO THE BEAUFORT SEA. AMBASSADOR SIMON NOTED U.S. SUPPORT AND ASSISTANCE IN THE ESTABLISHMENT OF THE ARCTIC COUNCIL AND PROMISED TO RAISE THE ISSUE WITH THE LEGAL OFFICE OF HER DEPARTMENT OF FOREIGN AFFAIRS AND INTERNATIONAL TRADE. EMBASSY OTTAWA WILL FOLLOW UP.

8. THIS CABLE WAS DRAFTED BY ROBERT SENSENEY, CHIEF OF POLAR AFFAIRS, OES, DOS, AND WAS TRANSMITTED BY EMBASSY AFTER HIS DEPARTURE FROM THE POST.

WALSH

IPC-01
The United States claims exclusive mineral resource jurisdiction over the entire area being offered. Canada claims such jurisdiction over a portion of the area. Blocks in the area of differing claims will be identified in the Notice of Sale. The Notice of Sale will contain procedures to be followed if any bids are received for disputed blocks. No leases will be issued until such time as the United States determines that it is in its best interest to do so. This area has been offered in three previous oil and gas lease sales in the Beaufort Sea: Sale 87 in August 1984, Sale 97 in March 1988, and Sale 124 in June 1991. Bids were received on blocks in the disputed area during the conduct of Sales 87 and 97. The partial bonus payments received with the bids were maintained in an escrow account. All of these payments have since been returned to the bidders, with accrued interest, and no leases have been issued.

IPC-02
Please see the response to Comment IPC-01.

IPC-03
The text on page III.B.7 has been changed in response to this comment. The gray whale was discussed in detailed in previous Beaufort Sea lease sale EIS's, because these sales included tracts within the Chukchi Sea, including part of the feeding area of this species. However, Sale 144 does not included any tracts west of Point Barrow in the Chukchi Sea (see Fig. III.B.4) and, therefore, gray whales are not expected to be exposed to or be affected by any activities associated with the proposal.

IPC-04
According to the *Merriam Webster International Dictionary* and the *American Heritage Dictionary*, the spelling "belukha" or "byelukha" in Russian means white whale, while the spelling "beluga" or "byeluga" in Russian means "white sturgeon." The EIS uses the "belukha" spelling as to not confuse our Russian neighbors.

IPC-05
The proposed rule covering incidental taking of marine mammals by oil and gas companies referred to by the IPC currently is under consideration by the NMFS and is expected to be finalized in the near future. It is likely that this rule will cover multiple activities that may affect multiple species on a large proportion of the OCS. The IPC correctly notes that industry is required to obtain a letter of authorization (LOA, referred to as "permit" in the comment) for activities that may have a defined effect on the indicated marine mammal species. That industry is required to obtain an LOA is set out clearly in Information to Lessee No. 1, Information on Bird and Marine Mammal Protection (Section II), and reference also is made to a NMFS Letter of Authorization for incidental, nonlethal taking of bowhead whales in Stipulation No. 4, Industry Site-Specific Bowhead Whale Monitoring Program. Also, the fact that BP Exploration submitted comments on several of the mitigating measures statements in Section II that are pertinent to their potential future activities indicates they are well aware of the content and implications of these measures.

IPC-06
The site-specific bowhead whale monitoring programs that have been conducted on leases where exploration drilling has occurred have included the recording of other marine mammals sighted while doing the bowhead whale monitoring. This other marine mammal monitoring is coordinated with NMFS and FWS.

The NMFS, in their 1990 to 1995 incidental take regulations for marine mammals under their jurisdiction, required monitoring and reporting by industry on six species of marine mammals—bowhead whales, gray whales, belukha whales, ringed seals, bearded seals, and spotted seals. The NMFS currently is revising the rule for incidental take of marine mammals, but the requirement for monitoring and reporting of these species likely will remain the same.

IPC-07
Stipulation No. 4, Industry Site-Specific Bowhead-Whale Monitoring Program; the ITL on Endangered Whales and the MMS Monitoring Program; the ITL on the Availability of Bowhead Whales for Subsistence-Hunting Activities; and the ITL on Community Participation in Operations Planning discuss the requirements for industry to meet with subsistence communities and the permitting requirements for the take of marine mammals. Stipulation No. 5 now contains language specifying a consultation and conflict resolution process if disagreements arise between industry and the subsistence community.

IPC-08
October 1995 FWS Stock Assessment Reports for Polar Bears and Walrus were consulted to update subsistence harvest figures for these species. Other sources consulted were Schliebe et al. (1995) for polar bear harvests and Stephensen, Cramer, and Burn (1994) and Cramer (1996, personal comm.) for walrus harvests. Bowhead Harvest Reports provided by the AEWC to NMFS for the years 1993, 1994, and 1995 were used to update subsistence-bowhead-harvest data for the communities of Barrow, Nuiqsut, and Kaktovik. Also, please see the response to Comment MMC-09.

IPC-09
The concerns expressed in this comment would be addressed more completely in a development and production EIS if commercially recoverable quantities of oil are discovered. In the event of such a discovery, the location of the field(s) would be known and pipeline route(s) and landfall(s) proposed. Also, the characteristics of the oil, including temperatures, would be known. This information along with other information about the characteristics of the various environments through which the pipeline passes would be used to determine the amount of insulation, or other strategies, needed to prevent thawing of the permafrost.

Potential pipeline routes would be surveyed to avoid hazards and determine safe routes. Information is available regarding gouge characteristics, including density of gouging and gouge depths. This information would be used to determine where the pipeline needs to be buried and to what depths; also, additional strategies that might be used to protect the pipeline could be evaluated. Critical habitats, which might be affected by pipelaying operations or potential temperature changes, could be avoided. During the open-water season there are alongshore, upwelling, wind-driven, and deepwater currents and the mixing associated with these currents and wind waves would help dissipate any temperature changes that might be associated with a buried, insulated pipeline.

There is considerable annual and interannual variation in the location where ridges form and the location of the fast-ice boundary varies in a zone that may be up to several tens of kilometers wide; the leads generally would form seaward of the fast-ice zone.

IPC-09
The concerns expressed in this comment would be addressed more completely in a development and production EIS if commercially recoverable quantities of oil are discovered. In the event of such a discovery, the location of the field(s) would be known and pipeline route(s) and landfall(s) proposed. Also, the characteristics of the oil, including temperatures, would be known. This information along with other information about the characteristics of the various environments through which the pipeline passes would be used to determine the amount of insulation, or other strategies, needed to prevent thawing of the permafrost.

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There is considerable annual and interannual variation in the location where ridges form and the location of the fast-ice boundary varies in a zone that may be up to several tens of kilometers wide; the leads generally would form seaward of the fast-ice zone.

IPC-10
Please see the response to Comment AEWC-05.

IPC-11
Because oil spills are considered accidental events, issuance of a letter of authorization (LOA) for incidental take of marine mammals that might accompany postspill cleanup activities prior to an incident would not be considered an appropriate procedure as it would suggest that a spill is inevitable. In this regard, the NMFS currently has an oil spill response LOA prepared and a streamlined procedure in place whereby a responsible party can apply for and

receive an LOA in a timely manner if an oil spill occurs. Any activities associated with this proposed sale that may result in an incidental take will occur well after the NMFS incidental take regulations are in place.

IPC-12

The third sentence in the first paragraph on page IV-C-1 reads: "Furthermore, the environmental effects from the base case of the proposal, as described in Section IV.B, would be eliminated." The potential social and economic effects of the proposal are analyzed thoroughly and conclusions are made in Section IV.B.

The State of Alaska potentially could receive revenues from the lease sale through the provisions of Section 8g of the OCSLA. Section 8g provides that a State adjacent to the OCS receive 27 percent of the revenues from a lease sale and any production for blocks leased between 3 and 6 miles from shore. It is unknown whether and how many blocks would be leased in this area and what production might be in this area. Therefore it is unlikely that the State of Alaska would be planning on revenues from this lease sale prior to a lease sale itself.

The NSB would derive additional property tax from increased onshore facilities averaging about 2 percent each year through the production period, as analyzed for the base case in Section IV.B.8. Prudent decisions by the NSB to sell bonds for community development should be based on actual increases in property value and property taxes. Liability to pay existing bonds rests solely with the NSB.

IPC-13

The epontic community, and the likely effects of the proposal and the alternatives on the epontic community, were discussed in the lower trophic-level organisms sections of the DEIS. Page IV-E-2 of the DEIS pertains to the low case which does not involve an oil spill. Hence, there can be no effects associated with a heated pipe in the low case. Regarding the scenarios that do involve a heated pipeline, the proposed pipeline is buried below the ice-scour zone, and is not expected to have a significant effect on the epontic community.

IPC-14

Pipe insulation would not be discharged in an uncontrolled release. Refrigerant systems likely would not be used for the pipeline, unless a portion of the pipeline had to cross an inshore area of shallow and unstable undersea permafrost. In such a case, a chilled seawater or seawater system would be used. Any discharge of refrigerant during a pipeline break would be of seawater treated with biocides and/or other corroison-inhibitors. Discharge of treated seawater would be short lived, and discharge quickly would be cut off.

IPC-15

Because oil spills are considered accidental events, issuance of a letter of authorization (LOA) for incidental take of marine mammals that might accompany an oil spill or postspill cleanup activities prior to an incident, as the commenter recommends, would not be considered an appropriate procedure as it would suggest that a spill is inevitable. In this regard, the NMFS currently has an oil spill response LOA prepared and a streamlined procedure in place whereby a responsible party can apply for and receive an LOA in a timely manner if an oil spill occurs. Any activities associated with this proposed sale that may result in an incidental take will occur well after the NMFS incidental take regulations are in place.

The oil industry that will be developing any discovery made in the sale 144 area is quite familiar with the federal permit requirements associated with such development, including those for incidental take. In this regard, we assume the industry realizes that acts that are forbidden by federal laws and regulations, or forbidden unless a specific permit or LOA is obtained, are illegal. That industry is required to obtain an LOA to satisfy incidental take regulations, and not be in violation of these regulations, is set out clearly in Information to Lessee No. 1, Information on Bird and Marine Mammal Protection (Section II), and reference also is made to a NMFS Letter of Authorization for incidental, nonlethal taking of bowhead whales in Stipulation No. 4, Industry Site-Specific Bowhead Whale Monitoring Program. Also, the fact that BP Exploration submitted comments on several of the mitigating measures statements in Section II that are pertinent to their potential future activities indicates they are well aware of the content and implications of these measures.

IPC-16

The listing in Section VI of those who testified will be changed to accommodate this comment.

IPC-17

The suggestion to develop a map depicting subsistence use both spatially and temporally in a single graphic is an excellent idea and will be developed. At present, Figure III.C.3-1 provides a detailed depiction of traditional subsistence-harvest areas for the four affected North Slope communities for all species for all seasons; Figures III.C.3-2 through III.C.3-7 show subsistence-harvest areas for bowhead whales, belukha whales, caribou, seals, walrus, and fishes. When these maps are combined with Figures III.C.3-8, III.C.3-11, III.C.3-14, and III.C.3-17 that graph the annual subsistence cycles for Barrow, Atqasuk, Nuiqsut, and Kaktovik, respectively, for all vertebrate, invertebrate, and plant species harvested, a detailed picture of the temporal and spatial aspects of subsistence use, we believe, is provided. The text further develops this picture by describing species and their harvest seasons in even greater detail.

The MMS has two methods for providing buffers to protect subsistence harvests from leasing activities and potential oil spills. Deferrals areas are spatial ways of protecting subsistence-harvest areas. A major portion of Barrow's marine subsistence-harvest area that was included in the Sale 124 sale area was deleted from the sale area for Sale 144—in effect, a deferral. In Sale 144, the Barter Island and the Nuiqsut Deferral Alternatives are included to protect important marine-subsistence-harvest areas for these communities. Temporal and spatial protection is handled by mitigation in the form of stipulations and ITL's. Stipulation No. 1, Protection of Biological Resources and Stipulation No. 5, Subsistence Whaling and other Subsistence Activities provide for the relocation and suspension of leasing activities if conflicts with biological and subsistence resources occur. Also, ITL's on Sensitive Areas to be Considered in the Oil-Spill-Contingency Plans, on Endangered Whales and MMS Monitoring Program, on Consultation with NMFS to Protect Bowhead Whales in the Spring Lead System, on The Availability of Bowhead Whales for Subsistence Hunting Activities, and on River Deltas all advise the lessee that operations can be curtailed for certain time periods and in certain areas if conflicts with biological and subsistence resources arise. The Nuiqsut Deferral and mitigation for Sale 144 were drafted after extensive consultation with local communities and the North Slope Borough.

IPC-18

A map showing a schematic of the currents has been included. For purposes of the oil-spill- risk analysis (OSRA), it is inappropriate to show a few representative wind roses. The OSRA model uses 9 years of wind data from 1978 through 1986 to simulate trajectories throughout the area. The degree to which wind forcing plays a role in the nearshore areas has been studied as part of the Beaufort Mesoscale Circulation Study (Aagaard et al., 1990), and there is often a reinforcement of the wind-driven component by the density-driven component. In conclusion, the spill trajectories for OCS Lease Sale 144, Beaufort Sea, show distinct variations in response to seasonal wind patterns and the strength of density-driven currents. Hypothetical spills on the shelf show wind-induced variability and the relatively important density-driven current along the Beaufort Sea coast.

IPC-19

The draft EIS addresses the probability of oil spills occurring; for purposes of analysis, it is assumed a spill will occur.

Alaska Oil and Gas Association

121 West Fireweed Lane, Suite 207
Anchorage, Alaska 99503-2035
Phone: (907) 272-1481 Fax: (907) 279-8114

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NOV 22 1995
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

November 20, 1995

Ms. Judith C. Gottlieb
Regional Director
U.S. Department of Interior
Minerals Management Service
Alaska Outer Continental Shelf Region
949 East 36th Avenue, Room 603
Anchorage, Alaska 99508-4302

AOGA Comments on Alaska OCS Lease Sale 144, Beaufort Sea - Draft EIS

Dear Director Gottlieb:

The Alaska Oil and Gas Association (AOGA) is a trade association whose member companies account for the majority of oil and gas exploration, production, transportation, refining and marketing activities in Alaska. AOGA hereby respectfully submits the following comments to the Minerals Management Service (MMS) for Oil and Gas Lease Sale 144's draft Environmental Impact Statement ("EIS") on behalf of all of its member companies.

AOGA supports Alternative I, OCS Sale 144, as proposed. However, members have indicated a higher degree of interest in the areas offered nearest to the shoreline, close to existing infrastructure and surrounding existing units.

AOGA commends the MMS in its effort to maintain a timely and regular Lease Sale schedule. AOGA strongly encourages the MMS to offer OCS Sale 144 as scheduled.

Individual companies are responding to specific areas of the EIS. We do note that the draft EIS assumes a number of spills for the environmental analyses of Alternatives I and III. The predicted number of spills is overstated and does not match historical or current industry experience in the Beaufort Sea. AOGA-01

Thank you for your consideration of these comments.

Sincerely,

Judith Brady

JUDITH M. BRADY
Executive Director

JMB:ts

FOLLOW-UP
MAIL COPY

AOGA-01
Because there has been no crude oil production in the OCS area of the Alaskan Beaufort Sea, the rate for spills ≥1,000 bbl is based on U.S. OCS platform and pipeline spill rates (1964-1992) and North Slope Crude Oil Tanker Spill Rates (1977-1992) (Anderson and LaBelle, 1994). Rates for spills <1,000 bbl also are based on OCS spills. As noted in Table B-57, the rate for exploration spills is based on the Alaskan OCS historical record. Production spills (<1,000 bbl) are based on the OCS experience. Spills associated with operation of North Slope pipelines and TAPS are based on the historical record (Alaska Dept. of Environmental Conservation records) for the period 1989 through 1994.

BP EXPLORATION

Alaska Exploration

BP Exploration (Alaska) Inc.
900 East Benson Boulevard
PO Box 196612
Anchorage, Alaska 99519-6612
(907) 561-5111

November 9, 1995

Judith C. Gottlieb
Regional Director
U.S. Department of the Interior
Minerals Management Service
Alaska Outer Continental Shelf Region
949 East 36th Avenue, Room 603
Anchorage, Alaska 99508-4302

RECEIVED
NOV 2 ? 1995
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Subject: OCS Lease Sale 144, Beaufort Sea - Draft EIS

Dear Director Gottlieb:

In response to your August 23, 1995 request for comments on the draft environmental impact statement for OCS Sale 144, please find attached detailed comments prepared for BP Exploration (Alaska) Inc. We reiterate our earlier requests that Sale 144 be maintained on schedule for September 1996 and our offer to assist the MMS in any pre-sale activities in which you require our assistance.

Thank you for this opportunity to comment on Sale 144.

Very truly yours,

E. P. Zseleczky, Jr.
Land Manager, Alaska

EPZ:lbs

BP Exploration (Alaska) Inc. Comments
on
Alaska OCS Lease Sale 144, Beaufort Sea - Draft EIS
Minerals Management Service

BP Exploration (Alaska) Inc. (BPX) is pleased to have the opportunity to provide comments to the Minerals Management Service (MMS) on the Draft EIS for the Beaufort Sea Planning Area Oil and Gas Lease Sale 144.

Sec. I(A) – [p. I-1]

BPX supports continuation of the OCS Environmental Studies Program by MMS as a means to produce relevant information about potential effects of oil and gas activities on the environment. The 280-plus studies conducted since the 1970's on offshore petroleum exploration (including 62 studies specifically on the Beaufort Sea planning area) provide strong technical support for the Proposed Action and future lease sales in the Alaska OCS region.

Sec. I(D)(1)(c) – [p. I-8 to I-9]

BPX supports the MMS designation of issues not warranting detailed analysis in the EIS. The significant experience developed by MMS in this region supports the current focus on appropriate and relevant environmental impacts.

Sec I(D)(2) – [p. I-10]

BPX supports the alternatives analysis conducted by MMS and supports the current schedule for Lease Sale 144.

Sec. I (D)(3)(b) – [p. I-15[

BPX supports the MMS decision to not recommend seasonal drilling restrictions as an additional mitigation measure. BPX agrees that seasonal drilling restrictions are not warranted and that concerns can be adequately addressed through monitoring programs and oversight by the MMS Regional Supervisor, Field Operations.

Sec. II(D)(1) – [p. II-4]

BPX supports annual Beaufort Sea environmental and cultural training for all employees and contractors involved in onsite exploration or development and production activities and will continue to provide training for all appropriate personnel.

Sec. II (D)(1) – [p. II-5 through II-9]

BPX supports appropriate and practicable mitigation measures to protect environment and biological resources. We encourage MMS to base those decisions on the best

V-62

available scientific information and we have included in our comments additional citations that may assist the Service in their efforts.

Regarding industry site-specific Bowhead Whale monitoring, BPX supports programs at a level appropriate for the location, season and proposed activity. For example, bowhead whale monitoring may not be appropriate for activities in coastal areas with only rare or incidental sightings of whales, but would be appropriate for offshore regions. It may be important to clarify in the Final EIS that temporary disturbances to whales are not necessarily sublethal because there may be no physiological impact that affects the fitness of the animal. BPX-01

BPX believes that additioal mitigation measures to protect bowhead whales in the spring-lead system are not warranted at this time. Bowheads are not known to occur within the lease sale area in the spring, but are present further offshore. BPX-02

Sec. II(D)(1) – [p. II-11]

BPX supports development of polar bear interaction plans for all OCS activities to help prevent human-bear interaction and raise environmental awareness.

Sec. III(A)(3) through III(b)(2) – [pp. III-A-3 through III-B-2]

MMS may wish to consult and include additional references for these sections in the Final EIS:

- 1994 Endicott Development Fish Monitoring Program, Vol. 1., 14 June 1995, prepared by LGL Alaska Research Associates, Anchorage, AK for the North Slope Borough and BP Exploration (Alaska) Inc.

- LGL Alaska Research Associates, Inc. 1990. The 1988 Endicott Development Fish Monitoring Program. Final Annual Report. Prepared by LGL Alaska Research Associates, Inc., Anchorage, AK for the North Slope Borough and BP Exploration (Alaska) Inc.
  - Volume I. Executive Summary and Synthesis
  - Volume II. Recruitment & Population Studies, Analysis 1988 Fyke Net Data
  - Volume III. Laboratory, Bioenergetics, and Genetic Studies
  - Volume IV. The 1988 Fall Gill Net Fisheries for Ciscoes in the Colville River
  - Volume V. Integration and Assessment Papers

- LGL Alaska Research Associates, Inc. 1990. The 1989 Endicott Development Fish Monitoring Program. Annual Report. Prepared by LGL Alaska Research Associates Inc., Anchorage, AK for the North Slope Borough and BP Exploration (Alaska) Inc. Final Reports.
  - Volume I. Executive Summary and Synthesis
  - Volume II. Analysis of Fyke Net Data
  - Volume III. The 1989 Colville River Fishery
  - Volume IV. Papers Contributing to Synthesis

- LGL Alaska Research Associates, Inc., Hunter/ESE Environmental Services, Inc. and W. J. Gazey Research. 1990. Analysis of 1985-1987 Data Collected by the Endicott Development Monitoring Program. Final report prepared by LGL Alaska Research Associates, Inc., Hunter/ESE Environmental Services, Inc. and W. J. Gazey Research for the North Slope Borough and BP Exploration (Alaska) Inc.
  - Volume I: Oceanographic Processes
  - Volume II: Results and Preliminary Impact Assessment
  - Volume III: Data Appendices

- Science Applications International Corporation (SAIC). 1990. Endicott Environmental Monitoring Program, Annual Report - 1989. Prepared by Science Applications International Corporation, Anchorage, Alaska, for the U.S. Army Corps of Engineers, Alaska District, Anchorage, AK. (Oceanography, River Discharge, Ice Breakup/Freeze-up, Sedimentation and Erosion, Caribou, and Snow Goose).

- Science Applications International Corp. 1993. 1988 Endicott Environmental Monitoring Program Final Report. Report for Alaska District, U.S. Army Corps of Engineers, Anchorage, AK.
  - Vol 1: Integration and Assessment
  - Vol 2: Oceanography
  - Vol 3: Breaches, Modeling, Sedimentation and Erosion
  - Vol 4: Ice Breakup/Freeze, Meteorology, River Discharge, Caribou
  - Vol 5: Snow Goose

- Science Applications International Corp. 1993. 1989 Endicott Environmental Monitoring Program Final Report. Report for Alaska District, U.S. Army Corps of Engineers, Anchorage, AK.
  - Vol 1: Integration and Assessment
  - Vol 2: Oceanography
    - Part 1 Oceanography - Main Report
    - Part 2 Appendices A-F
    - Part 3 Appendices G-J
    - Part 4 Appendices K-V
  - Vol 3: Breaches, Circulation Modeling, Sedimentation and Erosion
  - Vol 4: Ice Breakup/Freezeup, Meteorology, River Discharge
  - Vol 5: Caribou, Snow Goose

- Science Applications International Corp. 1994. 1990 Endicott Environmental Monitoring Program Final Report. Report for Alaska District, U.S. Army Corps of Engineers, Anchorage, AK.
  - Vol 1: Integration and Assessment
  - Vol 2: Oceanography
    - Part 1 Oceanography - Main Report & Appendices A-F
    - Part 2 Appendices G-X
  - Vol 3: Breaches, Circulation Modeling,
  - Vol 4: Sedimentation and Erosion, Ice Breakup/Freezeup
  - Vol 5: Meteorology, River Discharge, Caribou
    Caribou Synthesis (1987-1990)
  - Vol 6: Snow Goose

- Science Applications International Corp. 1994. 1991 &1992 Endicott Environmental Monitoring Program Final Report. Report for Alaska District, U.S. Army Corps of Engineers, Anchorage, AK.
  - Vol 1: Snow Goose

Sec. III(B)(2) - [p. III-B-3]

MMS may wish to consult with LGL Alaska Research Associates Inc. of Anchorage AK for new information on the eastern edge of the range of broad whitefish, as determined by 1995 studies in Mikkelsen Bay. In addition, MMS may wish to consult and include additional references for these sections in the Final EIS: BPX-03

- English, K. K. 1991. Effects of Temperature, Salinity and Prey Abundance on the Growth of Arctic Cisco and Broad Whitefish Feeding on Epibenthic Prey in *in-situ* Enclosures. Amer. Fish Soc. Symposium No. 11:119-131.

- Fechhelm, R. G. and W. B. Griffiths. 1990. The Effect of Wind on the Recruitment of Canadian Arctic Cisco (*Coregonus autumnalis*) into the Central Alaskan Beaufort Sea. Can. J. Fish. Aquat. Sci. 47:2164-2171.

- Fechhelm, R. G., J. S. Baker, W. B. Griffiths, and D. R. Schmidt. 1989. Localized Movement Patterns of Least Cisco (*Coregonus sardinella*) and Arctic Cisco (*C. autumnalis*) in the Vicinity of a Solid-Fill Causeway. Biological Papers of the University of Alaska 24:75-106. BPX-03
- Gallaway, B. J., W. J. Gazey, and L. L. Moulton. 1989. Population Trends for the Arctic Cisco (*Coregonus autumnalis*) in the Colville River of Alaska as Reflected by the Commercial Fishery. Biological Papers of the University of Alaska 24:153-165.
- Moulton, L. L. 1989. Recruitment of Arctic Cisco (*Coregonus autumnalis*) into the Colville Delta, Alaska, in 1985. Biological Papers of the University of Alaska 24:107-111.
- Moulton, L. L., L. J. Field and R. Kovalsky. 1991. Predictability in the Catch of Arctic Cisco (*Coregonus autumnalis*) in the Colville River, Alaska. Amer. Fish Soc. Symposium No. 11:145-156.

Sec. III(B)(6) – [p. IIIB13]

BPX suggests that updated data for caribou herds be included in the Final EIS. The Porcupine Caribou Herd decreased from 178,000 animals in 1989 to 152,000 in 1994 (pers. comm. Whitten, ADF&G, 1995). The Central Arctic Herd is currently estimated at 18,100 (ADF&G, 1995). In addition, references in this section to movements of large numbers of caribou (in excess of 50,000) should be attributed to specific herds. BPX-04

BPX believes that many of the impacts described in this section can be attributed to the early field design found in older portions of the Prudhoe Bay field. Many mitigating measures to eliminate adverse impacts to caribou herd movements through the field are currently used and would be included in the design of faciltiies to access OCS reserves, including but not limited to the separation of pipelines from gravel roads, the construction of pipelines from ice roads, and the elevation of pipelines.

It is important to clarify that cow/calf pairs are most sensitive to disturbances not in late July when they have massedin large herds but rather immediately following calving in late May. BPX-05

The following reference may be helpful:

- Alaska Oil and Gas Association. 1994. Mitigation of the Effects of Oil Field Development and Transportation Corridors on Caribou. Final report to AOGA. Prepared by LGL Alaska Research Associates.

Sec. IV (A)(1)(b)(2)(c) – [p. IV-A-3] and [p. IV-B-47] BPX-06

The Final EIS should be updated to note that the Dalton Highway is now open to public traffic.

Sec. IV(B)(4)(b) – [p. IV-B-22]

BPX believes that biological resources should be protected, but it the Final EIS should recognize that many wildlife species are only present in limited numbers in the winter (especially birds) and therefore many of the predicted impacts will only be short-term and temporary. BPX-07

The following additinal references may be helpful in preparation of the Final EIS:

- Pollard, R. H. and W. B. Ballard. 1993. Caribou Distribution in the Prudhoe Bay Oil Field, Summer 1992. Prepared by LGL Alaska Research Associates, Inc. for BP Exploration (Alaska) Inc.
- Pollard, R. H. and W. B. Ballard. 1993. Parasitic Insect Abundance and Microclimate on Gravel Pads and Tundra, and Observations of Caribou in the Prudhoe Bay Oil Field, Alaska, Summer 1992. Prepared by LGL Alaska Research Associates, Inc. for BP Exploration (Alaska) Inc.
- Truett, J. C., Bergerud, A. T., and D. Roseneau. 1989. Characteristics of Caribou and Reindeer Calving Areas. Draft Manuscript. Funded by Alaska Oil and Gas Association, Anchorage, AK. 53pp.
- Schmidt, D., W. B. Griffiths, D. K. Beaubien and C. J. Herlugson. (n.d.). Movement of Young-of-the-year Arctic Cisco Across the Beaufort Sea Coast. Amer. Fish Soc. Symposium No. 12.

Sec. IV(B)(4)(b)(1) – [p. IV-B-22]

There is no reference provided to support the statement that air traffic may have already adversely affected species of birds, including brant, molting and staging oldsquaw, and nesting common eiders. In general, this section would be strengthened by the inclusion of more supporting documentation. The references include do not indicate that disturbances will occur, but the summary section concludes that adverse impacts will occur. The following additional materials may be helpful in preparation of the Final EIS: BPX-08

This section needs more supporting documentation, only references included state that there will be no disturbance but the conclusions are that adverse impacts will occur.

- Johnson, S. R. 1991. The Status of Snow Geese in the Sagavanirktok River Delta Area, Alaska: A 12-Year Summary Report: 1980-1991. Prepared by LGL Alaska Research Associates, Inc., Anchorage, AK. Prepared for BP Exploration (Alaska) Inc. 25 pp. plus figures.
- Johnson, S. R. 1992. The Distribution, Abundance, and Movements of Black Brant in the Sagavanirktok River Delta, Alaska, 1991. Prepared by LGL Alaska Research Associates, Inc., Anchorage, AK. Prepared for BP Exploration (Alaska) Inc. 14 pp
- Johnson, S. R. 1994. The Status of Black Brant in the Sagavanirktok River Delta Area, Alaska, 1991-1993. Prepared by LGL Alaska Research Associates, for BP Exploration (Alaska) Inc.
- Johnson, S. R. 1994. The Status of Lesser Snow Geese in the Sagavanirktok River Delta Area, Alaska, 1980-1993. Prepared by LGL Alaska Research Associates, Inc., for BP Exploration (Alaska) Inc.
- Johnson, S. R. 1984. Habitat Use and Behavior of Nesting Common Eiders and Molting Old squaws at Thetis Island, Alaska, During a Period of Industrial Activity. Prepared by LGL Alaska Research Associates, Inc., Anchorage for SOHIO Alaska Petroleum Co., Anchorage, AK. 65 p.
- Ritchie, R. J., P. W. Banyas, A. A. Stickney, R. M. Burgess, and J. G. King. 1990. Tundra Swan and Brant Surveys on the Arctic Coastal Plain, Colville River to Staines River, 1990. Final Report. Prepared by Alaska Biological Research, Inc., Fairbanks, AK for ARCO Alaska, Inc., Kuparuk River Unit, The Duck Island Unit Owners and BP Exploration (Alaska) Inc.
- Ritchie, R. J., Banyas, P. W., Stickney, A. A., and King, J. G. 1992. Tundra Swan and Brant Surveys on the Arctic Coastal Plain, Colville River to Staines River, 1991. Final Report. Prepared by Alaska Biological Research, Inc., Fairbanks, AK for ARCO Alaska, Inc., Kuparuk River Unit, Endicott Unit Owners and BP Exploration (Alaska) Inc.

- Stickney, A. A., R. J. Ritchie, B. A. Anderson, and D. A. Flint. 1994. Tundra Swan and Brant Surveys on the Arctic Coastal Plain, Colville River to Sagavanirktok River, 1993: Prepared for ARCO Alaska, Inc. Prepared by Alaska Biological Research, Inc., Fairbanks, Alaska.

- Stickney, A. A., R. J. Ritchie, B. A. Anderson, D. A. Flint, P. W. Banyas, and J. G. King. 1993. Tundra Swan and Brant Surveys on the Arctic Coastal Plain, Colville River to Staines River, 1992. Prepared for ARCO Alaska, Inc. Prepared by Alaska Biological Research, Inc., Fairbanks, Alaska.

- Stickney, A. A., R. J. Ritchie, P. W. Banyas, and J. G. King. 1992. Tundra Swan and Brant Surveys on the Arctic Coastal Plain, Colville River to Staines River, 1991. Prepared for ARCO Alaska, Inc. Prepared by Alaska Biological Research, Inc., Fairbanks, Alaska.

Sec. V-B-34

BPX supports the statements in this section that bowhead whales are not present in the Lease Sale area in the spring, remaining further offshore in open leads.

Sec. V(B)(7)(c)(1) – [p. IV-B-46]

BPX-09

BPX believes that many of the adverse impacts described in this section can be attributed to the field design found in the Prudhoe Bay field. Many mitigating measures to eliminate adverse impacts to caribou herd movements through the field are currently used and would be included in the design of faciltiies to access OCS reserves, including but not limited to the separation of pipelines from gravel roads, the construction of pipelines from ice roads, and the elevation of pipelines.

Sec. V(D)(7) - [p. IV-D-6]

BPX-10

This section discusses an alternative to the Proposed Action which includes no development in the Barter Island deferred area and onshore development similar to the base case. The onshore effects for caribou are dexcribed in the discussion section as local and short term. However, in the "Conclusion" section for caribou, the displacement effects are described as long-term, directly contradicting the discussion above and previous discussions for the more comprehensive altern ative. This discrepancy should be changed to note only local and short-term effects on caribou.

Sec. IV(G)(7) – [p. IV-G-21]

BPX-11

MMS may wish to consult additional material for this section, as described above. BPX does not believe that evidence exists to support the theory that the growth of arctic caribou herds within their ranges is or could be limited by oil development facilities. No study has ever established a discemible effect from oil field activities on regional distribution, migration pattems, calving success, herd size, productivity, or other biologically important characteristic of caribou. Oil field structures have not caused large scale blockage of caribou movement, regional displacement of caribou, or a significant reduction in available habitat.

BPX-12

The reduction in calving habitat use is limited to those areas immediately adjacent to pipelines with roads and is temporary. There is no evidence to suggest that oil development facilities could prevent caribou herds from reaching the maximum

BPX-12

population size that they could achieve on their present ranges without the presence of development.

BPX-13

Calf production varies annually in the absence of development (e.g., sample cow:calf ratios for the Western Arctic Herd have been 75%, 42%, and 51% during one three year period of general herd growth)Caribou in the Arctic are not habitat limited. Population changes evident in the Central Arctic Herd in 1994 mirror population changes in the Western Arctic and Porcupine herds and continue to show that these populations are cyclic and are responding to a multitude of natural changes in the distribution and productivity of the herds. Growth rates and cow:calf ratios for the CAH are similar to those rates for the PCH, the WAH, and the Teshekpuk herds.

BPX-14

There is no evidence to support the theory that the Central Arctic Herd is divided into distinct east or west segments that are responding differently to oil development facilities. It is not possible to show which caribou have avoided all contact with oil development and there are no data to support these claims. References cited (Cameron, 1994) have not been published or made available for public comment, do not distinguish between disturbance and displacement. It is unclear how caribou can be experiencing disturbances if they have been displaced.

BPX-15

Finally, caribou movements in the summer are dictated by the need to feed and to avoid the swarms of insects which occur primarily in July (mosquitoes and parasitic oestrid flies (warble flies and bot flies). On cooler days, caribou move inland to feed, often within the oil field complex (Cameron, 1983; Pollard and Ballard, 1993). Insects are less abundant on the gravel pads and roads, presumably due to higher wind velocity due to the elevation, lower ambient temperature, and lack of vegetation. Therefore the construction of gravel roads may result in beneficial impacts to caribou by providing increased habitat for protection from insect harassment.

BPX-01
The term sublethal has been changed to nonlethal in the text in Section IV.B.6 in the FEIS.

BPX-02
Bowhead whales do occur in the western portions of the proposed lease sale area during the spring migration. The issue of the need for additional mitigating measures is not addressed here.

BPX-03
The comment points out several excellent sources of information about anadromous fish and the effects of causeways on them. The sources have been contacted or reviewed, and some information has been added to the description of the affected environment (Secs. III.B.2.b and d) and the cumulative-effects section in which the effects of long causeways are assessed (Sec. IV.H.3.a.4).

BPX-04
The text in Section III.B.6 has been changed in response to this comment.

BPX-05
The text in Section IV.B.7 has been changed in response to this comment.

BPX-06
The text in Section IV.A.1 has been changed in response to comments.

BPX-07
The DEIS recognizes that many wildlife species are present in limited numbers during the winter months, especially birds. However, not all OCS activities assumed to be associated with the proposal, such as air and vessel traffic, would occur only during the winter months but are expected to occur during the summer open-water season, when large numbers of birds are present in the Sale 144 area. Statements concerning wildlife presence have been incorporated where necessary to clarify vulnerability. The DEIS recognizes that noise and disturbance effects on wildlife such as birds are expected to be short term (a few minutes to < 1 hour) (see Sec. IV.B.4, Conclusion).

BPX-08
The text in Section IV.B.4.b(1) has been revised in response to this comment.

BPX-09
Although the field design used on more recently developed oil fields such as the Kuparuk River and Milne Point oil fields allow for improved access and movement of caribou, the Milne Point road and pipeline have affected cow-calf habitat use and distribution during and shortly after the calving season within about 2 km of the pipeline and road (see Sec. IV.B.7a, Effects of Disturbance, and Sec. IV.H.7.b, Displacement from Calving Areas). Although separation of pipeline and road would help reduce the displacement of calving caribou, such measures are not always feasible. The MMS has no jurisdiction to implement such measures and, therefore, the DEIS cannot assume such measures will be part of the proposal. Burial of the onshore pipeline and no construction of a road would be much better mitigations of effects on caribou such as is being proposed by BP Exploration for the Badami oil field prospect. Such a measure, along with seasonal restriction on construction activities during the spring-summer, would be expected to essentially avoid all effects on caribou. However, MMS has neither the jurisdiction nor authority to implement such measures or assume that these measures would be part of the Proposal.

BPX-10
The Text in Section IV.D.7 has been changed in response to this comment.

BPX-11
The MMS analyst (wildlife biologist) for Section IV.H.7 is aware of and has copies of the biological reports listed in the BPX comments on 144 DEIS. Some of these studies and other studies describe the overall distribution and movements of CAH caribou over the oil fields and indicate that there has been no regional effects on caribou distribution or abundance. But these studies do not disprove the findings of Cameron et al. (1992). The DEIS in Section IV.H.7 recognizes that so far, the displacement and reduction in habitat use by calving caribou is very local (within 2 km) near some oil-field pipelines and roads and concludes that the cumulative effects are expected to be local but long term (during and shortly after each calving season) over the life of the oil fields.

BPX-12
The DEIS recognizes that the reduction in calving habitat use by the CAH is only adjacent to oil development facilities (within about 2 km of the pipeline-road) and that the displacement is "temporary" in that the displacement occurs during the calving season and persists for perhaps 1 month after the calving season when the caribou begin to move over the tundra to avoid insect harassment. Thus, the displacement is no longer apparent due to the great variation in the natural movements and distribution during the insect season. However, this seasonal displacement (during the calving season) has been shown to persist every year since the oil field facility (Milne Point pipeline and road) was constructed (Cameron et al. 1992). The DEIS recognizes that there is no conclusive evidence that oil development would prevent the caribou herds from reaching maximum population size and concludes that cumulative local displacement of caribou may not result in a long-term effect on caribou abundance or affect productivity (see Conclusion to Sec. IV.H.7).

BPX-13
This commenter states that "caribou in the Arctic are not habitat limited." If this were true, there would not be the great variation in the annual herd productivity-cow-calf ratios. Habitat limitation for caribou is reflected though seasonal and annual variation in the quality and availability of forage plants on the spring-summer ranges and winter ranges (see Sec. III.B.6, last paragraph). The CAH calf production is similar to that of the other Arctic herds in 1994, and recent herd productivity data and population declines in some of these herds suggest that all of these herds are near or at their range-habitat carrying capacity. If local displacement and disturbance of CAH caribou is going to have an effect on individual cow reproductive success or affect the herd productivity, it would be expected to occur when the CAH is at range carrying capacity and the cows are competing with each other for calving space and forage during the calving season (see Sec. IV.B.7.a.(1), General Effects of Disturbance).

BPX-14
Cameron (1994) has been published by ADF&G in Juneau and is available to the public (see the 144 DEIS Bibliography). Cameron (1994) does not propose that the CAH is divided into distinct east and west segments nor that caribou east of the oil fields were never exposed to the oil field facilities. Cameron (1994) reported that cow caribou that happen to calve east of the oil fields appear to be have higher reproductive success than cow caribou that calve on the oil fields to the west.

BPX-15
The 144 DEIS recognizes the beneficial effects that gravel roads and drill pads provide to caribou during the insect season (see Sec. IV.B.7.c (2), General Effects of Habitat Alteration).

DEPARTMENT OF THE INTERIOR

MINERALS MANAGEMENT SERVICE
949 East 36th Avenue
Anchorage, Alaska 99503

OFFICIAL TRANSCRIPT

PUBLIC HEARING

BEAUFORT SEA SALE 144 DRAFT EIS

Fourth Floor Conference Room
Minerals Management Service
Anchorage, Alaska

Thursday, October 26, 1995
12:00 o'clock noon

MINERALS MANAGEMENT SERVICE PANEL MEMBERS

Ms. Judy Gottlieb, Regional Director of the Alaska Outer Continental Shelf Region

Mr. Rance Wall, Regional Supervisor for Resource Evaluation

Mr. Jeff Walker, Special Assistant to the Regional Director

Proceedings recorded by electronic sound recording. Transcript produced by transcription service.

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Executary Court Reporting
626 Cordova, Suite 104
Anchorage, AK 99501
Phone: (907) 272-4084

ANCHORAGE, ALASKA - THURSDAY, OCTOBER 26, 1995

(On record at 12:00 noon)

COURT REPORTER: On record.

MS. GOTTLIEB: Welcome to the hearing on the Draft Environmental Impact Statement for the Proposed Federal Oil and Gas Lease Sale 144 in the Beaufort Sea. The area that's discussed in the Environmental Impact Statement is shown on the map behind me. Yes. Or we have a map showing the area.

My name is Judy Gottlieb. I'm the Regional Director of the Alaska Outer Continental Shelf Region. Other panel members include Rance Wall, Resource Evaluation Regional Supervisor and Jeff Walker, my Special Assistant. This is our first public hearing, and others will be held November 6 through 8 in Nuiqsut, Kaktovik, and Barrow, respectively.

If you would, as a testifier, please state your name and address and the organization or agency you represent. We may need for you to spell your name just to make sure we have it clearly. If you have any prepared testimony, please provide a copy for us to the Court Reporter. And we would like testifiers, of course, to come up to the microphone. Our Recorder is making a verbatim transcript. Everything that is spoken here while we are in session will be recorded, and if you would like a copy you may see Cindy about obtaining one.

The purpose of this hearing is to improve the quality

of the Environmental Impact Statement before it is put in final form. Speakers will not necessarily be questioned unless one of us has a need to have some facts clarified or obtain additional information.

The comment period for this document closes November 20th. Until that time, we will accept written statements from anyone who would prefer to make written rather than oral comments. Those written comments and statements should be sent to us at 949 East 36th Avenue, Anchorage 99508. Again, the comment period ends on November 20th.

And so I think our first testifier, please come forward.

(Pause)

PUBLIC TESTIMONY OF MR. ROBERT K. BELL

Thank you, Madam Chairman. My name is Robert Bell. I am Chairman of the Fisheries Joint Management Committee which is a legislatedely based co-management body in Canada's Western Arctic created as a result of the Inuvialuit final agreement and the subsequent legislation that followed to settle a land claim. I have a card here that I'll leave here with you.

MS. GOTTLIEB: Great.

BY MR. BELL (Resuming):

I first of all appreciate the opportunity to be able to speak to you. I would -- what I would like to say is largely on behalf of the Inuvialuit of the Western Arctic, folks who live in the area directly east of the area under consideration for the gas and oil lease sale.

Like the Inupiat of your North Slope, the Inuvialuit have occupied the Yukon North Slope and the adjacent land and islands in and around the Mackenzie Delta for thousands of years. Like the folks on the Alaska North Slope, many Inuvialuit choose to follow a subsistence lifestyle and are therefore dependent upon wildlife, both marine and terrestrial, for their well-being. It's therefore not surprising that when they signed their own land claim agreement with the government of Canada in 1984, that agreement contains some very strong provisions to deal with the impacts of developments that were anticipated for this settlement region, especially those related to oil and gas.

The land claim established a two-tiered screening and review process to consider all development activities and assured the Inuvialuit that they would have equal represent- -- representation with government at both the initial screening levels and the review processes. Thus, within the settlement region, the Inuvialuit feel that they have the tools to protect and give preference to their subsistence lifestyle.

While the Inuvialuit have every confidence that the review process -- processes which are planned for the various developmental activities that may be contemplated for the Alaska North Slope will be every bit as rigorous and as

comprehensive as their own, they do wish to point out that this particular impact statement pays scant attention to the fact that many of the resources at risk are shared resources. That is, they are hunted and harvested on both sides of the Alaska/Canada border.

For some species, such as beluga and bowhead whales, the coastal waters off the Alaska North Slope form a highway, providing passage to and from wintering areas to the west and south and summering areas in the Canadian Beaufort Sea. Belugas whales, particularly, are important culturally and as a food source in the settlement region.

The waters of the Beaufort Sea support a polar bear population that is hunted extensively in both Canada and Alaska. That it is a shared population is supported by extensive scientific research. Acknowledging this fact, wildlife biologists on both sides of the border jointly provide management advice to the Alaska/Inuvialuit Polar Bear Commission so that the population can be managed sustainably for the benefit of both Inuvialuit and Alaskans. Yet this is the population that will be put at risk when the oil spills that the stats -- statisticians say are almost in- -- inevitable do occur.

This is also the case for large populations of other subsistence resources, such as migratory waterfowl. These resources may be more at risk even, since the lethal effects of relatively small amounts of oil are well documented. Within the area of potential impacts, such effects are likely to be both acute and chronic as there exists the likelihood of severe degradation of critical habitats such as staging and nesting areas.

Many of the fish species that will be at risk as a result of subsequent activities related to this EIS are migratory in nature. Some of these are important in both areas in a food chain sense, providing energy inputs for higher levels in the system. Others, like corregonids, herring, and arctic char are food fish and end up in the nets and on the dinner tables on both sides of the border.

Now, the Inuvialuit are quite able to qualify and quantify all of the above, should it be necessary. They have been conducting a comprehensive harvest study for the past eight years and know with accuracy the number of belugas whales harvested, the number of polar bears taken from the shared population, the volume of fish caught by species, by household, and by community. It is interesting to note that one of the reasons they decided to implement such a comprehensive and expensive harvest study was to provide themselves with the information necessary so that they could negotiate compensation agreements with industry in Canada.

Panel, I don't want to take any more of your time. However, I do want to assure you that the Inuvialuit feel that

they have a great deal at stake in this process and the likely subsequent developments. They feel that because of the potential negative impacts on their traditional and subsistence way of life, their concerns must be taken into account in the EIS process. They are prepared to contribute information and knowledge to the extent that their resources allow. Thank you. ANCH-01

MS. GOTTLIEB: Thanks. We certainly would like to get information on those particular harvest studies. That would be helpful to us. And I guess I also wondered, I'm sure it is in the study, whether they take narwhals?

MR. BELL: No. Narwhals are very incidental in our area.

MS. GOTTLIEB: Okay. Thanks.

(Pause)

MR. BELL: I could leave a copy of this if it would be helpful.

MS. GOTTLIEB: It would be great. We sure would like a card and we'll.....

MR. BELL: Sure.

MS. GOTTLIEB: We can be in touch with you.....

MR. BELL: Sure.

MS. GOTTLIEB: .....about getting some of those studies.

MR. BELL: Yes. And I'd just point out that as my technology failed once more and I had to fax this to myself to -- so that I could.....

MS. GOTTLIEB: We could make an extra copy.

MR. BELL: Yes, that would be.....

MS. GOTTLIEB: Yeah. And you're coming over to Kaktovik as well?

MR. BELL: I won't be there. We -- the Game Council, the Inuvialuit Game Council, which is the body that represents the collective interests in renewable resources for the Inuvialuit, are planning to have a delegate there. But you have to recognize that the only way to get over is to charter from Inuvialuit and its 10 or 15 thousand dollars to do it. So it's a -- if they are able to make it, that's another signal of their interests.

MS. GOTTLIEB: Right. Right.

MR. WALKER: Are your harvest studies specific to the Canadian side, or is that inclusive of both sides of the border?

MR. BELL: Just inside the settlement regions, or just to the Alaska border.

MR. WALKER: Okay.

MS. GOTTLIEB: Carl, you're welcome to come up.

(Pause)

MR. HILDE: Going to have to smash my knees on the table here.

(Laughter - Pause)

PUBLIC TESTIMONY OF MR. CARL HILDE

Okay. My name is Carl Hilde. I'm a biologist with the Indigenous Peoples Council for Marine Mammals, and I work at the Rural Alaska Community Action Program. I appreciate the opportunity to come in to this hearing. I double-checked my notice a couple different times, and I thought 12:00 o'clock noon was a strange time to start a hearing. I brought my lunch just 'cause I figured I might have to sit here for awhile, and I wasn't sure.

(Laughter)

But let me jump into my comments here; mine go pretty much through the order of the document. I haven't actually even gotten through the entire piece, and I will be submitting written comments here in the next month so that I can have a full set of comments. But there were some pieces here that I found quite disturbing.

As I looked at this document, I anticipate that this is based on other documents that have been written in the past and am surprised at some major components that I believe to be lacking from this document that needs to be considered in the final EIS that's prepared. So I'll get into this right now.

On page II, Roman Numeral II-4, there's a list of stipulations that need to be considered for the document, and one of those is No. 5, which is for the subsistence and bowhead whale activities. And I was very pleased to see that this was specifically outlined in this document. But at the same time, under No. 1 and No. 4 -- which I think I better just refer to here. This is II-4. The point under the No. 1 portion is the protection of biological resources. Point No. 4 is to modify operations to ensure that significant biological populations or habitats deserving protection are not adversely affected.

It's a nice general statement, and as I went further through the document, I was impressed with the fact that there ANCH-02 wasn't a whole lot of substantiation. And someplace in this document I really think it needs to be spelled out that the Marine Mammal Protection Act has clearly stated what the definition of "take" is. And I find, later, that definition. But the concern here is that within the Marine Mammal Protection Act, it states clearly that in order to have that kind of incidental take, that if you anticipate that this is going to happen, you have to have a permit to do so.

Several years ago the oil companies asked for a blanket permit for polar bear issues from U.S. Fish and Wildlife Service. And just this past year that was -- actually, about two years ago now, that was approved but with the condition that within 18 months, a polar bear habitat strategy needed to be completed. That has been done, and so this is proceeding. However, if my memory serves me correctly, and I will be verifying this, the limit for that particular activity is from the border of the Arctic National Wildlife

Reserve heading west. So it's not inclusive of this lease sale area.

So the question would be, What happens to the areas ANCH-03 north of the Arctic National Wildlife Refuge that is not included in that incidental take permit for polar bears and walrus? Likewise, that's just for the U.S. Fish and Wildlife Service. It does not include all of the other species mammal species that are covered under the U.S. -- under the National Marine Fisheries Service.

And as is specifically mentioned in here, bowheads -- you know, I think it's -- it's good throughout this whole document. You have a section on bowhead whales. It is an endangered species, so it needs to be specified.

Polar bears are talked about. However, information on all of the other seals, I think, is relatively limited in this. Walrus are mentioned, and they don't get into this lease area to any great extent. But what I found absolutely shocking ANCH-04 is the fact that even though there's a reference to grey whale, there's no other information in this document that deals at all with grey whales, even though it's suggested -- and I'll set out the specific rec- -- point where there's a conflict in the document.

Now, I understand, from talking to the National Marine Fisheries Service, that the oil companies have requested a blanket permit for incidental non-lethal take nationally for marine mammals, but that has not been approved to date. And so until that is, this could be a huge hang-up for the oil and gas lease sale as, throughout this document, it is mentioned that there may be situations where there would be spills, where there would be activity that would disturbed, and that is considered a take of these marine mammals, and so that an incidental take permit would be required for any specific activity.

So if it -- if they don't get a blanket permit for these incidental takes they'd have to be looking at every activity that was used for the development of this area would have to be specifically permitted, and it would be quite a process.

Also, that all of those permits must be coordinated with the local subsistence users. So there is a process where they -- the oil companies or whoever would be developing these lease sales -- would have to verify that they have met with local subsistence users and that there has been documentation of those meetings.

I think that at least this should be mentioned in this No. 1 point in this Item No. 4, that the Marine Mammal Protection Act and its requirements for incidental take need to be addressed. You don't have to go into a whole lot more detail, but I certainly think since this is early in the document, this is what -- one point where people are going to ANCH-05

be looking. ANCH-05

Therefore, Item No. 5 is not complete either, so that, with the bowhead whale, you'd want to be also looking at all of the other marine mammal species. It's not just the bowhead whale. Yes, it's endangered, but Marine Mammal Protection Act is for all the marine mammals, and therefore, it needs to be covered. ANCH-06

Item No. 3 should be expanded due to the paucity of data on all of the Arctic marine mammals, and that citation of all animals during the bowhead monitoring program should be made. The recommendation here would be that that would be excha- -- possibly retitled to being Bowhead Whale and Marine Mammal Monitoring Program. If you're going to be having crews out there monitoring for bowhead whales, the documentation of belugas and other marine mammals that are sighted during that time period would be valuable. I know that's -- that it does happen in those reports, but I think it should be specifically mentioned. ANCH-07

MS. GOTTLIEB: Excuse me, Carl. I'm getting a little confused when you're saying "Item 3" and.....

MR. HILDE: Okay. I'm.....

MS. GOTTLIEB: .....first I thought you meant the stipulation, but I'm wrong on that.

MR. HILDE: Yeah. Yeah, it's stipulation.

MS. GOTTLIEB: Well.....

MS. GOTTLIEB: Okay.

MR. HILDE: In regards to all take issues and the permits required.

MS. GOTTLIEB: Okay. 4, okay.

MR. HILDE: And then what I'm saying is, then, under the Industry Site-Specific Bowhead Monitoring Program.....

MS. GOTTLIEB: Right.

MR. HILDE: .....that should be expanded to bowhead whale as a primary focus, but also then include all of the marine mammals.

MS. GOTTLIEB: Okay. I've got it.

MR. HILDE: Okay.

MS. GOTTLIEB: Thanks.

MR. HILDE: I'm sorry. Okay.

BY MR. HILDE (Resuming):

The next item that I wanted to mention -- and I started flipping through this because I started looking at the maps, and I became concerned because last spring, President Clinton went to a meeting in Ottawa, Canada, to discuss a number of issues, and one of the things that was on the topic of discussion was the development of the Arctic Council.

The U.S. has opposed the Arctic Council for a number of years now, the basic philosophy, but agreed to enter into discussions if Canada would enter into discussions in regards to disputed boundary between the U.S. and Canada starting at

Demarcation Point. Canada has claimed for a long time that they claimed the area from Demarcation Point up 141 to the North Pole.

ANCH-08

This lease sale extends into that area. I don't think this should proceed any further until there's some clarity on what's going to happen in that area. So if there's to be a recommendation, Alternative 2 is no lease sale, or Alternative 3, that the Barter Island is deferred would be two ways to address this until that boundary dispute is clarified.

And I really think that it would be unfair to all the people bidding to move forward on that particular component of this lease sale until that boundary dispute is clarified and that both nations agree to exactly to whose territory we're talking about in that corner. And that was something I did not see anywhere in the document that -- as far as I've gotten, but I think it should be addressed since this is something that the State Department is currently investigating.

ANCH-09

On page III-B.7., I would recommend that your staff, if they have not seen them, get the -- this is September '95, so you may not have seen these yet. This is the Alaska Marine Mammal Stock Assessment Reports from the National Marine Fisheries Service, as well as the stock assessment reports both for Pacific walrus and for the Chukchi and Bering Sea stocks of polar bears. You can see these are October 4, '95, so they've been out for less than a month. So clearly, these were not

available when the draft was prepared, but they should be now considered for the next round of this, to include the most recent data.

ANCH-10

The other piece here. I do have a problem with the spelling of beluga. The correct common spelling is b-e-l-u-g-a, and the spelling that is used throughout this document is a white sturgeon from Russia. I don't think it's appropriate. I'm sorry.

(Laughter)

So I would recommend that since the National Marine Fisheries Service has beluga spelled one way, that we be consistent, at least on a national basis.

ANCH-11

Page III-B.7. mentions grey whale as being described below, but it's not. Grey whales are not described anywhere in this document that I have found. And that's a major error. We spent millions of dollars, the oil companies spent millions of dollars trying to rescue three of these silly critters a few years ago, and yet they're not even mentioned anywhere in this lease sale document. And that's a major, major error.

ANCH-12

Page III-C.9., No. 3, Subsistence Harvest Patterns. I would again refer back to the SRAs, the stock assessment reports. They do provide the latest information on harvest numbers.

As we get further into the document -- I'm now going to shift gears. I have a fascination with thermodynamic issues, and under Section IV-A.28., we start talking about pipelines that are going to be put under the Arctic Ocean. And yet there is no mention in any of the documents that I have seen to date that talks about biotic changes, changes of the local surrounding marine ecosystem when you start raising it a couple of temperatures by putting a heated pipe in the ground. ANCH-13

There's also been no mention of melting of the sea permafrost. There is a mention that it's more likely because the sea permafrost, being in the saltwater environment, is less frozen, or less cold, than the permafrost on shore, so that if you do put a heated pipe in the ground, no matter how well it's insulated, you increase the chance of having some thermo-erosion under water. Also, there's no mention about having a heated source below active ice, particularly the one that parallels the coast, not the one that's perpendicular to the coast. And this might actually weaken the ice and cause a lead system to be established that has not been there in the past. ANCH-14

So I would suggest that there be some information here about the heat loss gradient in water, undersea gravel, on-shore gravel, and elevated pipes, whether they're under water or on shore. I think this idea of having extensive pipes carrying hot oil under Arctic ice is an area that has not been discussed in this EIS. ANCH-15

As has been mentioned, I think, at hearings about a lot of oil development throughout the state, is the clean-up ANCH-16

capability of under-ice pipeline leaks. The viability of those technologies is stated in here as not being that great, nor in broken ice or in rough sea conditions. And think this is something that needs to be considered if this area is to be developed, that those technologies have to be tested in real world conditions. And until that's done, considering the statistics, you know, we would be looking at a spill here someplace in the future and no potential for really having the technology to clean up. ANCH-16

Page IV, Roman Number IV-A.21., any spill -- because it does talk in this section about the possibilities of a spill -- any spill will be a take under the MMPA, even if a single seal is affected, which is quite likely considering some of the statistics given in this document. So this needs to be mentioned. And this gets back to this idea of a blanket permit, which does not exists at this point, so that the way this document currently reads, in my mind, is that the likelihood of a spill is pretty great considering the large habitat used by a variety of marine mammals. You're talking about a set-up where any activity would require a permit for an incidental take. That should be anticipated.

Again, under IV-B., starting on page XXVI, there's a Section No. 5, which talks about all of the other marine mammals, but no grey whales are listed. And they should be under Section 5, not 6, because under Section 6, there's only ANCH-17

ANCH-17

endangered species, and grey whales have been taken off the grey whale listing at this point. So grey whales should be incorporated some place in the IV-B., page XXVI.

I mentioned about the spills, and I think that that's going to be self -- something that has to be dealt with in regards to this issue of take. IV-C.1., I was surprised; this is the no action section of the document, that if nothing is

ANCH-18

done with this sale, what would the impact be. I think it was pretty poor just to summarize this in two pages. I think there needs to be some comment about the socioeconomic impacts to the local communities, North Slope Borough, and the State.

If nothing happens there, we continue as is, but what possible impact that might be -- 'cause the- -- some of these communities, I think, are basing their future on continued development in the Arctic. And if suddenly this is not available to them for any consideration, it's going to have more ramification than just no mention in this particular section.

ANCH-19

Page IV-E.2. and other similar areas, again, I think need to address the lower trophic level organisms. This is in regards to the thermo impact of the heated pipe. And I'll mention -- but it -- it's throughout this document, there are numerous places where they talk about this lower trophic level, and there's been no mention of what happens when you put a hot pipe in the bottom of the Arctic Ocean. I think that you will

ANCH-19

see some significant change there because of the thermo-balance of a lot of those organisms.

ANCH-20

IV-G.21., habitat alternation should be modified to also consider not only the spills but the thermo-pipeline impact in the ocean -- undersea impacts.

ANCH-21

IV-H.1. concludes that there will be incidental take of marine mammals. This is illegal for companies to do this unless they have a permit to take, for incidental take. And that should be spelled out, that if you anticipate there will be spills and that there will be high likelihood of marine mammal impact, then these companies have to have these incidental take permits.

Thank you. I will be preparing this as a written document and submitting it later.

MS. GOTTLIEB: Great. Thanks Carl. As usual, very thoughtful comments. Hope you can stay a little bit.

MR. HILDE: Yeah.

MS. GOTTLIEB: There's some things that we probably can talk about that the hearing forum isn't exactly -- but we have.....

MR. HILDE: Fine.

MS. GOTTLIEB: .....some ideas to exchange with you. Thank you.

MR. HILDE: Thank you.

MS. GOTTLIEB: Sandra, if you'd would like to come up and.....

SANDRA: Oh, I don't -- did I sign in for comments?

MS. GOTTLIEB: I thought possibly.

SANDRA: Oh, no, I didn't have any really.

MS. GOTTLIEB: Okay. Okay.

SANDRA: I was just interested in the information.

MS. GOTTLIEB: Okay. Well, I believe then that's all our formal testifiers at this point. We'll go off the record, and maybe we can talk a little bit.

And Sandra, did you have some questions for us?

SANDRA: No. I hadn't seen a copy of the document, and I just read it in the paper, and I was mostly interested to.....

(Laughter)

COURT REPORTER: Off record.

(Off record at 12:30 p.m.)

(On record at 2:50 p.m.)

COURT REPORTER: On record. The time is 2:50 p.m.

(Side comments)

COURT REPORTER: I took your words.

MS. GOTTLIEB: Very good. Having no further people signing up to testify, we'll close the public hearing.

COURT REPORTER: The time is 2:51 p.m. The proceedings are now adjourned.

/ / /

(Whereupon, the proceedings in the above-entitled matter were adjourned at 2:51 p.m.)

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626 Cordova, Suite 104
Anchorage, AK 99501
Phone: (907) 272-4084

C E R T I F I C A T I O N

STATE OF ALASKA)
) ss.
THIRD JUDICIAL DISTRICT)

I, **CINDY S. CARL**, do hereby certify:

(1) That the foregoing pages contain a full, true, and correct transcript of proceedings in the above-entitled matter, transcribed by me, or at my direction and supervision, to the best of my knowledge and ability.

(2) That I have been certified for transcript services by the United States Courts.

(3) That I was certified for transcript services by the Alaska Court System prior to January 1, 1993.

SIGNED AND CERTIFIED:

BY: Cindy S. Carl
Cindy S. Carl
Certified Court Reporter

DATE: 12/8/95

CINDY S. CARL
NOTARY PUBLIC
STATE OF ALASKA

Executary Court Reporting
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Anchorage, AK 99501
Phone: (907) 272-4084

ANCH-01
The concerns of the Inuvialuit of the Western Canadian Beaufort Sea are equally as important as the concerns of the Inupiat living along the Alaskan Beaufort Sea coast. An attempt at incorporating traditional indigenous knowledge from the Inupiat North Slope Borough communities of Barrow, Nuiqsut, and Kaktovik has been done for the Sale 144 FEIS in order to address Native concerns about impacts to Inupiat traditional and subsistence lifeways. The MMS welcomes any information and knowledge that the Inuvialuit wish to contribute to the Sale 144 EIS analysis process.

ANCH-02
That industry is required to obtain a Letter Of Authorization for any anticipated incidental take, as well as the definition of take under both the Endangered Species Act and the Marine Mammal Protection Act, is set out clearly in Information to Lessee No. 1, Information on Bird and Marine Mammal Protection (Sec. II, p. II-7).

ANCH-03
Incidental take permits required for seals and whales in the Beaufort Sea Planning Area are discussed in ITL No. 1.

ANCH-04
Please see the response to Comment IPC-03.

ANCH-05
Please see the response to Comment ANCH-01; it is the same comment.

ANCH-06
Protection of marine mammals other than bowhead whales is discussed under ITL No. 1.

ANCH-07
Marine mammals other than bowhead whales are surveyed incidentally under the bowhead whale monitoring program and are listed and discussed in the monitoring reports.

ANCH-08
Please see the response to Comment IPC-01.

ANCH-09
The Alaska Marine Mammal Stock Assessment Reports (October 1995) do not include any new information on walrus, polar bear, seal, or whale distribution, abundance, or population statuses that is relevant to the 144 EIS. The information in these reports includes the same most recent information included in the 144 DEIS.

ANCH-10
Please see the response to Comment IPC-04.

ANCH-11
Please see the response to Comment IPC-03.

ANCH-12
Please see the response to Comment IPC-08.

ANCH-13
Please see the response to Comment IPC-09.

ANCH-14
Please see the response to Comment IPC-09.

ANCH-15
Please see the response to Comment IPC-09.

ANCH-16
Please see the response to Comment AEWC-05.

ANCH-17
Please see the response to Comment IPC-04.

ANCH-18
Please see the response to Comment IPC-12.

ANCH-19
Please see the response to Comment IPC-09.

ANCH-20
The offshore pipeline is not expected to have any "thermo" effects on the ocean floor, because the pipeline would be insulated to prevent cooling of the oil that would affect the flow of the oil.

ANCH-21
The proposed rule covering incidental taking of marine mammals by oil and gas companies currently is under consideration by the NMFS and is expected to be finalized in the near future. It is likely that this rule will cover multiple activities that may affect multiple species on a large proportion of the OCS. Mr. Hilde correctly notes that industry is required to obtain a letter of authorization (LOA, "permit" in the comment) for activities that may have a defined effect on the indicated marine mammal species. That industry is required to obtain an LOA is set out clearly in Information to Lessee No. 1, Information on Bird and Marine Mammal Protection (Sec. II). The NMFS also currently has an oil-spill response LOA prepared and a streamlined procedure in place whereby a responsible party can apply for and receive an LOA in a timely manner if an oil spill occurs. Finally, the fact that BP Exploration submitted comments on several of the mitigating measures statements in Section II that are pertinent to their potential future activities indicates they are well aware of the content and implications of these measures.

DEPARTMENT OF THE INTERIOR

MINERALS MANAGEMENT SERVICE
949 East 36th Avenue
Anchorage, Alaska 99503

OFFICIAL TRANSCRIPT

PUBLIC HEARING

BEAUFORT SEA SALE 144 DRAFT EIS

City Hall
Nuiqsut, Alaska

Monday, November 6, 1995
7:30 o'clock p.m.

MINERALS MANAGEMENT SERVICE PANEL MEMBERS

Mr. Bob Brock, Regional Supervisor for Leasing and Environment
Mr. Rance Wall, Regional Supervisor for Resource Evaluation
Mr. Jeff Walker, Special Assistant to the Regional Director

Proceedings recorded by electronic sound recording. Transcript produced by transcription service.

TABLE OF CONTENTS

NUIQSUT, ALASKA - MONDAY, NOVEMBER 6, 1995

(On record at 7:30 p.m.)

MR. BROCK: Is there anybody here that does not understand English? Do we need a translator for anybody here?

UNIDENTIFIED MALE SPEAKER: No, I don't think so.

MR. BROCK: Okay good. I hope that means that everybody understands English. My name is Bob Brock, and I don't like all this formality setting, but since this is your public hearing, we want to be sure and get this recorded, so we don't really have much option in this.

I'm the Regional Supervisor for Leasing and Environment in the Outer Continental Shelf Office in Anchorage, Alaska. With me on the panel are Rance Wall, our new Regional Supervisor for Resource Evaluation, and Jeff Walker, who is the Special Assistant to the Regional Director. This is our second public hearing, and one more will be held tomorrow night in Kaktovik and another one Wednesday night in Barrow. We have completed one public hearing down in Anchorage in October the 26th.

The purpose of this hearing is to receive your views and comments and suggestions on our Draft Environmental Impact Statement. And this is the Draft Environmental Impact Statement. There's plenty of copies back there; if you would like to take one home, feel free to do so. The Draft

Environmental Impact Statement covers about 9-1/2 million acres, as you can see, over on that -- the map hanging on the wall there.

(Laughter)

That's all right; you can sit in front of the map. The area in red and green is the area that's being considered. It's strictly offshore; there is no on-shore area involved here at all. We are three miles off shore and further. The State's jurisdiction goes out for the first three miles. So we're with the federal government, and we go three miles and further.

The Minerals Management Service has the responsibility to fulfill mandates set out in the Outer Continental Shelf Lands Act and the Oil Pollution Act. Oil and gas activities on the Outer Continental Shelf must comply with the National Environmental Policy Act, Clean Air Act, Clean Water Act, Occupational Health and Safety Act, Coastal Zone Management Act, and many, many other acts, as well as all of the operating regulations that are designed to make offshore operations safe and clean.

The Environmental Impact Statement took nearly three years to prepare. You have been a part of this process from the start, through your earlier comments, as well as your participation in the recent workshop that we held up here about a month ago on this Environmental Impact Statement. We have now come back to ask you what you think or what are your further suggestions on this Environmental Impact Statement.

We have a recorder here with us tonight, Rich Carl, sitting over here on the side. Through -- and you can obtain copies of this transcript through Executary Court Reporting Services. The main purpose, and the only purpose, of this Environmental Impact -- or this hearing is to improve the quality of the Environmental Impact Statement before it's put in final form.

Speakers won't be questioned unless it's necessary by one of the panel members to clarify a point. We're interested in your views of this Impact Statement and this sale. The comment period for this document closes November 20th, 1995. Until that time, we will accept written comments and statements from anyone who would prefer to make a written comment rather than an oral one. Or you can do both. By making an oral comment tonight does not preclude you from making a written comment later on.

Those written comments should be sent to our address: Minerals Management Service, at 949 East 36th Avenue, Room 308, Anchorage, Alaska 99508. Remember, the comment period closes November 20th.

Now, I ask everybody -- I hope everybody has signed in back there for our records. I'd like to keep a record of who is here. I did not bring up a copy with me up here, so I'm -- instead of reading off who signed up to testify and who

didn't, I'm just going to start by asking who would like to testify, and if you'd come up and sit there in the -- at the end of the table so that we be sure to get everything you say on the -- in the official record, I would appreciate that.

So with that, I'd like to ask who'd like to be first?

(No audible response)

MR. BROCK: I'll go get the sheet and read off the names (laugh). Okay. You can't leave, Frank (laugh).

(Off record)

(On record)

MR. BROCK: You know, I'm terrible at pronouncing some of these names. So if you'll -- Isaac? Isaiah?

MR. NUKAPIGAK: Isaac.

MR. BROCK: Isaac.

COURT REPORTER: Sitting on the couch.

MR. BROCK: Oh.

COURT REPORTER: Come up.

MR. BROCK: Okay. I didn't......

(Pause - Side comments)

<u>PUBLIC TESTIMONY OF MR. ISAAC NUKAPIGAK</u>

Good evening. My name's -- for the record, my name's Isaac Nukapigak. I'm the.....

MR. BROCK: Would you spell your last name please, sir, so we can be sure to get it right?

MR. NUKAPIGAK: N-u-k-a-p-i-g-a-k.

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BY MR. ISAAC NUKAPIGAK (Resuming):

I'm the long-time resident of this community of Nuiqsut. I'm also a subsistence hunter that -- that rely on the -- the resource that we have that is being provided out in the Beaufort Sea.

The main question I had -- concern I had pertaining to the Lease Sale 144 that's going to be affecting our livelihood, if any source of -- if this -- like I say, if this goes through on the lease sale, I mean, you guys are going to hurt our livelihood. I mean us Inupiat over -- us here that live here that depends on our resources for our daily diet. That is very strongly within the culture of our celebration that we have during when there's a successful fall whale hunt that's been landed.

Conc- -- the main concern I had, I do believe there's enough oils that is still needs to be looked in -- inland before any activity take place out in the Beaufort Sea. I mean, you guys are dealing with our livelihood, our garden of eden where our Native people rely on.

I do believe there is enough oil somewhere that hasn't been explored yet up in the inland. I mean, you still have other areas that the oil interests you haven't dig into yet. I do believe that the Mineral Management Service should consider of delaying due to the fact that the oil industries don't have any type of technology yet to do any clean-up if an

oil spill occur, especially with the condition that we have out in the Beaufort Sea where there's bristol (sic) ice ridges.

That is something that the -- you guys need to consider; there needs to be further research done. Knowing for the fact that there isn't any of technology yet to do any type of oil spill clean-up in our environment. 'Cause if any -- if the lease sale goes through and they did find oil, and if an accident occurs, I mean, you guys are going to be -- you guys are going to hurt our livelihood, our people that depend on the resources for our diet.

I do believe that something that the -- that needs to be considered strongly that will -- that's going to affect our people, this is something that needs to be considered. And we're -- I'm not just only looking at today or tomorrow. I'm talking about my kids' future, too, and their kids' future.

I'm not against oil and gas. I know the nation needs it, and our people needs it for to live on, that the Borough have provided through taxation. But I do believe that you guys should consider of delaying and do more research whether if they have the technology to do any clean-up if a disaster occurs. As you all know, that day will happen; it just happened in Valdez.

I really hate to see it happen here, in my garden here, where I depend for my food, my daily diet that I used. Something that you guys should consider that needs to be done,

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you guys need to look further, do more research whether if there is a technology for any -- any type of clean-up. It's just all I have to say. Thank you.

MR. BROCK: Thank you very much.

UNIDENTIFIED MALE SPEAKER: Thank you, Isaac.

MR. BROCK: Thomas Napageak.

(Pause)

MR. BROCK: Did you want to testify, Thomas?

MR. NAPAGEAK: Yes, I'm waiting.

MR. BROCK: You want to wait?

MR. NAPAGEAK: Yeah.

MR. BROCK: Okay. Joseph A-k-p-i-k.

PUBLIC TESTIMONY BY MR. JOSEPH AKPIK

Good evening, gentlemen. My name is Joseph K. Akpik. I reside here on the North Slope, from Barrow to Nuiqsut and Kak- -- Nuiqsut and Atqasak. And I feel the same way, too, that I would back up Isaac Nukapigak comments on -- on our subsistence and lifestyle within our region up here.

And I can see on your -- on your maps here, on the Sale 144, where they affect this whole Arctic Slope. And that would calling on cisco fish that we eat here in Kaktovik, and that would affect the migration of the whale. And I can see the boundaries of this proposed Sale 144, that that would pretty much affect this -- all our people here.

And like Mr. Isaac Nukapigak stated, that there is

on-shore oil deposits that -- that -- that can be discovered instead of an offshore exploration like this. Because I, myself, or this ice movement is -- oh, what you call that? It depends on the season that it's -- you cannot predict of how this ice movement would move if and when there's any platforms or exploration or anything, or drilling, that would take place because we cannot -- you cannot control that ice movement.

So this is one of the reasons why I would object to this proposed Sale 144. And there's this whole environment on this offshore that I'm really much up against. Like I will state again, that there is possible on this Colville Delta, there's ANWR on-shore that can be considered. And so that's all I have for now. Thank you.

MR. BROCK: Thank you.

MR. WALKER: Thank you, Joseph.

MR. BROCK: Abe? S-i-m-m-o-n-b-r (sic)?

MR. SIMMONDS: Simmonds. S-i-m-m-o-n-d-s.

MR. BROCK: Oh, "b-s," (sic) Simmonds. Okay.

(Pause)

MR. BROCK: Did he leave?

(Pause - Inaudible comments)

(Off record)

(On record)

PUBLIC TESTIMONY BY MR. THOMAS NAPAGEAK

Yes, sir. I'd like to make a couple a comments here.

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626 Cordova, Suite 104
Anchorage, AK 99501
Phone: (907) 272-4084

As I was just scoping through your book.....

MR. BROCK: He's Thomas Napageak.

BY MR. NAPAGEAK (Resuming):

My name is Thomas Napageak. N-a-p-a-g-e-a-k, Commissioner of Nuiqsut Alaska Eskimo Whaling Commission. The other hat that I wear is President of the Native Village of Nuiqsut.

I noticed that on page I-11, I-11 or whatever you want to call that, there is a paragraph there that indicates Nuiqsut deferral alternative. Let me read this:

"During the Kaktovik scoping meeting, Mr. Delbert Rexford, a whaling captain, suggested that the deferral of an area of Colville Delta in order to protect subsistence activities related to the bowhead whale. This deferral alternative was not analyzed because of three principle considerations:

"Many of the blocks within the region already had been leased by the State of Alaska and the USDY.

"Two, the primary area for bowhead whaling activities, both for Kaktovik and Nuiqsut, lies east of Colville Delta region in the vicinity of Cross Island."

Cross Island is the home of Nuiqsut whalers. We've

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got a camp there; all our camp facilities are there. We even have a winch to pull up the whales. That has been our whaling station since '70 -- '75 -- (speaking in Inupiat) -- since 1975.

NUIQ-01

"Three, the deferral option was not raised by residents or elders of Nuiqsut."

I disagree with that because under AEWC, the nine whaling communities work together. And if one whaling captain indicated that it should be deferred, it should be deferred because it -- he's -- he is one of the whaling captains of the nine whaling communities. I don't necessarily think that -- I don't necessarily believe that it should be really a resident, although it should be, but, you know, the nine whaling communities work together.

And I was going through some of the studies prepared by some people some years ago -- matter of fact, this one was dated April 1, 1990 -- where Minerals Management sponsored a meeting in Anchorage which was very productive, in my part, up to date. The species that were -- that I'm going to be talking about of bowhead whales. I'm a whaling captain, have always been, and will always be.

A bowhead whale is still an endangered species under Federal Register. We still have to live under the quota system imposed by federal government. Now we're talking about Lease Sale 144, which is the home of the bowhead whale and other endangered species. To name a few, polar bears. Under the federal regulations, the taking of polar bears is not very important to us now because we can't do nothing with the hide. The hide, as valuable as it is, goes to waste when we kill a polar bear. Because of federal regulations, we cannot sell.

Spectacled eiders that come here every now -- every summer for a short period of time are also endangered species which utilize the Beaufort Sea for their survival. And like the other two, should an oil spill occur, these endangered species that we -- that the federal government protects so much that they hurt the Inupiat people for trying to make a living with them, will be slaughtered by the federal government lease -- leases and dollars that they receive.

The testimony that I'd like to give to you is our words that were given to -- that are written to this book, was by Dr. W. John Richardson. I guess you've heard about him. It's about noise that disturbs the migration of the bowhead whale. I briefly went over this, and I'm not too sure how far back it is, but you did talk about the bowhead whale and the disturbance, but you were talking only about a few miles, whereas a studying person indicates that sound in water will travel many, many kilometers away. Let me read this: NUIQ-02

"Sound is transmitted very efficiently through water. Underwater noise created by ships and other human activities often can be

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detected many kilometers away, far beyond the distance where human activities would be detectable by any other senses." NUIQ-02

See what I mean? Something that we can hear, the whales will hear many miles away. That's why we have always been -- have never landed whales here in our community due to activities when (indiscernible) was underway. Because of seismic though traffic (sic), helicopters overflights, these were the cause of the whales migrating further north out to the ocean, 20 miles further north than their usual migration route.

"The long distance which -- the long distance over which calls and other natural underwater sounds can be detected are doubtless a major reason why many marine mammals, including bowhead whales, use calls to communicate. They probably also listen to natural sounds to obtain information about their environment."

I don't doubt that. I believe that. 'Cause if the sound hurts the first whale, the leading whale in the migration, he will report to his fellow whales, and they will not be seen in their normal migration route.

"They probably also listen to natural sounds to obtain information about their environment. Relevant natural sounds might

include serve (sic) noise indicating the
presence of shoreline or shore, ice noise, and
sounds from killer whales."

And on and on it goes. It tells us that sound is very harmful to the migration of the bowhead whale. And looking at the map where you plan to sell, that's specifically where the migration route of bowhead whales are.

And like Isaac indicated, there are NPRA, which is owned by the federal government, ANWR, which the President have authority with the stroke of a pen to open up. Why don't we go after these first before we go out into the ocean? And talk to the rich corporations to give us top bucks for our NPRA land. Thank you.

MR. BROCK: What report is that that you were referring.....

MR. NAPAGEAK: Fifth Conference on Biology of Bowhead Whales.

MR. BROCK: Okay. Thank you.

(Pause - Side comments)

MR. BROCK: Thank you. Abe Simmonds? Did he come back? Oh, there he is.

PUBLIC TESTIMONY OF MR. ABE SIMMONDS

My name is Abe Simmonds. I'm not going to try to explain anything on this proposed Sale 144, but I'm just going to say that I'm strictly opposed to it. And that's all I have.

MR. WALKER: Thank you, Abe.

MR. BROCK: Thank you.

(Pause)

Mr. NUKAPIGAK: I'm going to volunteer.....

MR. BROCK: Okay. We got -- we're going on a roll now (laugh).

PUBLIC TESTIMONY OF MR. JOE NUKAPIGAK

My name is Joe Nukapigak. Last name same as Isaac's, who first testified. I'm a resident of Nuiqsut, and I'm also the President of my village cooperation, which is Kupuko (ph) Corporation. And I want to testify in front of you in regards to this proposed Oil and Gas Lease Sale 144.

As anybody that I -- I firmly, strongly oppose this offshore -- this proposed offshore lease. As we always fear about these offshore drillings, that I believe that there's no technology yet by the oil industry that will convince me to support this. But I have seen -- I have known that there's no technology as of -- that I know of.

(Pause)

Maybe they -- there's a drilling rig out there that can handle a north sea type in north Atlantic versus where the ice floes are. Sea-ice-free environment, sure, we recognize that 'cause of the north sea development. Whereas here in the Arctic, nine months out of the year that we have sea ice, even the current is so forceful, sometimes the icebergs can peak as

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high as 200 feet. Some cases where it depends on what ice current that you are at geographically. Barrow arch is one that I know of, having grown up there, that has a very strong current. Chukchi Sea is one.

Because when it's what we call it, Chukchi Sea, Beaufort Sea is still Arctic Ocean, and Arctic Ocean that provide what we depend on, the sea mammals that we depend on, the fish, wildlifes. As we have seen development over to the east inland, which is Prudhoe Bay, which is considered one of the first giant oil fields, we've seen it how that place has been developed. Twenty years that we have seen development over to the east, inland.

NUIQ-03

At first, I was skeptical about the development scenario, but being observant in the oil and gas exploration in the land, it is -- it can be compatible. But how compatible that is remains to be seen offshore. The reason when I say "compatible," how compatible is the sea ice versus the -- where the drilling rig might be? Will it be able to withstand so many thousand per square inch? That, we don't know. If all the oil company or oil industry can convince me that there's a drilling rig out there, let me see it.

(Indiscernible) no matter what village that you may be at, we people depend on the sea animals. When we're hurting for -- sometimes we have a crash in some other animals that we depend on, like fish that sometimes that we don't know what

caused it. Is it from drilling mud? We don't know. These are the things that should be monitored from time to time if it's going to -- if there's going to be a responsible -- if there's an oil find out in the ocean.

Sometimes our testimonies are just being -- they're dissipate once we testify. And once the development's started, then, where are the mitigation measures that we requested? Mitigation stipulations sometimes are right in the bookshelves. Some comments can't be -- you know, they sometimes -- sometimes I feel that my comments are taken for granted, just to be pushed aside and hear the livelihood that's going to affect me. It's greatly affected.

Your proposed lease sale is a pretty large area. As there was some gentlemen that were earlier testify, right now, where we're sitting at, we're sitting in the bounty of NPRA, which is a jurisdiction of federal government through the Congress of -- through the act of Congress. National Petroleum Reserve. Why is it called National Petroleum Reserve? Tell me.

MR. BROCK: An act set it up that way, a law that Congress passed.

BY MR. NUKAPIGAK (Resuming):

Then why can't that be made available for explorations and whatnot, as some of the gentlemen were suggesting? Or even, you know, like what Thomas said, with the

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stroke of a pen, ANWR can be opened.

We've seen development, and we've seen our -- some of our -- well, we have seen some negative impacts. But it takes time to resolve some of these negative impacts. And here in the -- the potential oil spill that I see that -- and some of the analyses that I see here on the 1,000 barrels, the minimum, that there might be an oil spill. If you all (indiscernible), is the -- well, then, what is it that we're -- what is the high side? If the high side is 1,000 barrels, then is that a low side or the high side to -- within what the analysis suggested?

(Pause)

These are the concerns that we -- my people have always been concerned about. A responsible development is no -- not the -- now, the land and the sea are very fragile, the ecosystem that we co-exist with, the animals.

Even the employment, even if there's a separation, I suggest that we provide the employment. Now, I -- it would go against my principle. I would rather be a subsistence hunter than work for an oil company, especially when sometimes unemployment (sic) pays so high in the village. Sure, we know that. But slowly that -- but most -- but majority of our people are subsistence hunters. We rely mostly on what we catch here, what the land provides, what the ocean provides.

Time and time again, you know, that -- time and time again, we have said no to offshore lease sales, and still

they -- they still end up leasing OCS. I don't know, up to this day, other than what's on the State waters, that some of these potential marginal fields that might be developed. That is remain to be seen how that will convince me to start supporting offshore drilling. That is for -- might be further out than what federal government jurisdiction is, 200 miles.

Why don't you go further out in order to drill? And I'm convinced that drilling rig be able to withhold whether make -- whether Mother Nature can to. These are the concerns that I bring before you. How compatible are we? So that ends my testimony now.

MR. BROCK: Thank you.

(Pause)

MR. BROCK: Now, that's all the people we had sign up that wanted to, but I would like.....

MR. NUKAPIGAK: Excuse me.

MR. BROCK: Yes.

MR. NUKAPIGAK: I noticed that one of our whaling captains that doesn't fully understand English is here, so I'd like to elaborate a little bit about.....

MR. BROCK: You bet.

MR. NUKAPIGAK: .....what's going on here.

(Pause - Mr. Nukapigak speaking in Inupiat)

MR. BROCK: Thank you very much.

MR. LAMPE: My name's Leonard Lampe, for the record.

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MR. BROCK: How do you spell your last name?

MR. LAMPE: Lampe, L-a-m-p-e.

PUBLIC TESTIMONY OF MR. LEONARD LAMPE

I'm -- I'd like to testify I, too, am against this Lease Sale 144. You've heard a lot of gentlemen before me talk to you. I just want to remind you, you've heard a President of 200-plus shareholders speak out, and you also heard a President of a tribal council that represents over 400 members as well. So I just want to put that for the record. And these gentlemen aren't speaking for themselves; they're also speaking for their entities, for our shareholders and our tribal members.

NUIQ-04

I've been on an offshore rig before, and I've been on a -- it's a village oil response team formed by Arco for our village. We were on an offshore drill rig; we were going to have a practice, a drill, if there was a spill occurrence there, of how we would manage the spill, how we would manage the spill from going all over. And during our drill, you have stages of the ice: dangerous, very dangerous, and so forth. And during our drill, our drill was canceled due because the ice was dangerous. But it was the same -- it looked the same as when we got there, when it was stable when we got there.

But I want to know how the oil companies -- there's -- they can tell you there's no way, if they can't allow any men to go off the rig itself onto the ice during those stages, if there is a spill, no one can do anything about

NUIQ-04

it. No one will do anything about it. If a spill occurs, no one's going to clean that spill during that dangerous stage. And they were very strict, even just for a drill. Even if a spill were to occur, nobody would be allowed to get off that rig and go on the ice and try to prevent the spill from going any farther.

Also, and I disagree with some of your wordings in your Environmental Impact Statement here. You say that Nuiqsut depends most of its mammal seasons off the lease sale area. It depends on all; all of the mammals come from Lease Sale 144, not most of the sea mammals. It's all of the an- -- all of the sea mammals are on Lease Sale 144 for Nuiqsut. NUIQ-05

MR. WALL: Yeah, what page is that on?

MR. LAMPE: It's on the Nuiqsut -- the introduction of Nuiqsut.

MR. WALL: I thought maybe you (indiscernible), but that's.....

MR. LAMPE: I-11.

MR. WALL: Okay.

MR. BROCK: I-11? Oh.

BY MR. LAMPE (Resuming):

And also, you know, if there was a spill occurrence, no one would be able to clean up the -- the oil companies don't know how to spill an occurrence (sic) if that does ever happen. I mean, this was three years ago; nothing that I know has changed in the -- especially the waters of our -- our waters are very different, very different conditions, compared to -- I mean, it was a disaster in Valdez, and that was, you know -- to us, that's calm water, until when it started blowing that -- that evening.

But, you know, that was nothing compared to what we have up here in the north. You have no ice conditions over there, besides the wind. Over here you have water, current, ice, slush. You name it, you got it up here. And you can't even control the wind down in Valdez. How are you going to control all four of these up here? There's no way.

So I'm very against offshore. There's a lot of options open right now. There's ANWR. Prudhoe Bay has proven itself to us about being reasonable drilling on shore. So has Kuparuk. There's other areas in this areas that can be developed. I urge you to look at those areas. You've got to prove to yourself, to us, that it can be handled in a manner.

And with Valdez spill, with the offshore spill over there, that proved to us you are not capable. No oil company is capable of taking care of that spill. And with something like that up here, it's going to happen, with you knowing that you're not capable of doing this, of cleaning up. You know, you're going to have some -- a lot of answers to -- a lot of answering to a lot of people.

There's one thing in losing money, but there's

another thing in losing cultural -- culture. If you take away the culture of the North Slope, that's going to be the end of us. We're just going to be just like everyone else in the Lower 48, a lost people who's looking for a history, who's looking for their rights. Thanks.

MR. BROCK: Thank you. Frank.

(Pause)

PUBLIC TESTIMONY OF MR. FRANK LONG

Hello. My name is Frank Long. It's spelled L-o-n-g, and it's one of the shortest names that you can put on paper.

I've heard a lot of comments from my fellow residents of this community. And I heard what you read earlier about Clean Water Act, Air Pollution Act, and all those. Aren't we the people that's supposed to be protected by them? Or is the government? The federal government in all its entity and all the departments are the only ones protected by them because, at this point in time, there is air pollution by the industry that forms and shifts every which way the wind turns. It's a yellow smog that you can see this time of the year till spring is getting over to Barrow.

What are you going to do with the Clean Water Act? Would you go out three miles and beyond? I believe don't we have a right for the (indiscernible)? Aren't we the people that's supposed to utilize this stuff instead of the industry? We're supposed to be protected by our government, not pushed aside.

In most of your statement, in this book, is ridiculous. If I was to go to store and buy this book, I wouldn't buy it. But it's a handout written by some dude that sits behind a desk and never seen ice, current, water, nor wind and rain. All these lines show different currents as far as you go. The further you go, the stronger it gets. Ice packs not only form on shore; it's already out there. It's out there year around, 365 days a year. And during the fall when we're out on ice, heavy ice conditions, there are four leads that open up. And when the industry is heavy in their activity, we have to go all the way out to the fourth lead in order to meet our harvests of quota.

There's not only the federal government that tries to stop us from whaling, but there are other governments, international governments, that try to put a stop to us, who I think that don't have no say over our livelihood. I don't think the International Whaling Commission should have any say, or per se, of how many whales we should harvest. I don't think the federal government should jeopardize us by quota in our system.

I'm thinking of this right now as whales versus buffalo. Buffalo was slaughtered. We all know that, and we've heard of it, we've read it, we've seen it. And now Lease Sale 144 is going to do the same thing to the whale. You're going

to slaughter them. The commercial whalers in the early 1900s so say they left only a thousand whale, but the Eskimo proved them wrong. Who can number an animal? Was there a hundred buffalos after they were all slaughtered?

Like they said, oil spill is a very dangerous issue. Even in three inches or two inches of ice, it will not be cleaned up. What happens to the sediment? It goes to the bottom. All the fish, all the feeding for the whales, all the feeding for all marine mammals will be slaughtered. There are micro-feeds out there for every specie of animal: seal, polar bear, whales, beluga, walrus, and it goes all the way to the bottom of the ocean. Once there's an oil spill, I think we'll have the biggest disaster in history.

It kind of hurts me to think this way, but like everybody else, I'm not against oil and the development of oil. But I'd like to see a lot more improvement before it goes beyond three miles. There are studies that have been made that they can only go seven miles. There are productions that are proposed at this point in time to produce under the ocean. And I don't know if pipeline will withstand, like one of the guys indicated, 200 feet of iceberg if it should scrape deeper than 50 meters. That's a lot of scraping down below.

When ice moves, it has so much force that nobody can stop it, not even an ice breaker. There'll be damage not only to the mammals of the sea, the fish, the birds, everything that goes on the ocean, but it will also damage the industry heavily, not only by dollars, by equipment and maybe by their life. If they go ahead and want to do what they think they can do, I will have no feeling of bitterness why such thing happens if they go on a losing streak. It's bad enough to see a boat swamp; it's bad enough to know and have a fellow whaling captain lose a life just over a little rough water. How much more damage shall we go through?

I've been a whaling captain for seven years in this community, but I've participated in whaling since early 1950. And that's a good number of years. I know these guys that's behind me have participated nearly 50 years in active whaling. Regardless of how we whale, if the government takes our equipment, we have our own method. We don't really need (indiscernible) to harvest a whale.

I think this is substitute to satisfy what we can do for the government or what the government can do for us. We try to live by rules and regulations, but one day, rules and regulations won't do any good. And everybody knows it, and it's happening today. Like the assassination of the Prime Minister of Egypt. Thank you very much.

MR. BROCK: Thank you, Frank. I'm going to put this sheet back there because I'd like ev- -- I'm -- we're not through. I'm just going to set this sheet back here so that people can sign in that have not signed in yet. I don't want

to -- 'cause I don't want anybody to get out without at least letting us know you're here. So if those that have not signed in would be sure and sign in before you leave, I would really appreciate it.

Okay. Thomas, did you.....

MR. NUKAPIGAK: Yeah, I've got a question. I noticed that we have some representatives from industry, so I'd like to ask them a question.....

MR. BROCK: Okay.

MR. NUKAPIGAK: .....understanding to what's here.

MR. BROCK: Can I just wait a second on that, just for one quick minute?

Is there anybody else that would like to testify in the crowd?

(No audible response)

MR. BROCK: Thomas, can we have this fellow testify first, and then we'll go to -- we won't leave you.

MR. NUKAPIGAK: Okay.

PUBLIC TESTIMONY OF MR. PATSY TUKLE

My name is Patsy Tukle. I can't speak English for -- I get school for -- it's only for talking Eskimo language (laugh). (Speaking in Inupiat.)

MR. BROCK: Thomas, will you be able to help us on this?

(Pause - Side comments)

(Mr. Patsy Tukle testifying in Inupiat, with Mr. Thomas Nukapigak translating into English)

BY MR. TUKLE, THROUGH MR. NUKAPIGAK:

His name is Patsy Tukle. He's never gone to school. He was born and raised in this area. Parents who lived here, and that's one of the reasons that he never go to school, because there was no school here at the time.

MR. BROCK: How do you spell that last name?

MR. NUKAPIGAK: T-u-k-l-e.

MR. BROCK: Go ahead.

BY MR. TUKLE, THROUGH MR. NUKAPIGAK (Resuming):

Some years ago, there were a lot of people here, but most of them went to Barrow. The parents took their kids to Barrow for education purposes. But his family was one of the last ones that departed from here, and he was already old enough to start hunting, so he never attended. I mean, although he went there, he never go to school.

When he was growing up, there was a lot of Natives, but there was always one white man, and he always see this one white man. He had (indiscernible). And summertime, he would see two others coming in from Barter Island side. He regrets that he never went to school; he wishes he had gone to school, but his livelihood is subsistence all his life. He's a hunter; he's a whaling captain and survives on those.

There was no more aliens, white guys, when this guy

had a heart attack, died in Colville. There were nothing but real people -- Eskimos (laugh). And he remember Bud Helmrich (ph) coming down to Colville in a kayak, he and his wife. Now, that's a total of four white men that he's seen in his grown-up years.

He -- it's hurt him. He doesn't like to see white man come around because, realizing that he has lived here -- born here, raised here, never even went to school, and he hates white man when they come with a big book like this and tries to tell Inupiat what's going on. It hurts him, and he doesn't like that kind of visitors coming in.

Knowing that Inupiat doesn't have a written law, he hates you guys when you're coming with big books, tell us what to do. Even against the will of the people who talk, you still go ahead and do it anyway against the will of the Inupiat people. You guys just like to see us hurt. Just want to see us hurt all the time.

And being a whaling captain, he like -- he would like to see you guys work along with the whalers at times, not against them all the time, but work with them if you possibly can. And he's been evaluating himself with you guys coming in having public meetings. You let us talk; you take our words back to you, and it just doesn't seem to show in your books that we had spoken. And he wonders where -- who he's been talking to. In other words, you just rile us up and just leave

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us behind.

Cross Island is our whaling town, so remember that. Work along with us if you possibly can. Thank you.

MR. BROCK: Thank you. Okay. We'll go off the record here for a little bit and have a discussion on anything you want to talk about. So go ahead.

COURT REPORTER: You want to go off record?

MR. BROCK: Yeah, off record.

(Off record)

(On record)

MR. BROCK: Sir.

MR. AKPIK: Are we on record?

MR. BROCK: Yes.

COURT REPORTER: On record.

MR. BROCK: On record.

MR. AKPIK: Thank you.

PUBLIC TESTIMONY OF JOSEPH AKPIK

Thank you, Mr. Brock. On this Summary of Effects on Social/Cultural Resources on page IV-4, on the beginning?

COURT REPORTER: State your name again.

MR. AKPIK: Oh. Joseph Akpik.

COURT REPORTER: Thank you, Joseph.

BY MR. AKPIK (Resuming):

Resident of the North Slope. I have these -- they tell me it's summary. I believe it's on page IV, Summary on

Effects on Social/Cultural Resources. There's -- I think that this summary should be modified to where -- or if it all matters, I would feel comfortable if you would strike out Nuiqsut or Kaktovik because it's -- there would be a time where the City of Nuiqsut or a corporation would file a suit against the federal government if there ever was a big disaster.

I'm just speaking on behalf of us Inupiat, what the outcome would be if that disaster should come, because it's stated here that how can you prove that, NUIQ-06

"Overall, however, disruption of social/cultural system is expected for a period of one year without intensity to displace existing institutions."

There again, it's just -- it's a pretty broad statement, a pretty broad summary on there.

And then there again, to back up Thomas Nukapigak's part of the section of where he rests,

"The effects on subsistence harvest patterns in Nuiqsut and Kaktovik are expected to render one or more important subsistence resources unavailable...."

Now, that tells me that -- how can you prove that? This is my question.

"...for a period of not exceeding one year."

Here's one good example, I will say, because I used to work in

Endicott Island. Now, that affects our fishing lifestyle here, with so-called cisco. NUIQ-06

Now, I've seen them when they are extracting and dumping baroid bar (ph), caustic soda. That's the most deadliest toxin that can be mixed in with the drilling mud. And I've seen them mix that Macobar (ph) gel, and then you're mixing it with hydrocarbon, which is oil, then you got 20 different various toxic chemicals that you add onto your drilling mud. And I've seen them dump all of that drilling mud over the causeway right onto the path of the cisco fish. I don't know if anybody's aware of what effect it would have, but I'm sure there is somewhere along the line on our bottomfish here in the Beaufort Sea.

And there's another good example, too, that there's a hydrocarbon fallout that is going on that Frank Long has mentioned. I've seen it; it's just like smog out there. The cold weather sets in from the air, and it keeps that hydrocarbon fumes coming out, and it falls out to the tundra and the waterways. Now, these are some of the research that never has been done, and it's affecting our caribou, and it's affecting our fish.

These are some of the small portion of these chemicals that are being -- that will be being dumped out that your office can regulate that. There should be monitoring of how much chemicals are being dumped out in case there -- if it

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goes through on this offshore exploration, there are the effects that will come within our environment. But anyway, there it goes again on part of the summary. NUIQ-06

Overall, my feeling would be to strike out that whole paragraph on the summary on Effects on Social/Cultural Resources that covers Nuiqsut and Kaktovik. And it goes on here,

"Effects on the bowhead would be periodic and have no apparent long effects on subsistence harvests."

That doesn't tell us, and it's -- you cannot predict that.

"However, Nuiqsut and Kaktovik are small, relatively homogenous communities that would not absorb the presence of the tonics (sic) that come to the communities like Barrow, and they could experience an increase in social problems and possible social problems due to the construction of roads from the villages to the development sites. However...."

I mean, it goes on:

"Overall, however, disruptions of social/ cultural system is expected for a period of one year."

(Laugh) That I don't believe.

Now, if -- can somebody clarify that to us, what it

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actually means?

MR. BROCK: You're saying you disagree that it's going to cause a disruption, or you're just agreeing that it's not going to -- that it's going to cause.....

NUIQ-06

MR. AKPIK: No.

MR. BROCK: .....a disruption for not more than a year?

MR. AKPIK: No, I don't believe all of that. No, I don't. But there's -- how can you prove that "However" clause?

MR. BROCK: Oh. Okay.

BY MR. AKPIK (Resuming):

> "Overall, however, disruption of social/cultural system is expected for a period of one year without intensity to displace or disrupt our existing society."

Now, if somebody can clarify that and explain it to us so -- 'cause this summary is -- it bothers me.

(Pause)

MR. BROCK: I'll get you a clarification on it. I.....

MR. AKPIK: Well, in front of our people here.

MR. BROCK: Well, I didn't write that section, so I can't explain exactly what the author meant on that. But I believe that he wa- -- that the author was saying that it would not disrupt for more than a year without an existing --

without -- to displace the existing situation. I can get you a clarification, but I -- since I didn't write that, I can't explain the full intents of what the author of that section meant right here. I'd be glad to get you a summary -- or an explanation of it.

NUIQ-06

MR. LONG: Do you mean to say that.....

MR. AKPIK: Yeah, it means even after one year, everything would be all right.

MR. LONG: The author of this book is Minerals Management Service, Alaska OCS Region. You work for the department, and you're telling us you don't know what it means?

MR. BROCK: I'm telling you I don't -- I'm not going to -- I can't interpret exactly what the author of that section meant by that right -- no. I can't. I -- but I can get you an explanation of it.

(Pause)

MR. LONG: By the time we get the information, it'll all be sold.

MR. BROCK: I'll get it for you next week.

(Pause)

MR. AKPIK: But anyway, that just for the -- for your information that I have discovered within my own personal thing on -- relating to this extracting this toxic chemicals from the drilling mud that has been dumped onto our Beaufort Sea. Thank you very much.

MR. BROCK: Thank you.

(Pause)

MR. BROCK: Do we have anybody else that would like to testify?

(Pause - Whispered consultation)

MR. NUKAPIGAK: I got a question. How many more hearings do you have on this report?

MR. BROCK: We have a hearing tomorrow in Kaktovik and a hearing on.....

MR. NUKAPIGAK: I mean for this winter. Are you planning to come back before the final?

MR. BROCK: No, sir. We won't hold another public hearing on the -- on this document. No, sir. Here.

(Pause - Whispered consultation)

MR. BROCK: I'd like to thank all of you for coming tonight. I really appreciate it. And your concerns will be -- we will get those forwarded, and they will be in the final document. So we very much appreciate it. With that, the hearing is closed.

COURT REPORTER: Off record.

(Whereupon, the proceedings in the above-entitled matter were concluded at 9:22 o'clock p.m.)

C E R T I F I C A T I O N

STATE OF ALASKA)
) ss.
THIRD JUDICIAL DISTRICT)
)

I, CINDY S. CARL, do hereby certify:

(1) That the foregoing pages contain a full, true, and correct transcript of proceedings in the above-entitled matter, transcribed by me, or at my direction and supervision, to the best of my knowledge and ability.

(2) That I have been certified for transcript services by the United States Courts.

(3) That I was certified for transcript services by the Alaska Court System prior to January 1, 1993.

SIGNED AND CERTIFIED:

BY: Cindy S. Carl
Cindy S. Carl
Certified Court Reporter

DATE: 12/6/95

CINDY S. CARL
NOTARY PUBLIC
STATE OF ALASKA

NUIQ-01
Please see the response to Comment NQ-01.

NUIQ-02
These concerns have been addressed in Section IV.B.6 of the FEIS.

NUIQ-03
Industry has successfully used gravel islands, ice islands, drillships, and other structures in the Beaufort and Chukchi Seas. Before any drilling can begin, a company must provide evidence to the MMS that the drilling rig and equipment are capable of safely operating at the proposed drilling location under all anticipated environmental conditions. An independent third-party review is required for new or untried technology. In the case of production platforms, the MMS requires a detailed review of the design, construction, and installation of the platform.

NUIQ-04
There are times when it is unsafe for spill-response personnel to work directly from the ice or from small open boats. Under these circumstances, spill response will be limited to the deployment of skimmers from ice-strengthened ships and barges or in situ burning operations using helicopter support. When the oil is highly concentrated in leads and small open-water areas within the ice pack, both in situ burning and mechanical recovery can be very effective. If the oil becomes spread over a larger area, intermixes with the ice, and becomes emulsified or solidified, it will be very difficult to clean up the spill.

NUIQ-05
The text in Section I.D has been amended to accommodate this comment.

NUIQ-06
The statement mentioned and quoted by Mr. Joseph Akpik in his hearing testimony at Nuiqsut refers to the EIS summary that appears on page iv of the Sale 144 DEIS. This statement is a summary of the Section IV.B.9 (Sociocultural Systems) summary that appears on page IV-B-58 in the DEIS. Unfortunately, the summary text on page iv loses some of the context of the full effects analysis summary on page IV-B-58 which reads in part:

> . . .however, the resultant effects on their bowhead whale harvest would be no more than periodic and have no apparent long-term effects on subsistence harvests. Nonetheless, multi-year disruptions, even if minimal, of Nuiqsut's subsistence-harvest patterns, especially that of the bowhead whale, which is an important species in Inupiat culture, could adversely affect sharing networks, subsistence-task groups, and crew structures and could cause disruptions of the central Inupiat cultural value: subsistence as a way of life.

In light of this testimony and on revisiting the biological effects analysis of the bowhead in the Sale 144 draft EIS, the above statement has been revised to read:

> . . .however, the resultant effects on their bowhead whale harvest are expected to be no more than periodic and have no long-term effects on overall subsistence harvests. Biological analysis indicates that oil-spill effects could be lethal to a few individual whales, with population recovery lasting from 1 to 3 years. Therefore, multiyear periodic disruptions, even if minimal, of Nuiqsut's subsistence-harvest patterns, especially that of the bowhead whale, which is an important species in Inupiat culture, could adversely affect sharing networks, subsistence-task groups, and crew structures and Could cause disruptions of the central Inupiat cultural value: subsistence as a way of life.

The base case conclusion effects level has been change to read (in part):

> Chronic disruptions to sociocultural systems are expected to occur for a period of 1 to 2 years, and possibly longer, but these disruptions are not expected to cause permanent displacement of ongoing community activities and traditional practices for harvesting, sharing, and processing subsistence resources.

With all this in mind the Summary on page iv will now read:

> Effects on the sociocultural systems of communities in the sale area could occur as a result of assumed industrial activities, effects on subsistence patterns, and expected changes in population and employment. These effect agents could affect the social organizations, cultural values, and social health of the communities. Nuiqsut and Kaktovik could be affected because of their proximity to the proposed development sites. However, Nuiqsut and Kaktovik are small, relatively homogenous communities that would not absorb the presence of non-Natives as well as a community like Barrow; and they could experience an increase in social problems because of the increased presence of oil workers in their communities and the possible construction of roads from the villages to the development sites. Overall, chronic disruptions to sociocultural systems are expected to occur for a period of 1 to 2 years, and possibly longer, but these disruptions are not expected to cause the displacement of ongoing community activities and the traditional practices for harvesting, sharing, and processing subsistence resources.
>
> The effects on subsistence-harvest patterns in Nuiqsut and Kaktovik are expected to render one or more important subsistence resources unavailable, undesirable for use, or available only in greatly reduced numbers for a period of 1 to 2 years. Effects on the bowhead whale harvest would be expected, causing disruptions on overall subsistence harvests lasting up to 3 years. Barrow's subsistence resources could be affected for a period not exceeding 1 year; but no resource should be unavailable, undesirable for use, or greatly reduced in number.
>
> With regard to the economy of the North Slope Borough, both resident and nonresident employment would be expected to increase. Direct employment would reside in existing industrial enclaves. Property-tax revenues would increase above the declining existing-condition levels at about 2 percent through the 22-year life of the field.

DEPARTMENT OF THE INTERIOR

MINERALS MANAGEMENT SERVICE
949 East 36th Avenue
Anchorage, Alaska 99503

OFFICIAL TRANSCRIPT

PUBLIC HEARING

BEAUFORT SEA SALE 144 DRAFT EIS

City Hall
Kaktovik, Alaska

Tuesday, November 7, 1995
6:00 o'clock p.m.

MINERALS MANAGEMENT SERVICE PANEL MEMBERS

Mr. Bob Brock, Regional Supervisor for Leasing and Environment
Mr. Rance Wall, Regional Supervisor for Resource Evaluation
Mr. Jeff Walker, Special Assistant to the Regional Director

Proceedings recorded by electronic sound recording. Transcript produced by transcription service.

TABLE OF CONTENTS

KAKTOVIK, ALASKA - TUESDAY, NOVEMBER 7, 1995

(On record at 6:00 p.m.)

MR. BROCK: We'll go on the record. My name is Bob Brock. I'm the Regional Supervisor for Leasing and Environment in the Outer Continental Shelf Office in Anchorage, Alaska. And with me at the panel, if you haven't met them, is Rance Wall, on my left. He's the Regional Supervisor for Resource Evaluation that does -- the one that does the estimating on the oil and gas reserves. And Jeff Walker, who is the Special Assistant to the Regional Director.

This is our third public hearing. We held one last night in Nuiqsut, and last month we had one in Anchorage, and we'll have -- we have one more on this sale in Barrow tomorrow night. The purpose of this hearing is to receive your comments and your views on this Environmental Impact Statement. Our goal is to try to improve this Environmental Impact Statement to make sure we have an accurate document.

Two things I'd like to point out; I'm not going to go through all of the information that I necessarily have, but two things I'd like to point out, and that's that there is a Kaktovik deferral in the Environmental Impact Statement analyzed. I want to make sure you understand that no decision has been made to withdraw that area at this point in time. It's being analyzed as a potential deferral.

There was some feeling in Kak- -- in Nuiqsut last night, I got the feeling, that some people thought that that had already been withdrawn from the sale area. That -- just so you understand, that is not true. It's being analyzed as a potential deferral area, but it has not been withdrawn at this point in time. It's still in the sale area. That's one thing I wanted to make real sure that you understand.

And then I will be glad to -- after we take the testimony, I'll be glad to answer any questions, go off the record and answer any questions that you may have on this. We are trying our best to incorporate as much indigenous knowledge as we can in this document, and so anything that you have on that realm, we would definitely like to hear about.

I'd like to be sure that you know Richard Carl, who is our Court Reporter. And if you want a copy of this document of the verbatim transcript, you can get one through him at Executary Court Reporting Services.

And we also have a translator available. And I'm terrible on names, and I apologize.

THE TRANSLATOR: Frances Mongoyak from Barrow.

MR. BROCK: Okay. And she -- so she -- if we need a translator, she will be available to do that.

The comment period on this document closes November 20th, 1995. And that's when -- now, if you don't get your comments in, if you can give me a call, we'll try to

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accommodate them, and usually, if it's there a little bit late, we don't have a problem in accommodating them. But the comment period basically closes November 20th. If -- and those comments should be sent: Minerals Management Service, 949 East 36th Avenue, Room 308, Anchorage 99508.

With that, since -- George, since you have to leave, I'm not going to go through anything else. I'd be glad for you to go ahead.

MR. TAGAROOK: All right. Thank you.

PUBLIC TESTIMONY OF MR. GEORGE TAGAROOK

For the record, I'm George Tagarook. City Council members, citizens.....

MR. BROCK: How do you spell your last name?

MR. TAGAROOK: T-a-g-a-r-o-o-k.

BY MR. TAGAROOK (Resuming):

And I plan to live here forever. I'm going to comment on that I oppose any offshore drilling, and the deferral area is such a small area; it needs to be enlarged, maybe 100 miles north and 100 miles on each side. I mean, we use the ocean for our subsistence: whaling, we do fishing, we do bird hunting, duck hunting, and we also have summer camps along the coast.

I'm not in favor of the plan you guys have here. I think if you guys consider that the ice conditions, inadequate oil spill response, and, you know, it scares me. What if

there's a blow-out? What's going to happen. Is our renewable resources going to be depleted? Or I don't want to see another Prince William Sound.

But I do have some questions I want to ask, if some of you, or any of you, could answer the questions. We've provided you, as well as some of the administration in Washington, D.C., John Garamandy (ph), Special Assistant to the Secretary for Alas- -- Deputy Secretary, John Garamandy, and Special Assistant to the Secretary for Alaska, Deborah Williams, our guidelines on how to work in this country of ours. I don't know, the last time there was a couple of people here. Have you reviewed our Kaktovik papers in this place?

MR. BROCK: Have we what?

MR. TAGAROOK: Have you reviewed our Kaktovik papers? There was a pamphlet that we gave to the gentlemen last meeting we had.

MR. BROCK: Are you talking about the meeting on the -- the workshop on the EIS?

MR. TAGAROOK: Yes.

MR. BROCK: I was trying to remember. I read a bunch of that, but I don't remember.....

MR. TAGAROOK: I would like a response on that.

MR. BROCK: Okay. We'll.....

MR. TAGAROOK: For the record.

MR. BROCK: .....go through that and get you a

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response.

MR. TAGAROOK: Okay.

MR. BROCK: I didn't bring one with me.

MR. TAGAROOK: What actions do you intend to take with respect to our offer to participate fully in all development within these waters or through the impact papers that we presented you?

MR. BROCK: Well, that's one reason we're here tonight, is to get your input here. And, of course, we try to keep you involved all the way through.

MR. TAGAROOK: Okay. I noted a striking inconsistency between Interior's position on OCS development and ANWR development. Why has Secretary Babbitt charged that ANWR development will disseminate the porcupine caribou herd while on the shore -- while the on-shore facilities for this OCS development would seem to have so little lasting impact if there's going to be oil exploration on the federal OCS? Are they going to have like facilities on the coast, like pipeline, roads, or if there is a major oil discovery on the ocean?

MR. BROCK: If -- well, of course, it depends on where it was discovered, but it would -- wherever it's discovered, it would be brought to shore, and our scenario has it going to the pipeline. As far as why there's an inconsistency, if there is one, we operate under different laws. So that -- I'm not going to -- we operate under the --

we're hired and operate under the OCS Lands Act, which is an offshore, and we have nothing at all to do with any development or anything dealing with ANWR at all.

MR. TAGAROOK: Well.....

MR. BROCK: And I -- all I can say is that Congress has passed one law, and they haven't passed the other law. And that's just the -- you know, that's before Congress right now, is whether or not they're going to have development on there.

MR. TAGAROOK: Yeah.

MR. BROCK: And that's a congressional law.

MR. TAGAROOK: But Congress has already approved a lease sale on the OCS?

MR. BROCK: Yes, this is under the OCS Lands Act of 1953 and as amended in '78.

MR. WALKER: They haven't approved the lease sale.

MR. BROCK: I'm sorry. They haven't approved the lease sale; they've approved the program, which means that they approved the five-year program. And this is one of the five-year -- one of the sales on the five-year program, and Congress did not object. They did approve it through their law, yes, sir.

MAYOR SONSALLA: See, the inconsistency that George is talking about is that, you know, if development happens in the waters, you will have land-based support. And it seems to be okay under the OCS, but under any ANWR legislation, it's off

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limits. To us that doesn't even make sense that we could use the land in one part and not in the other part.

MR. BROCK: Well.....

MAYOR SONSALLA: And I don't know how you could justify using.....

MR. BROCK: Could we go off the record to talk about this? I'd rather be off the record.....

MR. TAGAROOK: No, I don't mind.....

MR. BROCK: .....talking about this, merely because I can't.....

MR. TAGAROOK: .....being on record.

MR. BROCK: No, but I can't say anything about ANWR on the record. I'm.....

MR. TAGAROOK: Okay.

MR. BROCK: I have nothing to do with ANWR, so I can't say anything about it on the record. So.....

COURT REPORTER: Off record.

(Off record)

(On record)

COURT REPORTER: On record.

MR. TAGAROOK: Why is there so little discussion on the special perils of working in a zone of unpredictable -- unpredictability and high-pressure sea ice currently that runs east and west?

MR. BROCK: I missed.....

MR. TAGAROOK: And if you do put a drill out there, what's the safeguard for protecting the rig from floating ice, icebergs?

MR. BROCK: What's protecting the rig?

MR. TAGAROOK: Yeah. Mm hmm (affirmative).

MR. BROCK: Well, I just -- we have had four sales out in this particular -- in this area, and they've drilled 28 holes, and they're -- each one of those -- I think they've drilled at least some of those in the wintertime. And they build a -- what do you call it, Jeff, around the.....

MR. WALKER: A berm.

MR. BROCK: .....a berm around the -- an ice berm around it. And as near as I know, they didn't -- they've had no -- absolutely no problems with that.

MR. TAGAROOK: There's so much offshore activity in Canada and -- where was I? -- why isn't there any mention of problems encountered in Canada with this kind of drilling in far more benign waters?

MR. BROCK: We use the information we get from Canada in the document.

MR. TAGAROOK: But.....

MR. WALL: If you have any.....

MR. BROCK: Yeah, but if you have some additional, we'll be glad to -- that's.....

MR. TAGAROOK: Yeah. Yeah. They got -- what? --

about 60 holes in.....

MR. BROCK: Right.

MR. TAGAROOK: .....Porcupine -- or not the Porcupine, but the whale calving area. Don't they have an EIS in Canada, or don't they -- or they just go in and drill as they wish, where they wish, or.....

MR. BROCK: I don't know what laws govern that. I don't know. They -- NEPA, National Environmental Policy Act, is a U.S. law, and I don't know if Canada has a similar law or not. I couldn't tell you.

MR. TAGAROOK: Yeah. But the eastern OCS from here to the border, that's our main whale -- bowhead whale migration area. Not only that, western Canadian waters is bowhead whale calving area; that's where they go calf. And I'm concerned if there's a spill, where the bowhead whales are going to go. Are they going to go to Russia or.....

(Pause)

MR. TAGAROOK: (Laugh) No answer.

MR. BROCK: I mean, I don't know what you -- I don't have an answer for that. That's -- I mean, they'll -- the migration has not been altered due to our -- on our whale surveys that we do every year. At this point in time, the migration is basically the same place it's been the last 17 years, varying just a little bit, but it varies a little bit each year.

KAKPH-01

MR. TAGAROOK: I'm particularly concerned on what the logistics you have in your book. Why is there so little discussion on this most critical aspect of work? What will be supplied? What will be the supply route and the timing? Will it be Canadian-based, and if so, how will it be monitored? Will it be so sloppy, or be as sloppy as the Canadian work or not -- then who will see to it that it is not, and how will they do it? The sloppy work that I know the Canadians do, no regulations, no EIS study.

MR. BROCK: Minerals Management Service basically has a person on the rig when the exploration time, almost continuously, and to monitor exactly what's happening on the exploration program.

MR. TAGAROOK: Then can we have at least one local from the community be a.....

MR. BROCK: It's a possibility.

MR. TAGAROOK: .....monitor, too?

MR. BROCK: If -- I'll just -- I'll record that as a suggestion, yes.

BY MR. TAGAROOK (Resuming):

KAKPH-02

I would suggest that the deferral area be extended 100 miles east, 100 miles west, 100 miles north. The whole Kaktovik waters of the Beaufort Sea be deferred from oil exploration, offshore oil exploration, due to our renewable resources going through: whales, fish, birds. So I totally oppose the offshore drilling.

If Congress can approve offshore drilling, why can't they approve on-land drilling? I know it's a different subject, but I don't see why they could do one and not the other. It's more safe, and you can -- it's stable on land versus ice, currents, the currents and the ice floes. It's scary. I mean, I want my kids and my grandkids to hunt whales, hunt seals.

(Pause)

I think -- I have a class to go to, but that's my comments. I hope you guys don't approve, but just that the deferral area be extended 100 miles east, 100 miles west, and 100 miles north.

MR. BROCK: We'll certainly put it in. Thank you very much.

MR. TAGAROOK: Thank you.

MR. BROCK: Let's go off the record for a minute.

COURT REPORTER: Off record.

(Off record)

(On record)

COURT REPORTER: On record.

MR. BROCK: And would you state your name and.....

MR. AKOOTCHOOK: I just going to have few questions about what's -- about, you know. And we already heard on offshore lease sale.

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MR. BROCK: Okay. What's your name, sir?

MR. AKOOTCHOOK: My name is -- he's ready.

COURT REPORTER: Go ahead.

MR. AKOOTCHOOK: They are ready? My name is Isaac Akootchook, and Kaktovik resident.

MR. BROCK: Could you spell that name?

MR. AKOOTCHOOK: My home.

MR. BROCK: Could you spell your last name, please?

MR. AKOOTCHOOK: A-k-o-o-t-c-h-o-o-k.

PUBLIC TESTIMONY OF MR. ISAAC AKOOTCHOOK

I live -- I born up here and live here until today. And lease sale (in Inupiat).

MR. AKOOTCHOOK: I going to speak my language.

THE TRANSLATOR: He's going to.....

MR. AKOOTCHOOK: Okay?

THE TRANSLATOR: And I'll translate it.

MR. BROCK: That's right. That's fine.

MR. AKOOTCHOOK: And translate -- and they supposed -- maybe my daughter help me on that, too. You know.

BY MR. AKOOTCHOOK, THROUGH THE TRANSLATOR (Resuming):

We have heard stories like that, that on the Beaufort lease sale that they were going to, you know, keep the sale -- the lease sales. They've heard about these issues before. This is issue of some -- what is different than on-shore because it's off -- you know, right in the Arctic Oceans. And

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it will effect a great impact on the living animals and mammals that are living, and it pertains to our general subsistence way of living, our lifestyle.

Animals like fishes, you know, all kinds of mammals, fish, ducks. And other areas, other countries have heard about that, and they do realize that there's a big impact on the lifestyles also. His main concern is if they do have the Beaufort offshore lease, you know, the drilling out there in our ocean, who's going to take care of the oil spills down there, and who will take care of the animals that -- if it has a big impact on the animals being lost because of the drilling?

He also says that it also plays an impact on the ice, the movements of the ice down in the ocean because on the land, when they have oil spills, you can see the oil spills, but not if there's an oil spill down in the ocean. The -- you can't see the oil spill; it'll be under the ice. They, most of the time, don't realize and find out at the last minute.

Like right now, with people like you guys from the Minerals Management come here for a meeting on big issues like this, that play a big impact on our environment, like our subsistence and things that we already know like -- you know, like the ice movements that the Inupiat people already know. They have to share it with you people, to educate you, and they have to educate each other on these issues.

And that's one of his concerns, too, is they don't

know when people like the oil companies, people come in for special meetings like that. And he'd like to emphasize that in the near future that people like, you know, you guys keep them notified all the time.

MR. AKOOTCHOOK: Thank you.

KAKPH-03

THE TRANSLATOR: He stated on that one issue, like I've heard oil spills, you know, throughout, on the land. Nobody has mentioned anything about the oil spills under the ice.

MR. BROCK: Under the ice.

MR. AKOOTCHOOK: How are they going to clean it up?

THE TRANSLATOR: Yeah. How?

MR. AKOOTCHOOK: Because that's a lot different.

THE TRANSLATOR: You know. And.....

MR. AKOOTCHOOK: Because we're fishing in every summer out around.

THE TRANSLATOR: He said the ice movements have been really changing, too, during the last few years.

MR. BROCK: Thank you.

THE TRANSLATOR: Yeah.

(Pause)

MS. AKOOTCHOOK: Hi.

MR. BROCK: Hi.

MS. AKOOTCHOOK: Is it on?

COURT REPORTER: It's on. Go ahead.

PUBLIC TESTIMONY OF MS. SUSIE AKOOTCHOOK

My name is Susie Akootchook. I was born and raised here in Kaktovik.

MR. BROCK: Can you spell your last name?

MS. AKOOTCHOOK: A-k-o-o-t-c-h-.....

MR. BROCK: Okay.

MS. AKOOTCHOOK: .....-o-o-k.

BY MS. AKOOTCHOOK (Resuming):

I've been well known to oppose the offshore drilling, offshore lease sales. I've voiced my opinions on that year after year after year, and I will oppose any lease sales in the Beaufort Sea. We have whaling; we have a whaling season, which is very, very important, and also during the summer, we go out and get seals and ooruks. We fish, we hunt ducks. There's a lot of activity out there in the ocean during the summer season, through the winter, through the fall season.

I oppose that lease sale. There's three alternatives; right? Was it three our four alternatives that you had?

MR. BROCK: Four, I think.

BY MS. AKOOTCHOOK (Resuming):

And where that Alternative 3, was it? That's -- that totally closes that Beaufort Sea sale?

(Pause - Side comments)

MS. AKOOTCHOOK: No. 3?

MR. BROCK: I think -- that's what I was going to say. I think 3's the Barter Island deferral. I had that marked yesterday.

(Pause)

MS. AKOOTCHOOK: Yeah.

(Pause - Whispered consultation)

BY MS. AKOOTCHOOK (Resuming):

Our hunters work very hard to provide food for our people, for the families that live here in Kaktovik. They utilize that ocean out there a lot; we live off of it. That's our land out there; that's our market. Inupiat would (in Inupiat). They put in a lot of hours down there in the ocean looking to provide food for our families. And I respect the hard work that they do. It's hard work.

And also, the women, when they bring in the ooruks or the seals or the fish, they work on them. And that's a lot of work also for the women to preserve the food. As we all know, that ANWR is -- everybody's waiting to hear what's going to happen. We all -- especially around here. I'm sure the whole state of Alaska is waiting to see what's going to happen with ANWR once Congress gets done with it, and it'll go through its proper course.

I would prefer to see on-shore drilling than offshore. The oil companies, as far as I'm concerned, have not satisfied me that the oil spill on offshore is a guaranteed

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clean-up, that it will be a perfect clean-up. They have not satisfied me; they have not shown me. I have not seen with my own eyes that the cleaning of an offshore oil spill will be cleaned 100 percent.

When there's -- like Isaac says, there's a lot of ice movement. The temperature of the ocean has changed quite a bit. I was going to say "drastically," but I won't use that. But temperature of the ocean has changed. I oppose offshore lease sales, period, and I've told you why, and I will continue to oppose offshore lease sales in our area.

We have feeding area for the bowhead whale in our area. We see them. Just last September we seen them just playing around out here. And I sure don't want to see no oil spills to damage what we have out there. We live off of the ocean, just as well as we live off the land. And I oppose it, and I got my reasons. And that's it.

MR. BROCK: Thank you very much.

MS. AKOOTCHOOK: Thank you.

(Pause)

MR. BROCK: Anybody else?

(No audible response)

MR. BROCK: Well, if not, we would.....

MAYOR SONSALLA: I have a few comments.

MR. BROCK: Oh, okay. Yes, go ahead. I'm sorry.

(Pause)

PUBLIC TESTIMONY OF MAYOR LON SONSALLA

My name is Lon Sonsalla. I'm the present Mayor of Kaktovik. My concerns is -- are that if there is some kind of drilling, which I don't think is a good idea, but if there is, we do need somebody that has knowledge of sea ice movement and somebody to be out there monitoring operations all the time that is from here. That could -- that would be of great assistance to anything that happened out there.

KAKPH-04

I'm kind of wondering what the benefits to Kaktovik would be if there was drilling out there. I have no idea. That's one of my -- also one of my concerns. In our papers that we have come up with, that pamphlet that George was talking about in this place, we mention that we need an impact office, not just for any offshore that might happen, but also for ANWR. It would be what we visualize it as an impact office here locally that could deal with any problems that might come up, that we would be able to be directly involved with the -- any process that is going on. And also, there would have to be a local person, or a persons probably.

Personally, I'm very worried about the dangerous effects of the sea ice movement also, as are -- as just about everybody else is here, and the almost impossible task of trying to clean up an oil spill. I know in your document -- and it's a pretty formidable document -- but I've only gotten through part of it. But the worst case, I think, was like

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three major oil spills.

And I don't know how you would even begin to start cleaning up something that's under the ice and on the ice, you know, and just would be totally -- to me, it would be scattered all over the place. I don't know how you'd go about it. I mean, even in Prince William Sound, which is ice-free, it was just a disaster down there.

So also, I'm worried about the danger to the sea life. The -- it is not just the whales, the fish, the seals, the bearded seals, the ducks, and even the polar bears would be affected by this, I'm sure. And so -- and all of those are a valuable resource to the people here. We'd -- I think it would be too major of a dramatic effect to have any kind of drilling here.

I did -- it's probab- -- I don't know if it would benefit the village here locally, but I kind of doubt it would.

My last comment is, we really don't have the technical resources to properly respond to a document of this size. I mean, we've been kind of overwhelmed lately, with half the Council's been down -- City Council's been down in Washington, D.C., doing the ANWR jig down there. And the rest of us have been trying to keep things going up here. And we really don't have the money or the people that we do need to analyze something of this size. And possibly that could be part of the -- you know, the impact off this that we visualize.

It's not something that's here yet, but something maybe in the future, we hope that we could be part of that.

That's all I have for now.

COURT REPORTER: Thank you.

MR. BROCK: Thank you.

(Pause)

MR. BROCK: Anybody else?

(No audible response)

MR. BROCK: Okay.

MS. MONGOYAK: I do. Even though I'm a translator, maybe it'll be a good idea if you can tell these people who have come here to this real special meeting about if there are going to be any more meetings, to let them be informed.

MR. BROCK: Okay. Yeah. Right now, this is the last meeting we plan unless you request a meeting for so- -- on something. We'll go to Barrow and this, but this is the last meeting that we -- public meeting that -- or public hearing that we had planned to do. And then we'd be more than glad to come back up if you have some questions on specifics. We'll send people up to help answer those questions.

MAYOR SONSALLA: What is the process from here? You're taking public comments right now, but.....

MR. BROCK: Public comments right now. The pro- -- we'll get all the public comments, we get all the testimony; we go through all of the testimony. We try to answer each and

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every one of those, and assuming -- and the decision has not even been made to do the final ES -- EIS. But if the decision is to proceed with the final EIS, that'll be the next decision that has to be made.

And assuming that that is the decision, then we'll write the final EIS, and it will respond to all of the comments, either individually, or if they're all -- if there's a lot of similar comments, we'll group them and respond. That's the first major decision. Then after the final EIS, which is about -- will come out about a year from now, you know, after the final EIS is published, then there will be another decision point of whether we're going to go ahead with the Notice of Sale.

At -- usually, at the same time that the final EIS comes out, a consistency determination comes out and goes to the State to see if we're consistent with the Coastal Zone Management Act. If -- and then as soon as that is completed, then we -- then the Secretary himself makes the decision whether we'll proceed with the sale.

MAYOR SONSALLA: So the Secretary of the Interior.....

MR. BROCK: Makes that decision.

MAYOR SONSALLA: .....makes the decision whether there would be a complete sale, no sale, or.....

MR. BROCK: That's.....

MAYOR SONSALLA: .....the Barter Island deferral?

MR. BROCK: That's correct.

MAYOR SONSALLA: So it's Mr. Babbitt once again.

MR. BROCK: Right. And that would -- if it stays on the present schedule, that could be as early as -- and I don't have the schedule with me. I think it's sometime in late summer or early fall of next year. I believe it's September, if I remember right.

MAYOR SONSALLA: All right.

MR. WALKER: So while we don't have another public visit hearing in our process, the coastal CD, consistency determination, the State comes back to the North Slope Borough, through the CD process, and asks for, you know, input for the State's process on the coastal -- on the consistency determination that we have to get for a sale process. So there's still opportunity through that process yet as well, through the State process, on this sale activity.

MR. BROCK: That's correct.

(Pause)

MR. WALKER: Okay.

MR. BROCK: So let's close the public hearing now, and we'll reopen it if somebody else comes in. But if nobody else comes in, we'll close it.

COURT REPORTER: Off record.

/ / /

V-111

(Whereupon, the proceedings in the above-entitled matter were adjourned at 7:30 p.m.)

C E R T I F I C A T I O N

STATE OF ALASKA)
) ss.
THIRD JUDICIAL DISTRICT)
)

I, **CINDY S. CARL,** do hereby certify:

(1) That the foregoing pages contain a full, true, and correct transcript of proceedings in the above-entitled matter, transcribed by me, or at my direction and supervision, to the best of my knowledge and ability.

(2) That I have been certified for transcript services by the United States Courts.

(3) That I was certified for transcript services by the Alaska Court System prior to January 1, 1993.

SIGNED AND CERTIFIED:

BY: Cindy S. Carl
Cindy S. Carl
Certified Court Reporter

DATE: 12/7/95

CINDY S. CARL
NOTARY
PUBLIC
STATE OF ALASKA

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KAKPH-01
If there is a discovery of recoverable quantities of hydrocarbons in the U.S. waters of the eastern Beaufort Sea, before any hydrocarbons can be produced or facilities related to production constructed, a developmental EIS (DVEIS) would be issued. Any such DVEIS would contain an industry-generated field-development scenario. This development scenario would be very detailed and would include supply routes and traffic levels. Affected communities such as Kaktovik would be a part of the DVEIS review process.

KAKPH-02
The extension of the boundaries of the Nuiqsut deferral by 100 miles would extend the deferral beyond the proposed sale area to the north and into Canadian waters to the east. This fact would render this suggestion unworkable. However, within feasible limits, the final configuration of the sale area is at the discretion of the Secretary of the Interior. The boundaries of alternatives are presented to him for consideration. After a review of the data presented and the concerns of the public, the Secretary may alter the sale area to boundaries different then those analyzed, pick an analyzed alternative, or abolish the sale entirely.

KAKPH-03
Please see the response to Comment AEWC-05.

KAKPH-04
Please see the response to written Comment KAK-01.

V-113

DEPARTMENT OF THE INTERIOR

MINERALS MANAGEMENT SERVICE
949 East 36th Avenue
Anchorage, Alaska 99503

OFFICIAL TRANSCRIPT

PUBLIC HEARING

BEAUFORT SEA SALE 144 DRAFT EIS

Assembly Chambers
Barrow, Alaska

Wednesday, November 8, 1995
8:00 o'clock p.m.

MMS PANEL MEMBERS

Mr. Bob Brock, Regional Supervisor for Leasing and Environment
Mr. Rance Wall, Regional Supervisor for Resource Evaluation
Mr. Jeff Walker, Special Assistant to the Regional Director

Proceedings recorded by electronic sound recording. Transcript produced by transcription service.

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BARROW, ALASKA - WEDNESDAY, NOVEMBER 8, 1995

(Tape No. 1 of 3)

(On record at 8:10 p.m.)

MR. BROCK: Good evening. I certainly want to welcome all of you here. My name is Bob Brock. I'm the Regional Supervisor for Lease and Environment with the Alaska Region of the Minerals Management Service.

And before I introduce the panel members, I want to thank, first, your tolerance. We're -- the plane was late, and I want to thank your tolerance for not leaving us and still showing up to the hearing. It's very important, and I'm glad that you were able to wait for us. And I'd also like to thank Tom Albert and the North Slope Borough for their assistance in getting us here from the plane and making some of the arrangements. We really appreciate that effort.

With me on the panel tonight is Rance Wall, who is the Regional Supervisor for Resource Evaluation. That is the group that tries to determine how much oil and gas resources there are in the area we're talking about. And Jeff Walker, on the -- right here beside me, is the Special Assistant to the Regional Director of the Alaska Region.

This is our third and final public hearing on this particular sale. We held one in Anchorage October 26th; we were in Kaktovik last night; and we were in Nuiqsuit the night

before.

The purpose of this hearing is to receive your views and comments and suggestions on this Draft Environmental Impact Statement. Our goal is to make this as good a document as we can and to present the facts of the area in the document.

The map behind me on the wall here shows the area we're talking about; it's the area in red and green, is the area that's being offered. It starts three miles from the shoreline and goes offshore. The first three miles are State waters, and this has nothing to do with anything on shore; it's strictly offshore we're talking about.

The area covers about 9.5 million acres in the entire area. There have been three prior sales that have covered this general area, and a fourth one that covered part of the area. There were -- there has been about 28 holes drilled in -- off of leases in that -- in those -- in some of those leases, and there is still some leases out in the area from the previous sales. In fact, there's four leases out there that have looked at potential development, although no development at this point in time has been started, nor has any development plans been approved.

The Minerals Management Service has the responsibility to fulfill the mandates set out in the Outer Continental Shelf Lands Act and the Oil Pollution Act. In addition, we have the -- a number of other laws that we follow:

the National Environmental Policy Act, the Clean Air Act, the Clean Water Act, Occupational Health and Safety Act, Coastal Zone Management Act, and many others. In addition, Minerals Management Service has in place a whole host of operating regulations designed to make offshore operations as clean and safe as possible.

The -- this document on Sale 144, the Draft Environmental Impact Statement, has been about three years in the making. We have been up a number of times in the past during the call for nominations, during the scoping process for this EIS. I think many of you participated just recently in a workshop to look at the Environmental Impact Statement and acquaint you with the way it's written. But you're asked one more time to take a look at it and give us your comments on how we have prepared this document.

It's -- I've asked people to sign in; I'd like to be sure that everybody has signed in. And if you've -- if you want to testify, it's good to check that you'll testify, but before we leave here tonight, I will make sure that everybody that wants to testify has a chance to testify. So I'll start with that, but then we'll proceed with making -- with just calling for individuals that might not have checked whether they wanted to testify or not.

Rich Carl, over here on the end, is the Court Reporter that we have. He's making a verbatim transcript of

this -- of these proceedings, and copies of the proceedings can be arranged through him at Executary Court Reporting Services.

The comment period for this particular Draft Environmental Impact Statement closes November 20th, 1995. Any written comments that you would like to send in addition or in place of spoken testimony tonight should be sent to: The Minerals Management Service, 949 East 36th Avenue, Room 308, Anchorage, Alaska 99508. Remember, the 20th is the closing period for these comments.

With that, I'll -- I think that the first testifier on the list there is Burton, and I'll start the testimony at this point in time. So thank you all, and, Burton, you're on.

(Pause - Side comments)

PUBLIC TESTIMONY OF MR. BURTON REXFORD

Thank you. The Alaska Eskimo Whaling Commission, to the Minerals Management Service public hearing on the OCS Proposed Notice of Sale, Beaufort Sea Natural Gas and Oil Lease Sale 144. Barrow, Alaska; November 8, 1995.

First of all, I'd like to welcome you to Barrow, all Minerals Management personnel. My name is Burton Rexford, the Chairman of Alaska Eskimo Whaling Commission. Thank you for giving the AEWC the opportunity to speak to review the Proposed Notice Sale 144 in the offshore waters of the Beaufort Sea.

The AEWC was formed in 1997 (sic) -- 1977 by the whaling captains living in subsistence whaling communities of

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Gambell, Savoonga, Little Diomede, Wales, Kivalina, Point Hope, Wainwright, Barrow, Nuiqsut, and Kaktovik. Our primary goal is to protect Alaska Eskimo subsistence whaling as it relates to the year-round tradition and the cultures of Siberian Yupik and Inupiat Eskimos.

The area being proposed for OCS lease sale 144 includes the traditional subsistence whaling areas of the bowhead whale for the communities of Wainwright, Barrow, Nuiqsut, and Kaktovik. The bowhead whale is an extremely important resource for Inupiat culture.

The AEWC has, and will, continue to oppose any OCS activities that have a negative impact on the bowhead whale, its migration, or on our subsistence hunting. The AEWC especially would like to address No. 12 -- I guess that's on the sale of notice that you are refering to?

MR. BROCK: Yeah.

BY MR. BURTON (Resuming):

These terms ands stipulation -- Stipulation No. 1, Protection of Biological Resource, under this proposed notice of Sale 144. This area is an area of biological sensitive habitats which includes a variety of marine mammals. One very important aspect of any OCS lease sale is that we consider the bowhead whale a mitigating factor. The AEWC is most concerned with adverse impacts that exploration through development and production to termination of any OCS drilling will have on the

bowhead whales' migration route as well as their feeding areas.

The AEWC realizes that the bowhead whale is not the only marine mammal affected by this activity. There are numerous marine life that the subsistence users in the coastal communities depend on, such as walrus, ring and bearded seal, and many species of fish, not to mention the waterfowl all which migrate through this area.

BAR-01

At this time, we will address Stipulation No. 1. Some -- Protection of Biological Resources 1, 2, 3, and 4. AEWC would like to share the following statement from a study put together by Dr. John W. Richardson in 1990. This was his abstract in the Fifth Biological Conference of North Slope Borough's sponsored meeting:

"Sound is transmitted very efficiently through water. Underwater noise created by ships and other human activities often can be detected many kil -- kilometers away, far beyond the distance where human activities would be detectable by other senses.

"The long distance over which calls and other naturals underwater sounds can be detected are doubtless and major reasons for many marine mammals including bowhead whales, use calls to communicate they probably also listen to natural sounds to obtain information about their

BAR-01

environment. Relevant natural sounds might include surf noise noise indicating the presence of shoreline or shore ice noise and sound from killer whales.

"Concern has risen that manmade noise may have a negative effect on marine mammals. It may do so by raising the background noise level. Such interfering with detection of calls from con -- conspicous or other important natural sounds. Manmade noise can also lead to disturbing reactions ranging from brief alterations in behavior to short or long-term displacement.

"There has also been speculation that extremely strong noise might cause hearing impairment that occurs in terrestrial mammals under some conditions. The major sources of industrial noise to which bowheads are exposed are aircraft and ship traffic, ice-breaking seismic exploration, marine construction, and offshore drilling. Often the EIS statements for offshore activities deal with only the area under consideration, but the impacts may be felt at greater distance from the area of the lease sale.

BAR-02

"Many species migrate between the Navin Chukchick (sic) -- Chukchi, and Beaufort Sea planning areas. It is not possible to separate the impacts of one area from the subsequent behavior of the animals in another area.

Drilling activity in one area of the Arctic, waters can have an impact whenever animals from that area travel and migrate. It is important to recognize that interaction between these areas not limited to annual migrations."

Stipulation No. 4, Industry Site, specifically, bowhead whale monitoring program. As noted here, MMS conducts over-flight surveys of the bowhead migration each fall. At the same time, NMFS requires OCS operators holding letters of authorization to monitor the impacts of their activities on bowhead whale migration.

Coordination among MMS and OCS operators and NMFS on the subject could do a great deal to conserve financial resources for the parties involved and to promote reliable scientific research on interactions between marine mammals and offshore operations.

Stipulation No. 5, Subsistence Whaling and Other Subsistence Activities. In order to inform management decisions to be made, it is imperative that you fully take into account comments made by all organizations and individuals throughout the lease sale process, from the beginning to the end.

The people who live in the impacted areas are the most knowledgeable about its environment throughout the year. This is the one area that this lease sale will impact and affect all the people of the Arctic Slope. We will be so very impacted by chances both socially and economically.

Stipulation No. 5. To your proposed notice of sale you make an attempt to address these impacts by requiring that leases -- lessees meet with the AEWC and affected communities. The results of these meetings are to be reported in the Exploration Plan or the Development and Production Plan. This is a good start, however, it will not alleviate conflicts. Our communities prefer not to have conflicts with the MMS or with the OCS operators. However, we know that they will arise.

BAR-03

Therefore, we must agree to a mechanism for resolving conflicts, not merely reporting them, unless you resolve conflicts when they arise. therefore, we must agree to a mechanism for resolving conflicts not merely reporting them -- again. Unless you resolve conflicts when they arise in this area, you only invite more conflict.

We strongly encourage the MMS to work with our communities and interested OCS operators to create a dispute resolution mechanism. Such as an independent or mutual --

BAR-03

mutually agreed upon arbitration panel. This way could -- we would have a place to take conflicts when they arise and to have a compromise worked out.

The present proposal is good effort in this area. However, if you give us nothing more than an opportunity to comment, with no assurance that our comments will be acted on, you do no more than pay lip service to our concerns.

This is where we live. That ocean out there is garden from which we gather our food. We are leasing our garden for industrial development. If you expect any cooperation from our subsistence hunters, you will involve us in your process in a meaningful way.

We look forward to seeing you -- your next draft of Stipulation No. 5. The AEWC has made strides -- great strides in protecting the bowhead whale and its environment over the past 18 years by supporting extensive scientific research on the bowhead whale biology. Costs millions of dollars in research, and the most effective and humane techniques for taking bowhead whales within the context of our aboriginal hunt.

The Alaska Eskimo Whaling Commission believes strongly that the MMS and the Oil and Gas Development interests that it represents should be held to no less of standard of quality and integrity in its research than the AWCN and North Slope its required to meet in its efforts to protect the bowhead whale and our traditional bowhead subsistence hunt.

In conclusion, the Alaska Eskimo Whaling Commission supports the idea that onshore resources should be developed before any on -- offshore activities occurs. The Arctic is our home and we know it and understand it. Thank you again for this opportunity to speak on this very important issue.

MR. BROCK: Thank you, Bert. Can we have a copy of that statement?

MR. REXFORD: Yeah. On page 4B-36, during your statement in the EIS book: BAR-04

"Bowhead likely temporarily changed their individual swimming path as they approach or are closely approached by seismic vessels."

This statement I don't believe.

(Pause)

MR. BROCK: Where is that statement?

MR. REXFORD: Oh, 4B-36. Yeah. In the first paragraph.

(Pause)

MR. BROCK: You don't believe they will change their direction, or you don't believe they will temporarily change their direction?

MR. REXFORD: They don't temporarily --

MR. BROCK: Oh, okay.

MR. REXFORD: What I'm saying, I guess is it's not

temporary.

MR. BROCK: Okay that's w- -- BAR-04

MR. REXFORD: Yeah.

(Pause)

MR. REXFORD: 'Cause we had that experience with Nuiqsut whalers when the area of concentrate of seismic was west of Camden Bay. And, we tried everything to remedy the -- the issue, but we failed -- AEWC failed.

MR. BROCK: We will -- we will be back in touch with you on -- on that stipulation you were talking about.

MR. REXFORD: I have a follow-up statement on the OCS --

MR. BROCK: Oh, okay.

MR. REXFORD: Maggie will do it.

PUBLIC TESTIMONY OF MS. MAGGIE AHMAOGAK

My name is Maggie Ahmaogak, Executive Director to AEWC. I wish to submit to MMS the proposed regulations governing the small tanks of marine mammals, harassment takings incidental to specified activities referring to §228.4 of the Code of Federal Regulations, incorporating any plan of cooperations relating to incidental harassment or takes occurring in an area of subsistence hunting.

I'd like to read a portion of the most important part that has been sent to NMFS and as draft regulations to be incorporated within that Code of Federal Regulations:

"One the issues that the AEWC has focused on heavily with regard to open -- open water oil and gas operations in the Arctic, is the need for clear guidelines governing interactions between oil and gas operators and subsistence users. Much of this work is formalized in the Marine Mammal Protection Act Amendments of 1986 and 1994.

BAR-05

"The AEWC strongly encourages MMS to incorporate within all Beaufort Sea and Chuckchi Sea lease sales protection for marine resources and subsistence activities consistent with the statutory requirements of MMPA.

"Of particular concern are interactions between fall subsistence bowhead hunters and offshore oil and gas operators. Based on its experience with these issues the AEWC believes that by focusing on two specific areas, MMS could contribute to the reduction of tensions related to subsistence and industrial interactions in the Arctic OCS and promote research on environmental impacts of offshore operations.

BAR-06

"First, MMS should consider requiring as a condition of its lease sales in the Beaufort and

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BAR-06

Chuckchi Seas, that purchasers and their affiliates subcontractors successors and assigns operating in an area where subsistence activities might be affected make a good faith effort to obtain the agreement of representatives of subsistence users to the relevant plan of operation.

"By imposing this requirement, that will encourage offshore operators to work with local subsistence users on development of mitigation measures that protect subsistence users and are consistent with operational objectives. The AEWC has a long history of working cooperatively with members of the exploration of production industry to develop such measures."

The second area where MMS could make an important contribution is that of research of impacts of OCS operations on fall migrating bowhead whales. MMS conducts over-flight surveys of the bowhead migration each fall. At the same time, NMFS requires OSC operators undertaking activities in the area of the bowhead migration, to monitor the impacts of their activities on the migration.

What nation among MMS, OSC operators, and NMFS on this subject could do a great deal to conserve financial resources for the parties involved and to promote reliable

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scientific research on interactions between marine mammals and offshore operations?

With this, we'd like to also supplement copies of the draft regulations that have been already supplemented for incorporation into the <u>Code of Federal Regulations</u>. Thank You.

MR. BROCK: Thank You.

MS. AHMAOGAK: Mm hmm (affirmative).

MR. REXFORD: Harry will point out the Nuiqsut whalers. Whale 107 and whale 108.

(Side comments)

MR. REXFORD: Nineteen -- what year was that, Harry?

MR. BROWER: 1991.

MR. REXFORD: '91?

MR. BROWER: Mm hmm (affirmative).

MR. BROCK: Both?

MR. BROWER: Yeah, both of them. These were whales taken by Nuiqsut whalers from where they were known, you know.

MR. BROCK: In other words, you're pointing out the distance.

MR. BROWER: Yeah. This is how.....

MR. BROCK: Yeah.

MR. BROWER: .....far they were out.

MR. BROCK: How far is that? What's the.....

MR. BROWER: I'm not sure how far we are from.....

MR. REXFORD: Nuiqsut Whalers claimed, it was 35

miles out.

MR. BROCK: It was 35 miles.

MR. REXFORD: Thirty-five, forty miles.

MR. BROCK: And that was in '91.

MR. BROWER: Mm hmm (affirmative).

MR. REXFORD: Thank you, Harry.

MR. BROCK: Thank you.

(Pause - Side comments)

MR. BROCK: We got a copy of this -- of these locations down at the -- since this meeting, didn't we? Didn't our office get a copy of those locations?

MR. REXFORD: I'm not sure.

MS. AHMAOGAK: Maybe the areas specified as the islands in his previous statement, you may have gotten the coordinates for those islands.

MR. BROCK: Is there any chance we could get that map?

MR. REXFORD: Yeah, I think it can be made available. Where's the dot.....

(Side comments)

MR. TOM ALBERT: Harry Brower put the map together.....

(Laughter)

MR. TOM ALBERT: .....and he -- Harry needs to put more (inaudible - cough) and write some sort of a.....

MS. AHMAOGAK: That report identified 11 islands and (in Inupiat). Those islands, I think, that have the coordinates for -- within your EIS has the Point Barrow, Nuwuk from there as the -- where the bowheads' natural habitat localization areas. Ilutkwok (ph) Island, Tepkaluk (ph) Island, Cooper Island, Martin Island, and east beyond Martin Island.

MR. BROCK: Okay.

MS. AHMAOGAK: Those are -- what?

(Side comment)

MS. AHMAOGAK: Tepkaluk (ph).

MR. BROCK: Okay. Well, we'll work with Tom to see if --

MS. AHMAOGAK: Yeah.

MR. BROCK: -- we can't get that then.

MS. AHMAOGAK: Mm hmm (affirmative).

MR. BROCK: We appreciate that. Thank you very much. Or Harry.

The next one that I have down that wants to make a comment is Michael -- and I'm not sure what that -- is that P-e-e-l-e-y-a-n?

MR. PEDERSON: Pederson.

MR. BROCK: Okay.

(Pause - Side comments)

PUBLIC TESTIMONY OF MR. MICHAEL PEDERSON

Good evening. Welcome to Barrow. My name is Michael Pederson, and I'm the Natural Resource Specialist for the Arctic Slope Native Association. ASNA is a nonprofit tribal consortium dedicated to the cause of Native self-determination with headquarters in Barrow. We provide services under a Public Law 93.638 contract to the tribal members in the following communities: Anaktuvuk Pass, Akucumsuk (ph) Kaktovik, Nuiqsut, Point Lay, and Wainwright. ASNA supports the comments of the Alaska Eskimo Whaling Commission and North Slope Borough, our local municipal government.

Several species of marine mammals, fish, and water fowl are the main biological products of the Arctic Ocean and are used extensively for subsistence purposes. The indigenous population in the coastal communities are dependent upon the subsistence resources for their food as well as their cul -- cultural continuity.

An oil spill can threaten the arctic marine ecosystem primarily through effects on marine mammals, migratory water fowl, and coastal stocks of migratory fish. Out of the 28 exploratory wells that have drilled, only nine have been determined to be producible, but none of which is considered commer -- commercially viable under current economic conditions. This appears to be some reasoning to explore elsewhere, such as on-shore.

ASNA disagrees with the draft EIS in identifying the BAR-07

BAR-07

Beaufort Sea as having an average marine productivity environmental sensitivity to coastal habitats and sensi -- sensitivity to marine habitats, and marine biota. The Beaufort Sea's ecosystem is one that is depended on by subsistence users from the communities of Barrow, Nuiqsut, and Kaktovik. Residents from these communities also share their subsistence resources with other coastal communities, as well as communities located inland, and with relatives who live in the urban areas of Alaska.

ASNA does agree with the U.S. Environmental Protection Agency in identifying this area as having high environmental hazards and agrees with the U.S. Fish and Wildlife Service to create a coastal buffer in case you decide to allow leasing to protect the coastal resources such as fish stocks.

ASNA also agrees with other organizations in the draft EIS that say that there is a high potential of oil spills in the Arctic, and that there is inadequate oil spill cleanup technology available at this time. Winter ice conditions are severe and unpredictable.

ASNA agrees with the State of Alaska and the North Slope Borough to exclude lease plots off of Point Barrow, which is a bowhead whale migration corridor. Migration occurs in both the spring and fall. This has been in the past in other lease sales and it is recommended that this area continues to be off limits to lease sales.

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The Kaktovik deferral areas should also be off limits to lease sales as has been in the past. That area is a known bowhead whale feeding area. Scientific research has shown that bowhead whales caught by whaling captains in Kaktovik have been feeding as they migrate from the eastern Beaufort Sea.

Our Inupiat culture and our way of life needs to be protected from the effects associated with petroleum development, including our subsistence life style. And the residents of the North Slope Borough is not going to sit down and watch developments happen without input from us.

One thing that you guys need to consider also is when you do lease sales, you guys should have a federal revenue sharing program so that impact funds can be distributed to those communities.

BAR-08

ASNA is pleased to see that the Borough deferral area is outside the proposed sale area, but the area north of Dease Inlet is critical habitat for several species of marine mammals, and this is an area that is heavily traveled by and used by subsistence hunters from Barrow. Several fish camps are located down river from Dease Inlet.

The alternatives not included in the draft EIS are concerns that the subsistence users have including all the deferrals listed and they should have been adequately addressed.

No matter what happens in the Beaufort Sea, the

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adoption of mitigation measures affecting the potential of oil spills and noise has to reduce the risk to bowhead whales during their migration, both in spring and fall.

I want to reiterate that our culture and subsistence mainstay is the bowhead whale, and that the whaling captains as well as other subsistence users should have input on decisions that will directly impact us by oil development. I believe that MMS should have considered more lengthily a seasonal drilling restriction in their draft EIS.

BAR-09

On March 28, 1994, a scoping meeting was held in Barrow. Some of the concerns that I addressed at the time, included the following related to Lease Sale No. 144. In Lease Sale 144 the communities whose subsistence activities will be affected are Nuiqsut, Kaktovik, and Barrow. Each fall whaling crews from Nuiqsut travel to Cross Island to hunt for bowhead whales. This is the only location available to the Nuiqsut whaling captains besides Nora Island where they can hunt for bowhead whales during the fall.

In Kaktovik, the whaling crews ventures out to sea to hunt for bowhead whales. They also hunt bearded seals, beluga whales, and fish for Arctic Sisco, Arctic char, and salmon. All these animals are hunted for subsistence purposes. The area in Lease Sale 144 is also an area heavily used by fall migrating bowhead and beluga whales.

Areas such as Camden Bay have been identified as

feeding areas for bowhead whales, and beluga whales have been observed following the bowhead whales during their spring migration. Beluga whales stay closer to the shore than bowhead whales do, but both bowhead and beluga whales migrate in the open leads along the coastline. This area, the Beaufort Sea, is also home to polar bears, bearded, ringed and spotted seals, and walrus -- walruses which the Inupiat people also hunt for subsistence.

In the past several years, the Beaufort Sea has seen exploration activities come and go, such as the Kuvlum Prospecting, Arco's Cabot site, which did not yield any significant finds. Any obstacles, such as exploratory drilling rigs, will affect the migration routes of the marine mammals which our communities depend on for subsistence.

It's not just the food, but we use other portions of the animals for Eskimo drums and bearded seal skins to cover our traditional umiaks during the spring bowhead whale hunt. Local arts and crafts are also made with certain parts of the animals we hunt. It is not only from the seal in which we gather our food, but on the land as well where we hunt for caribou, moose, wolves, wolverines, and foxes.

If you -- if you go ahead with lease sales and developments begin displacements of the animals we hunt will occur, our Native hunters will have to travel long distances to provide the traditional foods for their families. We have seen this happen to the Nuiqsut whaling crews at Cross Island when exploration activities such as seismic testing, force the whaling crews had to travel more than 30 miles in search of bowhead whales, at times running into stormy weather as they returned from a successful hunt and, in the end, only being forced to cut loose a bowhead whale that they had been towing so that they can make it back to Cross Island safely.

What concerns us is if development proceeds, how will the people living on the coast survive if there is an oil spill or even a blow-out? We all know the results of the Exxon Valdez oil spill in Prince William Sound. Some communities down there have had to forego their subsistence life style immediately after the oil spill. I have heard this frustration first hand from the people living in those communities.

We have been told time and time again that the necessary equipment will be available in the case of an oil spill. That is not good enough. The Beaufort Sea is very unpredictable both during the summer and winter. Icebergs and the ice pack itself is a dangerous force to reckon with. Dangerous conditions do exists, and we feel that offshore exploration is not a possibility that should be further explored. Other alternative sources of fields should be explored such as developing potential on-shore resources.

In closing, ASNA opposes any type of exploration and development in Arctic OCS. ASNA prefers alternative two, in

the draft EIS which is no sale. The marine mammals that live in the Beaufort Sea provides for our sustenance as well as terrestrial animals. The sea is our garden and that is true. It has been said again and again. So how many more times do we have to repeat it?

The MMS went to great lengths to develop this draft DIS, but in the end, the impacts of any decision that is made will be on our doorstep. So I urge you to take the necessary steps to pro- -- if you proceed with the lease sale, to provide for the protections we need to continue our subsistence lifestyle across the Beaufort Sea from Barrow to Barter Island. Thank you.

MR. BROCK: Thank you. Can we have a -- okay, good.

MICHAEL PEDERSON: Yeah.

MR. BROCK: Bill A-d-a -- and I'm not sure what's the letters after that.

BILL ADAMS: M-s.

MR. BROCK: I expect it is.

PUBLIC TESTIMONY OF MR. BILLY ADAMS

Good evening. I have a bad cold today and I happen to have this cold for several days now. I haven't received any kinds of books or anything as part of the community. There's a lot of people out there that needs to get some of this information.

I just found out there was a meeting today, and right

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off the bat I wrote down what was in my mind and inside of my me, in a few short minutes.

My name is Billy Adams. I was born and raised in Barrow, Alaska, and I'm 30 years old. I live a subsistence lifestyle, and I'm a whaler who depends on the bowhead whale for food, just like the many other Inupiat people who live by the ocean.

I work for the North Slope Borough Search and Rescue Department. Through my personal observations during offshore searches, I have witnessed what the current can do in a few short hours. If a spill were to occur offshore oil and other foreign substances could travel great distances. Other -- other problems such as ice pile-ups and similar weather conditions could endanger the lives of people and wildlife.

Which the Native people depend upon from the ocean. An oil spill clean-up in this matter will be impossible in the Arctic Ocean, even in the short several months. One cannot imagine what the impact can do to the wildlife and the li- -- and to the wildlife and the lives of the people that depend on the ocean for food.

I can remember when a seismic ship was doing some work near Barrow during the fall whaling season. In that year we did not spot any whales because the noise was disturbing the migration route of the bowhead whale. If there should be any development in the Arctic, it should be done on the land where

the oil can not go far into the oceans current or under the ice. Thank you.

MR. BROCK: What year did you say that you -- you didn't see any whales?

MR. ADAMS: That was probably in 1986.

MR. BROCK: 1986.

MR. ADAMS: To my recollection. Thanks.

MR. BROCK: Thank you.

JEFF WALKER: Thank you.

(Pause)

MR. BROCK: Gene Brower.

PUBLIC TESTIMONY OF MR. EUGENE BROWER

I'm going to speak in my Native tongue first. My name is Eugene Brower.

(Speaking in Inupiat)

This Lease Sale 144, gentlemen, was brought -- my name is Eugene Brower. I'm a whaling captain in Barrow, past President of the Barrow Whalers. We have come before you time and time again objecting to the lease sales off the ocean, off the Beaufort Sea.

Looking in this draft impact statement you've made here, there's no mention of the whaler's observations that have been given to you time and time again on these draft EIS statements that you come here to hear from us or to present to us.

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Different whalers from Barrow or from the different villages have come before you and told you of their observations, their experiences out in the ocean. And what they've -- they go through to get the bowhead. There is not one mention of any of that statement from previous statements by any -- anybody in this book.

Now we have a different class of people again before us just to hear the environmental impact statement. It's never the same people that come before us. And we speak like a broken record before you. Whatever we say is never put -- is never inputed in this book what so ever.

Maybe if we have the fancy degrees of being doctors or an expert of so-and-so, you can put our statements in the book. But you don't use the book from the real people that give you the real live experiences as to what they've observed, the knowledge they have of the area they're involved with, none of that is ever inputed into the statement.

BAR-10

It's just like on your page 4, Summary of Effects on Biological Resources. You have a statement in there that says 'The bowhead whales exposed to noise-producing activities and oil spills would experience temporary effects. However, oil spills would result in lethal effects to a few individuals with the population recovery within one to two years.' Now, that's a lie if I ever saw one. Based on what scientific knowledge are you making that statement?

For years, we the people up there, through our government here, the North Slope Borough, with our scientific people that work with the Municipality and the people up here, have brought study after study before you, the government, and the IWC, and we have had to prove every statement we make with a back-up and a back-up on top of it. Yet, here on the draft statement, you can easily just make a statement that if there's an oil spill that the bowhead is going to recover in one to three years.

BAR-11

Where we have been managing through AEWC and our local whaling associations on managing the bowhead for the past 17 years, using scientific knowledge and our own common sense for management. You say that the noise is not going to displace the migration route. In the past, we have had different whaling captains that have left us now, and some that are currently alive that have come before you time and time again to give their observations, their experiences, on the displacements of the migration run of the bowhead.

Based on seismic activity that has been done over at Prudhoe, off Simpson, off of different areas on the Beaufort Sea. Here in Barrow, not too long ago, we had that experience of the Arctic Rose, a seismic boat that did a high frequency reso -- resolution study off Cooper Island. During that fall season, my fellow whalers had to go far out to go look for the bowhead whale. That was stated on one of our environment impact statements that we have before you.

In the following year, or the year after it, the platform drilling ship Cabot was put out there to do some drilling. Just from the noise from that drilling ship sitting idle, you could not find the bowhead whales where you normally find them. They had to farther and farther out, and if I'm not mistaken, a chance to be corrected, the four whales that were caught when the drilling platform was out there were caught off Cape Simpson. That's almost 60 miles to the east of us, where we found the bowhead.

Those were brought to you guys' attention on the map and in previous statements, yet, not one mention of them in this book. You are going through different things. There is very loose, very lightly written draft statement. You talk about effects of the bowhead are most likely -- that there are -- that you are saying -- you very like -- activities are seismic activities are going to have a likely effect on the bowheads.

When have seen it, when the seismic activity is going on to the east of us, where the migration route off -- off here in Barrow are farther out than the normal migration route. That's on -- it looks like 4B-34, potential effects of noise and disturbance. Very lightly, you speak very lightly of the displacement of the bowhead route. BAR-12

The following page, you got a big paragraph there.

You got a -- third and fourth paragraph of that page. It's very lightly written. We've got actual case experiences up here in Barrow where I made reference to the Arctic Rose, that did the high frequency resolution off Cooper Island on a couple tracts of land, or parcels of land out there and that drilling platform. Then -- then you are saying that there are going to be about 273 drill -- ah, drillings out there. Production service wells to be drilled for the next 24 years once the lease sale goes into -- once you make the lease sale. That's pretty close to 12 drillings per season. BAR-12

And you are saying that's going to be a minimal impact on migration run of the bowhead? From all the activity that is going to be done during -- during the 12 drillings per season? Whether during the winter time or in the spring, when you got open -- open water out there to do the drilling?

That is going to have a tremendous impact because of our experience. We've told you that time and time again. The subsistance harvest patterns are going to change, are going to be heavily impacted up here. North Slope, Kaktovik, and Nuiqsut, and also Barrow. Because Barrow hunts during the spring and the fall time.

You've heard from us here in Barrow. You've heard from the villages in Kaktovik and Nuiqsut, that the migration route is affected when you have seismic activity. But it seems like our federal government doesn't hear that. It's no where stated in this --this statements made by actual hunters, whalers that have made their observations and brought they say -- and brought their views to you.

You talk about different birds, species of birds. They are going to be affected. Different species breed around those islands that are out there.

You barely speak -- it might have been five of 4D-4, effects on the bowhead whale. You speak lightly of it. You think that -- you say that the bowheads are going to be displaced a little bit, but they are going to be coming back. BAR-13

It's -- it's frustrating to come here. To come before you to make a statement on the issue of the bowhead. Or -- or our subsistence way of life up here. Time and time again we've come before you to make this different -- to make this very same statement. That we prefer that you go on the mainland first, then go to the ocean.

This is -- you -- you live down in Anchorage or back in D.C. or elsewhere where you won't be impacted. We're the ones that are living up here, that are going to be heavily impacted by whatever happens out there.

True, Barrow might be the cosmopolitan city of the north, but the Inupiat people that live up here, that live off the subsistence lifestyle, want to keep living that lifestyle. And if you have any questions, I can answer some questions if -- if you have them at this time.

MR. BROCK: Not right now, but thank you very much.

MR. BROWER: And I hope in the future, that the statements that we make, whether it's written or not, or have been tape recorded or not just put on some shelf so they can collect dust or archives without being inputed into this planning. I mean, its -- you guys weren't the same guys that were here last time around.

MR. BROCK: I was, but ......

MR. BOWER: But your cohorts are not .....

MR. BROCK: I've -- but yeah, but we try to work them in -- I'm not -- sometimes we don't give the proper credit to where we get it, but we do try to work those statements in but we are not.....

MR. BOWER: You never see them in there. You never see them in this book......

MR. BROCK: .....But we don't -- we haven't.....

MR. BOWER: .....there's nothing in there.

MR. BROCK: .....been giving it the proper credit that needs to, and that's something we are going to change.

MR. BOWER: When? We'd like to see the change when you say we are going to see the change. That's another broken record for you, that you are going to see a change. There's never a change. Thank you.

MR. BROCK: Thank you.

(Pause)

MR. BROCK: Jim.....

(Pause - Side comments)

PUBLIC TESTIMONY OF MAYOR JIM VORDERSTRASSE

Thank you, gentlemen. My name is Jim Vorderstrasse, Borough City Mayor. I'd like to go on record as supporting the Alaska Eskimo Whaling Commission, the North Slope Borough, and the other people who have testified here tonight.

I've been hearing the testimony for many, many years. And I guess my question tonight would be, are you the gentlemen that make the decision on whether they have the lease sale or not?

MR. BROCK: The Secretary of Interior ultimately makes that decision. No, we're not the people. We -- all we -- our goal is to make sure this is as honest and forthright a document as we can so that the decision-makers have that information.

BY MR. VODERSTRASSE (Resuming):

All right. I -- I've been reading through this document the last couple days trying to develop some comments and it's -- it's overwhelming. There's a lot of things in here that have been studied and you have graphs and probabilities of how much oil would be spilled in worse case scenarios or worst -- or some other instances. But who knows?

I think back on the Valdez spill. Did -- did you ever imagine it would be that bad when it happened? Did they

ever have that? And I just don't think that you can really imagine how bad it could be and how it could affect this environment here. And why are we willing to risk going out there in the ocean for a hundred days of cheap gasoline down in the Lower 48. I just don't think it's worth it.

And I -- I don't know if you gentlemen would be here if in fact something like that did happen, to clean it up. Or try and clean it up. I just think there are other -- many other things that should be instituted before we go to that extreme.

And I know you've drilled 28 holes already, and nine have proved possibly that there might be oil there, or they -- they're not commercially viable at this time. But are we really to risk what could happen to the environment here? And maybe never bring it back to the way it was. Is it that important?

And, we know that even though you have these different graphs and stuff that -- it might not truly be a worst case scenario if there was an accident, and I would sincerely hope that you would really take a look at it.

And these people up here I've -- myself included -- I've seen over, over, and over again. They come and testify and we're the people that live here, and yet we don't seem to get the attention that I would think you would give someone in their own backyard. It happens in our own backyard. And it

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seems like it's a -- it's a done deal.

Before -- it just goes ahead anyway, no matter what we say. Even though I don't think that I've ever heard anyone testify for an oil sale -- offshore oil sale here. Well, that's my comments. Thank you.

MR. BROCK: Thank you, sir. Tom Albert.

PUBLIC TESTIMONY OF MR. TOM ALBERT

My name is Tom Albert. I work for the Borough's Wildlife Management's Department. And if you don't mind, I would like to read my statement. I've got it enclosed in these three documents, and I'll just begin with page 1.

(Laughter in the background)

Anyway. Thanks a lot for coming here. And -- these reports I'm just going to refer to them as some examples of something and -- as I think as a couple of people have already pointed out, we've all been doing this for a long time, and one might wonder whether -- whether it's worth it or not.

When this draft environmental impact statement was, you know, on the way, or before it got here, I was convinced -- in fact, I would have bet money -- but I'm glad I didn't -- that this one was going to be different than the many, many other ones that I've seen over the last 16 almost 17 years now. Sixteen years or so.

If I had to bet, I would have bet the following things. That for once, this Environmental Impact Statement

would not only have the standard scientific statements about seismic noise, that is: Bowheads don't react until they're 7.5 kilometers away. But it would also had (sic) some statements in there that the Borough, the AEWC had made, or that the individual whaling captains have made here. They don't believe this; no one that lives around here believes that 7.5 kilometers is the magic number for seismic boats. BAR-14

But I read through the bowhead sections in here, and I was really -- I really kind of got mad that this one was the same as all the rest. It doesn't si- -- if you can find one reference in here to what anybody around here has ever said in the bowhead sections, point it out to me. I've read them, kind of fast, I might have missed it. That -- that really is a shame.

I also thought that this EIS was going to incorporate significant amounts of data from the BBN Noise Study which is this big report -- this one here -- 1987. I thought it was going to incorporate some findings in response to two drilling platforms, the Corona and the Hammerhead platforms in the fall of 1986. I can't even find it even listed in here even as a reference. BAR-15

I've read every one of the reports that have come out over the last many years on monitoring up here. This is by far and away the best -- the so called SWEPI Report, done by LGL for Shell. The rights to Corona and Hammerhead. And in my opinion, the only reason it was so good is because for those of you that remember back when we had seemingly endless head-banging sessions with the various agencies and industry groups trying to pressure Shell into doing a good job. Finally, they did agree to do a good job and they did. It was an excellent report. It shows plenty of bowhead impacts. Is it cited in this EIS? I can't find it.

BAR-16

The third thing I thought sure was going to be in this report was after the standard bowhead whale feeding study, done for MMS by LGL, are the -- the eastern part of the Alaskan Beaufort Sea, which now has almost become chiseled in gold.

I thought for sure in this EIS, you would also site the report by the North Slope Borough Science Advisory Committee. Seventeen experts who spent three days reviewing this thing, who concluded that the data in this feeding study report do not support the reports conclusion. If you are a scientist, you know what that means. That's a very nice way of saying, you stretched the data, and if you want to get real smart, you could say somebody might of lied.

Here's 17 experts that we paid to review this report, that worked for various universities around the country. We've given you copies of this report, and it's never done any good. But just in case I've got a few more for you anyway.

MR. BROCK: Could I -- could I have the year of that

report, Tom?

MR. ALBERT: Of what report?

MR. BROCK: That blue one.

MR. ALBERT: 1987, the same as the feeding study. It was reviewed soon after it. Anyway, none of that is in this EIS. That one flabbergasted me.

Anyway, another thing I want to comment on is the response of bowheads to noise in relation to drilling and seismic ships. And the third thing I wanted to mention was this feeding study report.

Now let's -- let's take a look at the EIS -- if you've got one -- if you open it to Arti -- §4B-36 and B-35, I want to show you something. Something scary. Anyway, if you open it -- if you look -- for whoever pays any attention -- if anybody does to these types of comments, the §IV B-35 and 36, that's where it talks about bowhead responses to drill ships, approaching ships, and ice breakers and seismic and so on. Let me cite a couple of examples.

BAR-17

On 35 page it says that 'most bowheads respond when a seismic boat is 7.5 kilometers or closer.' This 7.5 number is one of the -- it's like a universal constant or something -- speed of light or something. This'll soon appear in the handbook of chemistry and physics as a constant, I guess, because it is quoted so often. But there is nobody in this room who believes it.

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Now if you go back and read the original papers that this was based on reports, in most instances where they studied the whales with the approaching seismic boat -- or the seismic boat off or whatever -- there was another seismic boat boom -- booming in the background.

Very few of the so called control animals in those studies were ever free of seismic sounds. But anyway, on page 35, we've got the 7-point kilometer thing. And it also says on page 35, that bowheads exhibit strong avoidance when the boat gets within a few kilometers. That's probably less than 7.5.

BAR-18

Well, let's go look at some real data that don't (sic) appear in this -- in this report. If you look at the SWEPI Report, this green thing, that was done in the 1986 drilling and so on at -- at Corona and Hammerhead, on page 45 of the Intergration and Summary Section of the SWEPI Report, they note that approaching seismic boat cause strong responses at 12 miles for a group of four to seven whales which moved strongly away. That's 24 kilometers.

So who ever was doing the 7.5 kilometers calculation forgot to put this in. And interestingly enough, it's the same guys, Dr. Richardson and his colleagues. I can't understand it. So there's a strong response at 12 miles. Does that ever get quoted in these EIS type documents? Don't hold your breath.

BAR-19

Another thing, on page 116 of the Behavioral

BAR-19

Observations Section of that SWEPI report, it notes that there's an increase in the call rate after seismic boats stop, in bowheads. After the seismic boats stops, their call rate increases. This is when the whales are 60 miles away from the boat, 110 kilometers away. So here's -- here's whales that are 60 miles away changing their call behavior when a seismic boat stops. Does that ever get into this document? I can't find it. All we have in here is 7.5 kilometers and a few kilomters.

Needless to say, the people -- all the -- the whaling captains, the guys that go out and hunt the whales around here, they don't believe the 7.5 kilometer thing. Let me ask you, why are none of their comments in here? If you want to put down the 7.5 chiseled-in-gold comment, why isn't it followed by another statement that says, however we have been repeatedly told for the past 10 years at 722 meetings, that the whale -- that the whaling captains -- the hunters that go out, feel that the reaction is on the order of a 10 miles or more? Why isn't that in there? Does anyone care to try answer the question? Why isn't it in there?

BROCK: I believe it's used, but I don't think it's given its proper -- its proper response.....

ALBERT: It's not in here.

BROCK: .....but I'm -- I'm -- I'm going to have to do some checking.

ALBERT: Okay, Bob, it's -- it's not in here, believe me. I read it real close. Okay. Let me ask you, is there any chance that any of these comments will get into the final Environmental Impact Statement? You got -- we know the old 7.5's going to get in there. That's -- I tried to erase it, okay, you -- it's -- it's -- it's an indelible ink in that book, I know it. Are any of these other numbers going to get in there? They're true. John Richardson, they're the guys that reported them, and I gave you the exact pages they occur on.

MR. BROCK: Yes, well I'm going to -- I'm going to find out what -- what the deal is on those.

MR. ALBERT: Okay.

MR. BROCK: I will, and I'll get back to you.

MR. ALBERT: All right. That -- man, that'd be great if -- if something like that ever happened.

BY MR. ALBERT (Resuming):

But anyway, let's take a look at the responce to drill rig noise and ice breaker noise. On page -- in EIS on IV b-36 in paragraph 3 where it talks about drill rigs and ice breakers, it says 'approaching whales may slightly change their migration speed and swimming direction so as to avoid the noise source.' BAR-20

Slightly change speed and swimming direction. What's that mean? Well, let's take a look. It also mentions, that the BBN noise study -- this white report down here -- says that BAR-21

bowheads are likely to respond to ice breakers at somewhere between one and 15 miles. BAR-21

Now, if you go and get the BBN report and look at it yourself, on page 317 of the BBN report. They speculate -- that -- that this is an estimation report. Okay, modeling type right report. But instead of the 1 to 15 models, it says that at least some bowheads will be displaced in response to an ice breaker now at 25 miles. This means the diameter of 50 miles.

It also says that probably one-half of them, will be displaced at 11 miles. Which means a 22 miles diameter zone. Fifty percent of them are going to be displaced. That's a whole lot different than the one to 15 mile thing. Same report, okay. You can look it up on page 317 in that report.

Let's go look in the SWEPI report. This LGL report done for Shell on the 1986 Corona and Hammerhead stuff. If you look on page 45 of the Integration and Summary section of the SWEPI report, they give their principal finding. This is pretty strong for John Richardson and his colleagues, "principal finding." None, no bowheads were seen closer than 9.5 kilometers, 6 miles, and few were within 9 miles, 15 kilometers.

That's a lot different than what is in the EIS which says one to four miles and -- and things of that nature. In the SWEPI report, it also notes, that they followed one whale for 6.8 hours. I'm sure most of you guys have heard of this whale. They followed it for 6.8 hours, as it approached the drill rig at Hammerhead, turned north and went around the thing. They -- they followed it through an arc of about 90 degrees or so. BAR-21

The bottom line is, that over those almost seven hours. The thing stayed 23 kilometers, or about 12 miles away. That's pretty good evidence of what at least one whale did that somebody watched. I can't find that report even referenced in this document. And if you produce the final Environmental Impact Statement, just out of fairness. That kind of stuff should be in here. It's not fair to say 7.5 kilometers all the time for seismic. And one to four, or something like that for a drill rig. That's just not right.

If you look at the thing that was done in relation to Kuvlum. Everybody remembers Kuvlum Copact study for ARCO? They have some interesting stuff, too. And I don't know whether that is cited in here. But anyway, the bowheads that were seen averaged 24 miles away from that drill rig -- averaged 24 miles away. The bowhead calls -- and they did a lot of acoustics -- peaked at 19 miles away. So at 19 miles, there was something significant going on the calling rate of these animals. And they were averaging 24 miles or so away. BAR-22

Belugas averaged 47 miles away. They really stayed away from this thing. And beluga calls peaked at 60 miles. This is on page 3 of the May 14, 1999 (sic) 1993 report on the

Kuvlum project which reported on drilling in the summer or fall -- and fall of 1992. BAR-22

There is some real significant impacts that just don't seem to get included here. This thing -- this feeding study -- Bob, you probably remember this. The long time ago -- I think it was like in the mid-80's -- the Borough was going to sue MMS to delay a lease sale. There was a big panic and a bunch of people -- all of us -- went to Washington and so on and met with a lot of chiefs. And finally got worked out in the big interior building, that if the Borough would back off the Minerals Management Service would agree to do a very good study on this -- on the feeding area around Barter Island because that's what we were all arguing about at that time. BAR-23

But as is often the case, you know when you get into an agreement like that where you do your part first, you've got to hope the other guys does his part. MMS did do this, paid for a study -- you guys paid for it, a million or two million, what ever it was produced a great big report which is great. You know, life -- and some time I'm going to get a wood stove and take care of some of these things when I retire. But the fact is, the bottom line of the 560 pages, or what ever it was -- was, that -- that area around Barter Island over there, is not a significant. It produces less than one percent of the nutritional requirement of the bowhead herd. Or less than 2 percent, something like or -- it some insignificant amount.

BAR-23

When the people in Kaktovik found out about this, they all blew a gasket. People like me, we all got upset. You know, what's going on here? All the bowhead whales that get caught at Kaktovik have full stomachs. People see them feeding over there. So we gave that to our science advisory committees I told you, and they -- 17 people divided up for 3 days and went over that report chapter by chapter. And I'll give you another copy of this report which said something that I only ever saw them say about one other report that they've ever reviewed which basically said -- didn't basically, it actually says it -- that -- that the data in the report don't support the reports conclusion. That's terrible to say about a scientific study. One might wonder whether the 1.9 million or whatever it was, maybe you should ask for the money back, or part of it. It's probably too late now. But that, you know, that's pretty tough.

Now, out of common fairness, scientific fairness, whoever writes these EIS'. This was not written by a bunch of yokels who live in Houston, Texas or something like that. This was written by -- just look at the names of the people that wrote this -- they were good scientists. None of them worked for the Borough, they don't have any real ax to grind. They are all university employees from all over the United States. And they just dumped all over that thing. And they concluded something that needs to be put in here. If you want to cite

BAR-23

that thing -- this thing to say that area of there is no good as a feeding area, then out of fairness, you've got to cite this. That's just normal scientific behavior.

So -- so if the final Environmental Impact Statement is produced -- I'm sure it will be, I sure hope that you put in some of the comments that people make here. The generic comment from the whaling captains is they don't believe 7.5 kilometers. And they have on-the-ground experience. They can't tell you whether the bowheads are 10.9 miles away, but they know they are a long ways away, more than 10 miles.

And -- if you -- anyway. I -- I sure hope that when you revise this document, that you take some of these things into account. And one of the reasons that there's so few people in this room tonight is because the answer that we get when we ask people to come out is 'why should I?'

You know, if you remember back, Bob, you used to come back up here in the mid-'80s. There used to be a lot of people come to these things. Cause people thought it was worth something. But now most people feel, why should I give up watching the Lone Ranger or something like that on the T.V.? Cause this is not nearly as interesting, and it's not going to do any good.

If you revise this final EIS and none of these things have been changed. It's like Eugene Brower pointed out and so on -- Burton and so on. Then that sells (sic) tells us something real significant. It just tells us that, you know, you guys are doing your job jumping through a hoop coming up here. We are doing our little job telling you our thing and it's for nothing. It shouldn't be that way. Thanks a lot.

MR. BROCK: Thanks a lot, Tom.

(Off record)

(Tape Change - Tape No. 2 of 3)

(On record)

PUBLIC TESTIMONY OF MR. CRAIG GEORGE

My name is Craig George and I am a wildlife biologist with the Department of Wildlife Management. As you can see, I have a smaller pile than Tom -- things to read. Anyway, I wanted to start by just correcting a few technical errors. The population estimates that are given in the bowhead section are out dated, they're incorrect. And I can provide -- the current estimate is 8,000 animals. I'll give you the proper reference later. BAR-24

But a more significant error is the -- the omission -- or the -- of the rate of increase information. It says in there that there's no clear trend in the population. And that the increase in number of animals seen during the population census work that we do here in Barrow is attributable to changes in techniques. That's flat wrong. It's -- there's a clear significant trend increase in the population since 1978 and I think the most current estimate is 3.1 percent per year. BAR-25

So that's a fairly important problem there. That's on page 3B-10, and I've got a -- some publications to leave with you on that.

We've heard a lot about traditional knowledge this evening. I can tell you that it's a -- local knowledge, we've used it extensively in shaping our population work that we've here. And I think our success is largely attributable to using the local expertise. There's nothing mysterious about traditional knowledge. Wildlife biology is largely an observational science. And, it's real simple, the person -- or the -- who has the most number of observational hours has the best data. It's just kind of how it works and the cumulative hours of observation of the whaling community just dwarfs anything that's been done by the scientific community. And the thing is it's not written down in to a black and white format that can be cited easily. But in some cases, it is we report it -- information in our various reports and cite the reference. And I'm sure you know Sue Morris' paper on summer records of bowheads whales on the northeast Chuckchi Sea. This is largely an accumulations of local sightings that I've collected and she's collected and other people have that -- that contradicts the --basically what's said in this document that bowheads all summer in Beaufort Sea -- in the eastern Beaufort Sea.

Every year, and more and more commonly, guys like

Billy and Carl, sitting over here, give me recent -- you know, sightings of bowhead whales summering in our area. And those are all summarized in this paper. I didn't see this cited there. You can have that? Anyway, the take-home here is that we recommend that you listen to what -- and -- what people have said here this evening and take it to heart.

Regarding the feeding section in here. Probably one of the most important things we've learned from doing the population work here is you need a long time series of estimates. You need to stick with the project for at least 10 years to see trends through all the variability. And, we have some new information on the number of whales that have been feeding at Kaktovik and at Barrow and I can provide those later. We've seen an interesting change in that early in the late '70s and early '80s when people first started reporting on feeding habits of bowhead whales in the spring, all the whales had empty stomachs. So it became cast in concrete that bowheads don't feed in the spring. That was common scientific knowledge. Well, more and more we are seeing oceanographic changes, whatever. I'm sure it's cyclic or may be random, but some years, all the whales here have been feeding in the spring. So anyway, we can -- we can give you new information there.

And I think that a big problem with the feeding study, the '85/'86 study that Tom, you know, spent a lot of

time discussing may have been just that. That they hit a couple years where -- I know that '85 was a year of heavy ice cover that reduces the primary productivity, the whales didn't hang out there. That's well known. I think it's cited in here now that years with high ice concentrations in the east drive the whales out and they're here sooner. They return -- you know, their return migration happens sooner.

Tracy's report, I believe he's MMS, is that right? Steve Tracy. Yeah, I've we've talked extensively about -- I've spoken to him about how bowheads react to heavy ice cover, it's pretty clear from your data that -- that in heavy ice years whales are further offshore. And you guys, I think, were being too careful in not stating that emphatically but if -- if you plot the information it's -- it's, I think, pretty dramatic.

Here it is -- I -- I took the information from your reports and ploted it and there's a very strong relationship between ice cover, ice savarity and the kind of mean distance offshore. Anyway, that's something that could have a tremendous effect on feeding and that sort of thing.

The section on oil spill contact, kind of like Mayor Vorderstrasse mentioned. My gut feeling about that is that it's grossly underestimated. For instance, the discussion -- and I'm just basing that on an intuitive feeling, not scientific data, but I can't imagine how in the base cases spill -- oil spill that gets into a spring lead season, can't

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be anything but catastrophic. You know, really -- really bad. And, you know, I've -- I've read the scenario, and maybe it's right that just a few animals will be affected, but to me, that is absolutely -- you know, like a year like 1983, here's a report, 1983, you can have that.

We estimated using acoustic data that 93 percent of the whales passed within two miles of the lead edge. That's 93 percent of 8,000 animals were in a -- in a tiny, tiny little constricted area. If you introduced oil into a situation like that, you could affect a large number of animals.

I guess that completes my comments and I have a number of publications to give to you guys.

MR. BROCK: Thank you.

MR. GEORGE: Thank you.

MR. BROCK: Thank you very much.

(Pause - Side comments)

MR. BROCK: Edward I-t-t-a; is that correct?

MR. ITTA: Yeah.

(Pause - Side comments)

HARRY BROWER: Excuse me, Bob?

MR. BROCK: Yes, sir.

HARRY BROWER: It would help the hearings, we've been kind of waiting and wanting to mention some -- make some comments on that. I can either.....

MR. BROCK: Okay. Well, while we're waiting for

Mr. -- Itta?

MR. ITTA: Itta.

MR. BROCK: Itta? Well, why don't you come on down, sir?

(No audible response)

MR. BROCK: Oh, okay. Is he here, Mr......

MR. ITTA: I'm right here.

MR. BROCK: Do you mind if this other gentleman goes ahead, sir?

MR. ITTA: I'd like to go ahead and do mine.

MR. BROCK: Okay. We'll get you next, okay?

EDWARD HOPSON: All right.

MR. BROCK: Oh. Okay. Did you want to testify?

MR. HOPSON: Yes.

MR. BROCK: Okay. I'll -- you're right after this gentleman over here.

PUBLIC TESTIMONY OF MR. EDWARD ITTA

Good evening. I'm Edward Itta, President of Barrow Whaling Captains Association and personally, I'd like to just state for the record Tom its almost 300 times, I think, we've been at these meetings. And I don't say that in jest.

I'm the President of the local Barrow Whaling Captains Association, and we are 44 captains strong, and we consist from anywhere from 550 to 600 active whalers and their families that we represent here. I'd made some comments

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specific to your EIS statement and I will follow up with a written report.

MR. BROCK: Thank you.

BY MR. ITTA (Resuming):

But between the -- my colleague Eugene and Tom and Burton, I think it's all pretty much been said, but what I want to make a comment about here is going to be very brief, and then I'll make a statement.

You've heard time and again the frustration that we feel of generations, of ages of information that have been gathered up here. The wisdom of the ages just thrown out, like it didn't matter. And we are tired of that, very tired. Of all those whalers that use pack this assembly room when the offshore stuff first started, we just have a very few left. Our elder whalers, Burton, Eugene, and Nate. And we still come because we have faith that something is going to happen.

BAR-26

That -- I wish to impart to you that -- and acknowledge, that we oppose any offshore activity. Period. A couple of reasons. We know that you don't have the technology. Not even close, to do an oil spill plan actively and proficiently. And that, secondly, we don't have any confidence at all that the oil industry can operate safely under our conditions up here because it has never been proven to us. They have tried to show us some open water oil spill response which were wolferly (sic) inadequate. And none of those are

mentioned in your EIS report.

BAR-27

Now we know that ex- -- exploratory action has to happen first before you do development. But we have always stated, that if there's an interest in doing exploratory, surely they must have a conceptual plan for development. Such as how are they going to transport this oil? And where?

And -- and it's amazing that those considerations are not even taken into account by the Secretary of Interior, who so adamantly opposes development on ANWR, when he doesn't even consider and supports OCS activity but does not consider the development aspects of the infrastructure that will be needed to transport this oil, should there be oil offshore. I want that clear.

BAR-28

The -- the second portion of my comments has to do with traditional knowledge and wisdom gained up here. And how it feels to not even be acknowledged at all in your report. When we've had such high hopes after the last two meetings that perhaps we are finally going to get some accounting, up here.

That's about the extent of my comments. But I want you to take what I have said, and I want to share with you the feeling that you give to us when you leave us out in the cold like this. And that is to turn your back on us and -- and not show the respect that I feel we are due. And I want you to feel that very emphatically.

By my last statement, which is, that I'm going to recommend to our association that we never associate with any of these activities here any more because you have, in fact turned your back on us. And I'm turning my back on you, unless I am assured, unless I see in the final report that our comments have been taken seriously. And our scientist's comments have been included in here.

So at this time, I'm going to put my jacket on. And I turn my back, but I'm still willing to come back when I see our comments in this EIS. And I thank you.

MR. BROCK: Thank you, sir.

(Pause)

MR. BROCK: Sir, I'm not sure what your name is, so I'm not sure what .....

(Inaudible response)

MR. HOPSON: Which one is it? This one?

COURT REPORTER: Yes.

PUBLIC TESTIMONY OF MR. EDWARD HOPSON

My name is Edward E. Hopson. I am speaking on my own, however I'm a member of the Barrow Whaling Association and retired. I'm going on 76. I'm 75 years old, been a whaler all my -- all this time, ever since I was old enough, except for the time that I served four years in the World War II. I was in the service, a veteran of World War II.

I found out about this meeting about a half an hour before 8:00 p.m. when Burton came on the radio and said that

they were going to start at 8:00 p.m. and now it was 7:30 p.m. Otherwise, it he hadn't announced I wouldn have missed this meeting. I'm very concerned, one of the elders, and I have a reason to be concerned. I want to support all those testimonies that I heard, all of them. I want to back all -- all -- all -- all the testimony that I heard.

I -- if I had known earlier, I might -- I might a have a little written statement, or testimony to offer but that -- I didn't have enough time. I felt that I just want to offer some help if I can to -- to my people here.

At one time, when I had a little authority with Arctic Slope Regional Corporation, we came in support of exploration inside the Barrier Island, but not off-site. We came on record we -- to support that. We each felt that even though we felt it was dangerous, it was better than going outside the Barrier Islands.

Now the thing is, in my time, here in Barrow, I have seen in mid-winter when ice was about six - seven foot thick frozen down, how far out -- offshore from the beach it froze I don't know. It very quietly all of a sudden, ice is pushed up. Breaking the power line, go up the hill. That must be what about what, 20 feet high? Steep bank? Ice go right up. It barely missing -- cover some of the houses close to the edge. It happened two times in my life time here in Barrow. BAR-29

The impact of that ice -- the strength of that ice.

I don't how -- how it is. You don't -- you have never experienced it. I don't know if even the strongest rig that anchored well in the bottom of the ocean would stand that. I doubt if it will. So powerful. BAR-29

And then -- another thing, too. Are you aware -- does the Congress -- aware that you are going -- getting ready to sell leases on the ocean? When they say no-no to on shore exploration or development on some proven resource? No-no? There's a lot of statements that I'd like to correct, including our biologist here in Barrow.

Let me say something about -- permit myself. It might be out of subject but, there is no calving grounds for caribou. Make a note, everyone of you. Like people claim, that on ANWR there's -- there's a calving ground for the porcupine herd. Caribou will have found -- wherever it -- what -- whenever it ready to -- ready for it and -- and -- and -- and then right there wherever they are. There is no calving ground for caribou. That's -- I'd like to make that understood. BAR-30

Now the concern here -- I came -- I'm probably the oldest here now. But I came because I'm concerned there are many, many elders that are not here that are probably listening on the radio. This devel- -- this exploration on -- on offshore is very dangerous. Nobody knows that, I suppose -- I suppose that whether we talk like man opposing it, you're going

to go ahead and do it anyway. I think that's happened before.

There has not been any -- anyone that I know in my Native community that would say, okay, go ahead try their well out there. Not in the whaling community, or are we talking about -- we talking about our renewable resource? And it should be managed by -- it's -- it's been managed by the Eskimo Whaling Commission contract with the north. Otherwise, we wouldn't be under the -- under the -- under any United States.

If -- if we haven't -- if our Eskimo Whaling Commission have been worked to get the -- to -- to have a cooperative management with the United States. And we like that. And the reason, when -- when the whaling was band. We went ahead, North Slope Borough, all the Native communities got together and start counting -- counting the population of bowhead. And they proved that there is more than -- more than what they -- what they thought it was when they -- when they -- when they declared a ban on whaling.

Now that we are do- -- our whaling commission is doing well managing it. And the population is increasing as far as we know. And the thing that is going to -- to stop us from -- from that resource which is very important, not only the whale, not only the bowhead, but all the other animals: seal, walrus, you name it -- waterfowl.

We all felt that Valdez accident on the Sound was large, but that's a -- let's say something happened in the

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water, in mid-winter. You have no -- the industries will tell us when they have a public hearing. Also, I remember, we don't have technology. We don't develop technology unless we get over there. You've got to give us permission to go out there so we can find technology to take care of any -- any accidents.

It is -- let me say that it is impossible in winter time under ice when something happens. I -- I am sorry. I have to apologize. I don't have a written statement but I came here, wait for -- I've been here since 8:00 p.m. waiting my time, and now it's after 10:00 p.m.

I want to stay here to express -- with hopes that I can be of help to this -- to this. We still -- all the whaling community still opposes offshore exploration or development. Development especially, I believe. How are you going to get it up there into the market?

Why is -- there's a lot of unexplored territory on on shore. There are some proven resources, oil and gas, on shore, which can be done a lot easier than if you have a -- either a small or large accident on the on-shore, you can do something. Accident under ice, and heavy ice, there's no way that there is anybody, I believe, will ever, ever find a way to clean that accident under ice.

I -- I -- I'm saying this because I'm really concerned and I'd like to preserve that whaling for -- for my children, and for their children, and their children forever.

And I thank you for the opportunity to speak.

MR. BROCK: Well I.....

MR. HOPSON: Thank you.

MR. BROCK: .....thank you for your patience, sir, in waiting. Just -- so everyone will understand. And I'm not making -- I'm not justifying this, but we do operate under the OSC Lands Act which is an offshore law, Congress passed it and Congress does review our -- the plan the Interior Department puts forth every five years and they -- they can either disapprove it or take no action on it at all. And they did -- they did not disapprove it the last five years and that's what we are operating on.

The -- the ANWR bills and the other bills are before Congress but there isn't a bill there. But I don't work on that section of it, so I don't want -- you know, I just work on one portion of it. I'm -- and the other portion of the law has not passed yet. So, you know, I'm -- I'm not making an excuse, I'm just trying to explain that I can't get involved in that -- in that area of it.

MR. HOPSON: Yeah.

MR. BROCK: I'm strictly in the offshore.

MR. HOPSON: All right.

MR. BROCK: And that's.....

MR. HOPSON: Now, now like I've said it's a lot of -- it's a lot of information that you're supposed to know.....

MR. BROCK: Right.

MR. HOPSON: I guess it's a -- it's been said over and over -- all these -- all these hearings, and -- and it seems like you never even hear about it. And, I think, as far as I know, unless something changed, would always have -- we'll -- we'll be -- be always be opposing the offshore exploration or development. And thanks again.

MR. BROCK: Thank you. Sir?

PUBLIC TESTIMONY OF MR. CHARLIE OKAKOK

Good evening. My name is Charlie Okakok. I work with the Native village of Barrow tribal government and work as their wildlife director.

MR. BROCK: Sir, could I get you to spell your last name, I.....

MR. OKAKOK: O-k-a-k-o-k.

On January 24, 1983, President Ronald Reagan published a federal Indian policy which stressed two related themes. One, that the federal government will pursue the principle of Indian self government. And two, that it will work directly with tri- -- tribal governments on a government to government basis.

One of the principles was to meet these two objectives -- was EPA in keeping with federal trust responsibility will assure that tribal concerns and interests are concidered whenever EPA's actions and or decisions may

affect the environment on their lands. Another of the principles was, the agency will strive to assure compliance with environmental statutes and regulations on Indian lands. Direct EPA actions through ju- -- judicial and administrative process will be considered where a significant threat to human health on the environment exists.

On March 14, 1994, Carol M. Browner, the current head of the EPA, reaffirmed the validity of that policy. On July 14, 1994, EPA pub- -- published a memorandum on tribal operation actions. One of the action items was each assistant and regional administrator should take steps to increase implementation and management of and insure compliance with environmental programs where such environmental programs do not exist. The agency in carrying out its trust responsibilities, must work in partnership with tribes on a government-to-government basis to ensure the protection of tribal human health, natural resources, and environments.

There are key legal issues, including jurisdiction over programs through inherent or aboriginal and through delegated authority from Congress. The environmental laws: one, the Clean Water Act; two, Safe Drinking Water Act; three, the Clean Air Act; four, CERCLA, known as super-fund; RCRA; FIFRA; TSCA; EPCRA; and the Pollution Control Act are the programs that authorizes the EPA to treat tribes as states.

EPA has regulatory and enforcement authority on

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Indian lands and authority to expend financial resources on Indian's lands under various reg- -- federal statutes. EPA is also responsible -- responsible for NAPUC (ph) compliance for its project on Indian lands.

Although MMS say there are incompliance with these laws, MMS continues to issue leases even if there are mitigating circumstances under an EPA. The issues concerning the livelihood of the effective areas should be at detriment in having these sales in the Beaufort and Chuckchi Seas.

One of the leading issues is the subsistence hunting of whales. Whales are protected under the Marine Mammal Protection Act and the Endangered Species Act and should enjoy protection under these laws. In the event of an oil -- oil spill, god forbid, the protected species of whale is in serious danger as they already are in the endangered species list.

We of the area in the proposed lease area sale will be great -- greatly impacted and should be protected under these laws and the EPA. Under your studies it is ex- -- expected to render subsistence activities unavailable or undesirable for one or more periods of one or two -- one to two years in the event there is an oil spill. Are the leas- -- leasing agencies ready to compensate the subsistence users for that period that are undesirable and un- -- unavailable for the subsistence activities?

Also affected would be the bird species which are

protected by the Migro- -- Migratory Bird Species Act. The birds nest in our area offshore and travel south to their wintering area. Any oil spill would be devastating to the -- to our bird species. Not only will the subsistence hunter be affected, the hunters of our birds south along the migration routes will also be affected.

The polar bear also protected by the Marine Mammal Protection Act is one of the animals that would be affected if there was to be an oil spill. Also through the industrial activities. Polar bears reproduce only once every three years. They den along the coast which is designating for a lease sale. Any activity would be a determent to the population of the polar bear.

Displacement of caribou is expected during drilling activities. Caribou are the main staple of the diet of the proposed lease sale area inhabitance. The impact of dis- -- displacement would be addressed as the subsistence hunter will have to go further to be able to catch the caribou. If and when there is drilling activities, the subsistence hunter should be compensated for extra gas and food that they will need to get the caribou.

Fish are also one of the main staples of our diet which will be affected during drilling activities -- during drilling activities. One of the questions arise as to the impact drilling -- impact the drilling activities will cause to

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our subsistence fishing, is that leasing agency prepare to compensate subsistence fishers?

All the sea mammals will be -- will be impacted during drilling activities. The circle of life as we know it will be impacted. Are the leasing agencies ready and willing to compensate our subsistence users? Thank you.

MR. BROCK: Thank you, sir.

(Pause)

MR. BROCK: Mr. Brower. I can't read it. Rodney? Is that the way?

MR. JOHNNY BROWER: Johnny.

MR. BROCK: Oh, Johnny. Okay.

(Pause)

PUBLIC TESTIMONY OF MR. JOHNNY BROWER

For the record, my name is Johnny Konuk Brower. I am from a little village in Barrier area, Igulkarluk (ph), Inupiat whaling community. I am speaking here as an individual, and I am also representing my family that has whaling -- whaling activity agendas each year -- twice a year. And, specifically, I wasn't informed of this meeting, but I was listening on the radio and it started to sound like something was going on so I got interested in finding out what's going -- what's going on.

As a active Inupiat subsistence person in the community and very active in whaling, I don't know why we don't get any information through letters for this kind of meeting.

It seems like somebody wants a general arena of certain people at times. And I'm not very fond of certain -- certain type of arena meetings only.

I would like to -- if I -- if I could be -- if I could push a debate, I -- I-- I'm always interested in some -- some sort of -- some sort of participation. I've just got -- I -- my statement will be informal and my testimony will be informal myself. There will be a lot -- a lot of whaling activity and subsistence in terms of the hardship in fall time whaling. And -- and the I guess, problems in subsistence hunting in some areas, sometimes.

Anyway, I grew up here in Barrow. I grew up mostly in Eagle (indiscernible), called Browerville, for educating people. And I went to school in Oregon. And I was the president of my Inupiat people from Alaska North Slope region in the state of Oregon. I have been a very outspoken person in Oregon. Very active, sometimes I get invited to speak in meetings, and etc. Some of my past activities -- but I've been living up here in the North Slope since I got out of school, other than going out for college every now and then.

According to some of the activities we've had here in the North Slope, the beginning part, I'm not very fond of this whale census activity taking place here in the North Slope country because somebody on a hearsay basis made it public that there is only 947 whales. And there is no record of that

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person's testimony or why they mouthed off 947 whales. And this kind of insult to my Inupiat people, and my Inupiat tribe is very ugly according to my -- according to my feelings and nature.

There are times that I would like to express it very profoundly but I take -- I make -- I make a demand to withheld it a lot. At times in facing some hard -- unnecessary hardships is very ugly and unnecessary intrusions are very ugly but we humble ourselves in an organized fashion when they conduct a tribal meeting about the situation that arise and why -- why it's like that.

And I for one -- one of the persons who courageously disagree with the census study because the facts and findings that somebody said 947 whales and never had seen a whale or even had been out in the ocean area. They are probably still just living in the city to this day.

Anyway, about this seismic activities and the drill -- drill ships, personally myself I co-captain for my -- for my whaling captain a lot in certain seasons and experience good whaling seasons and sometimes hardship cases. But we make do and make the best of it even if its a hardship case.

We have experienced that drill ship out here -- just out quite a ways from Barrow. Usually we encounter whales from the point at the farthest sometimes maybe 12 miles. My information and understanding in sightings and -- and traveling

in bo- -- hunting and pursuing whales, 12 miles from the point is usually quite distanced for fall times at various seasons. With that drill ship, we -- we went out maybe 10 days in a row, we went out whaling, but we would -- we would go past that -- that drill ship that -- out there and the first sea mammal we would encounter would be between to seven to 10 miles north side of that drill ship and it would only be a -- it would -- they would only be grey whales.

Very specerie (sic) -- very specifically in my mind they are very noted because I can recall and use them if I have to -- to make a testimony or a statement. And, seven -- seven to 12 miles north side of that drill ship we -- we encounter very few grey whales. And, when we get passed around 17 miles, in a great distance, we could see the different types of the blows that the whales use when they come up for air. And, if your -- if you understand what type of a blow it is, you could either pursue it or just say it's another whale that's -- that's not specifically for consumption to our taste.

And, in 17 miles, we would with -- with my fellow whaling activity crew, we would -- we would sight bowhead whales that -- the closest north side of it 17 miles. And that's quite a ways. But to be able to harvest and bring some food home, to be able to share with the community, we go to a great distance and great hardship.

We didn't ask for those but that's we -- that's what we deal with every so often. Things happen in a very -- even though when we don't when we want them to -- or if we don't like them, they come around.

It would -- it would be nice if the United States of America would treat us like real American people and instead of just stepping on us and stomping on us and using us for general information and information gathering that they could put on an environmental statement impact paper that can be circulated from office to office so people don't have to come to Alaska to use the information or say I have this-- I have this knowledge because I read this from the impact statement. So it could bring somebody else, maybe in Dallas, Texas or Boston, Massachusetts or in the certain university.

All these -- all these things that are being gathered and written down and collected from very professional people in tribal, traditional ways, these people that speak for -- speak in these meetings, they to me, they have the doctors degree of knowledge in the areas on what I wanted to do and learn to do when I was very young. But what I got for education in the state of Oregon, wasn't qualified to fit very useful in a subsistence and traditional way of life, but I can use it for a useful -- usefulness in some of the areas that I -- that I get into sometimes.

And, the whales from -- the whale activities we hunted that one -- one year from my own -- from my own

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experience in harvesting and helping harvesting other whaling captains in -- in the same general area, we would move -- move around in crews. We hunt in crews. And we help each other when somebody gets -- when somebody strikes a whale, we would help -- we -- we -- we'd cooperate if they'd put the whale out of its misery. And then cooperatively tow it back to town to be butchered and harvested for consumption.

And, I'm not -- I for one, I don't think we should be forced into these kinds of categories against our own free will. In some ways in -- there's a lot -- lot of things that are -- I want to say that are -- they've already been said on some of these well protected federally made laws, but I guess when Congress passed the bill that they want to integrate the Arctic Natural Wildlife Reserve, because it is a very unique, beautiful place that would be considered a place to go to and do something or even do some -- a place to go do some hunting. Or just enjoy the view.

Now, there's a lot of talk -- there's a lot of talk that people are asking, 'Can you help support us?', endorse the drilling in the area where the Congress has bill -- passed the bill. And in the ar- -- general visiting areas where wild animals are very endangered. Not just sea mammals, land animals in some sense, bird species-wise, stellar eiders, they do a lot of nesting in the background, back woods of the Barrow, even though there is no woods around here. Our back

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woods are the rivers and lakes.

We do a lot of traditional harvesting and gathering in our -- in our traditional ways. And in -- it's very disturbing. For years and years, all these conductions of meetings and nobody relaying anything to Congress or when they head back to D.C. or some place where they are going to do all their work to -- to finalize the statements. They don't -- they don't say these people are living in the endangered area and what they're hunting, it's endangered -- so endangered that if they could deplete it.

Being a Native and having nothing to hunt is very embarrassing. Native enjoy gathering food, and hunting for food. It's the only livelihood a lot of people have. I presume most of you -- you have some sort of a budgeted agenda for an office or a committee that -- that lives -- that lives off getting paid conducting these meetings. Traveling to long distance places, like to Barrow and other places. We, we Native people who -- who come here to speak, to help you write these impactment -- environmental impactment statements. We don't get paid for this.

It would be nice -- it would be nice if your -- your budgeted plans for your office and committees, if they sufficiently fund people for helping you for doing these things. It would be okay for me. It's -- a lot of people have withheld and hold back for a long time, and in some ways

it's noticeable eventually that it's getting to a point of where I'm getting sick and tired of it -- it's too much.

It's going to a meeting -- meeting after meeting after meeting after meeting, it's -- I don't get nothing out of it, but I put my two cents into it. What do you get out of it for conducting these meetings?

MR. BROCK: What do I get out of it?

MR. JOHNNY BROWER: Yeah.

MR. BROCK: This is my job. Yes.

BY MR. JOHNNY BROWER (Resuming):

Most of us Natives up around here, the only livelihood and job we have at times is only subsistence hunting. And I know, in some different foreign countries, they have rules and regulations where there the hunting areas are within the jurisdiction of the law and it's well enforced, and it's well protected.

If they set aside something similar to ANWR, it's their religion to practice to keep it that way because it was designated and conducted and set aside and placed as the law that this area is a safe -- a good place -- a good place called wilderness. A habitation of wild animals and etc. It's not just for -- not for --- it's not just for bird species, not just for caribou species, but within their water districts, also.

A lot of fish, belugas, seals, polar bears, whales.

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A lot of stuff we harvest around here, they're seasonal migrators. They come up when summer is starting. And when the summer is full bloom, their general duty is to nest, raise their young. And they have only a certain limited season to do that. And after that is done, they raise their young to a point where -- where they can fly off and start doing their own things, and then nature takes place from there.

I, myself, would like to see a very strong ruling to -- to be able to protect these subsistence territories for subsistence hunters. Especially the Native way of life.

Looking for oil and wanting to do more oil drilling is getting -- getting to a point where who wants to listen to anybody? We'll go ahead and do our drilling anyway. It seems to be that type of an attitude.

State of Alaska doesn't consider the Inupiat people very much. I think the Inupiat people should have the right the rightful ownership of the oil and the money. God knows, they -- truly they deserve it. And they shouldn't be deprived of it, either. And in any other meetings or gatherings of information, personally, myself in my own feelings, I would like to see my tribal -- my tribal agency offices being notified that they may be able to place it within -- within the Native community. That way the Native people would be able to understand what's going on. Instead of like the elder Mr. Hopson just stated.

I heard -- I heard Burton Rexford talking on it -- about it on the radio. That's how I found out about on -- about the meeting. I wasn't informed. I heard about it on the radio after the meeting got started.

I think these kind of ugly intrusions and insults into our Native way of life. That's -- that's -- that's got to come to a stop. We've had enough of it. And believe me, when they start practicing what they want to do, when they start speaking and saying they are going to do something about it. You'll understand the impact effect of it. Thank you very much.

MR. BROCK: Thank you, sir. Mr. Oleman.

PUBLIC TESTIMONY OF MR. NATE OLEMAN, JR.

Hello. My name is Nate Oleman Jr., I'm a whaling captain. Briefly in Inupiat.

(Speaking in Inupiat)

What I just stated was even though I want to give my testimony in Inupiat, I can't do that right now because you don't have a translator on board. And I want you to understand what I'm going to say. And I'll speak in your Native tongue, since I can't speak in my Native tongue.

MR. BROCK: Thank you. We appreciate that.

BY MR. OLEMAN (Resuming):

This has been a whaling community, prior to establishment of government entities. First we started off with the Native village of Barrow, with their tribal board and BIA was involved. And, City of Barrow was incorporated with their city council and their commissions. Then, not too long ago, North Slope Borough was established with their North Slope Borough assemblymen, and they have 15 departments and 12 commissions.

In fighting for our rights up here, we had to establish governments. And, to this day, those three are still in existence. But we have to address to other entities here locally in Barrow which I'll name off: ICAS with their regional tribal board; ASNA with their regional tribal board; BIA; State of Alaska and their legislation; BLM; Alaska Native Hospital; the Weather Bureau; and to the Land Clai- -- Lands Claims Act, UIC emerged with their board; ASRC with their regional board.

And then when we were told to stop whaling from Barrow, AEWC emerged. They have their regional board; we have our own Barrow Whaling Captain Association with the support from UAA, and we work closely with Barrow Volunteer Search and Rescue. Also, from the establishment from the North Slope Borough, North Slope Borough School District was established with their school board. We have the flex (sic) with their DEW line, and we have Aqumac TC. We also have to deal with our two U.S. Senators and our Representative in Barrow alone to fight for our rights to hunt.

For our subsistence, we have over 40 agencies that we have to deal with every day. That is not going out of Barrow to go see someone else; that's just in Barrow alone. That's not counting the numerous nonprofit organizations, like the Alaska Legal Service, and we have a lot of businesses. We did this to respond to the oil companies that came in, the federal agencies that keep coming up, like you, for whaling, IWC, State and rest of the world that have shown interest in our community for drilling rights within our backyard.

We also have new organizations that emerge to answer local issues that are taken up from local concerns. And from the local issues, it goes to the State, they show interests and are very watchful of what we are doing. Our nation is watchful or what we are doing; so is the rest of the world. We get a lot of news media from a local issue, which was the alcohol Proposition 1, the Sobriety Movement and Freedom Council.

When we have an issue locally, it starts from local to state to our nation, to the world. We were a small community that didn't have any form of a government; now we have over 40. That's not addressing what we have to respond to the state, to our nation, to Washington D.C. or to the world organizations.

In closing, I (sic) opposing the offshore lease sale. You had come up here on November 10, 1989, with your five-year OSC plan, we were aware of that. I have made numerous statements since I've been up here. I have been an elected official for 17 years. And I have made a lot of statements to you to different organizations and I'm -- I'm opposing the offshore lease and go ahead and open up ANWR, because both of them will bring money to your government. That's the intent, is to get some money from the lease or from ANWR. They both serve the same purpose. I'd rather have ANWR open up on-shore versus offshore. Just leave our whaling alone. Thank you.

MR. BROCK: Thank you, sir. Max?

PUBLIC TESTIMONY OF MR. MAX AHGEAK

Good evening. My name -- for the record, my name is Max Ahgeak. I'm the President of our local village corporation, UIC. The area that is being proposed for -- for sale, for exploration, development, and production of oil and gas are the prime hunting grounds for our shareholders of our marine mammals.

This sale concerns us very much because of the ever-changing conditions of our ocean. The currents and the ice conditions are always changing at a moment's notice. I don't believe that this draft proposal will ensure that our subsistence lifestyle will not be jeopardized by the development of oil and gas in Arctic waters. For that reason, we are against exploration on our ocean which we depend on for our substince -- subsitence lifestyle, which we tresure because of our culture. And I'll be following through with a written

statement. I just wanted to make a short comment. Thank you.

MR. BROCK: Thank you, sir.

(Pause)

MR. BROCK: Did you want to make a comment?

MS. CARROLL: Yes.

MR. BROCK: Okay, you're on.

PUBLIC TESTIMONY OF MS. MARIE ADAMS CARROLL

Thank you for this opportunity. My name is Marie Adams Carroll. I am -- I didn't realize there was a meeting going on, with a hearing on Lease Sale 144. I work with Public Information, and it's a little embarrassing. It seems that there wasn't very much advertisment about this meeting.

I wanted to say, first off, that I wanted to make a brief statement. I support the comments of the North Slope Borough Wildlife Management Department office studies that they've been involved with. I've been involved with marine mammals since 1978, over 15 years, working first with the Alaska Eskimo Whaling Commission, and now I'm working with the Alaska Beluga Whale Committee. And it seems to me like it's just frustrating to come here year after year, every time you come here, and not seeing any results of the hard work that we've put into this.

We've spent millions of dollars from our community to address the concerns that we have with offshore oil and gas development and our subsistence hunting. None of that is

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addressed; none of that is acknowledged. It is disheartening, and as Edward Itta said, we might as well turn our backs on you cause we haven't seen any results from all that hard work.

The other thing I wanted to -- briefly state is with the continuing debate over ANWR. It seems like a sham, that this administration, and I'm talking about President Clinton's administration, who propose to keep ANWR closed. He's willing to threaten endangered species, just offshore from ANWR. It really does make us feel that no one really listens to us. We don't have the environment with -- on our side with this issue. We don't have the Humane Society, or any of those other conservationists on our side, like the Gwich'in have with the ANWR issue.

So we don't get the attention that we should be getting here because we're dealing with bowhead whales. Population of 8,000 bowhead whales. And our President is claiming to be an environmentalist, trying to protect over a 100,000 caribou. It is very disheartening to see that on this end of the world.

So I hope you carry this message. I strongly -- I'm strongly in opposition to oil and gas development offshore because if anything happens with that our way of life is going to be shattered. All of the dreams that I have for my children -- and I have three boys that we're raising up here, that I want to have them live up here where my heritage is and

to learn the subsistence life that we grew up with. That's going to be shattered because you're unwilling to listen.

This administration, President Clinton who proposes to be an environmentalist, is willing to put our lives on the line. And I am -- I guess I'm very disheartened by the whole affair. The publicity, you know, that comes out of ANWR. And here we are, the only people trying to protect offshore marine mammal resources.

Do we have the environmentalist crying in front of President Clinton? No we don't. We're the only ones that cry to protect our own lives and resources up here. And its -- I think its totally unfair for you to come here year after year and all this hard work, there is nothing to show for it. Nothing to show for it. Not in your EIS statements.

In fact, I was looking at it, and I saw the same person who is cited in your document that the Clinton administration uses to protect the porcupine caribou herd to say that if an oil spill occurs near Kaktovik, it's only going to have maybe up to a years impact on caribou hunting in Kaktovik area, near the offshore area.

And it seems to me like if the President had been on the other side of the issue on ANWR, he would have said the same thing. He would have used the information the way he wanted -- he wants to and that is, you know, it's just seems to me that there's no real hard look at the information that

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you've presented -- you been presented with from the North Slope Borough Wildlife Management Department, our researchers, and the university scientists that have done the reviews.

That -- you know, I've talked with the Department and they do a lot of work because I work with them on other issues so I just wanted to say, I strongly oppose offshore development and basically, I hope that President Clinton realizes that the caribou are not the only issue up here. The Gwich'in aren't the only people up here. There's Inupiat who depend on offshore marine mammal resources that you are putting on the line. And you are putting our lives on the line because of that. Thank you.

MR. BROCK: Thank you, Marie. Arnold Brower?

PUBLIC TESTIMONY OF MR. ARNOLD BROWER, JR.

For the record, I'm Arnold Brower Jr. I'm a tribal council member for the Native village of Barrow and work as a Special Assistant to the North Slope Borough Mayor.

I've been working in the Borough since its conception in 1972 and I have dealt with these issue and testimony like everybody else that -- like all the distinguished colleagues and associates and whaling captains before me. Their distinguished statements and I support all of them.

I want to emphatically tell you that you have not convinced my people. You have not convinced us that you will do a good job offshore. You have not taken any technology up

here to tell us and convince us that you will do it safely, soundly, and environmentally sound manner.

I think the Badahma (ph) project has indicated to us at least that they are trying and they can do a very -- pipeline system. But things of that nature need to come to us, that we may look at it and see that it is environmentally sound. That it will not threaten our livelihood.

I think that many people here have already discussed the misstated 'the sea is our garden.' We harvest what we eat from the sea. We don't harvest crops in the Arctic. We don't plant and do farming on land like everybody else. That's why it's so critical that we maintain our culture and protect our interests in the ocean.

All our fish, all our seals, all the walrus, marine mammals, polar bear, they've already discussed that. It's our life. Inupiat way of life. That's what we are Inupiat.

Until we see something that says it can be done safely. To this day it is no drilling. Do not drill offshore for any kind of development until you find technology and bring it here and show us. Here is the model.

I think that -- I applaud that you have come here and at least have got some statements and testimony from our people, and this is why we don't want it, because we thrive on the Arctic Ocean. And I would like to send that message real clear to your department, that there shall be no drilling. We

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don't want any drilling.

You have no system, no technology to prove that you can -- to development of any kind of that nature in the Arctic. Thank you very much.

MR. BROCK: Thank you. Harry Brower, Jr.

PUBLIC TESTIMONY OF MR. HARRY BROWER, JR.

Good evening. For the record my name is Harry Brower, Jr. I'd just like to comment that the comments I make are my personal comments. I'd like to start with the -- stating that I'm in opposition the offshore lease sale. Another thing is -- another reason for that is I've had personal observations on bowhead whales being diverted further out from shore due to seismic activity.

Just in that many years, one of the drill ships shi- -- sitting out there in idle, I've had personal observations from that in a -- in a -- using a GPS as to where the kill location sites of whales were in -- in noted on -- on the maps that the kill sites are a lot further offshore than we normally hunt. In the good season that's -- that without any ship movement out there or without any seismic activity out there, it's really eas- -- easily noted or readable on the maps.

I've got -- we've placed two maps up there, ones for Barrow area which includes -- also includes Nuiqsut and Kaktovik areas. I can point out to you some of the areas that

are -- you know, that have diverted the whales due to the seismic activity. The furthest one is for Nuiqsut, it's on the first map there. And the-- the -- the -- I think it's No. 107, that is just a second location that was given to us. And that was on the map. The first location was not even on the map, where the kill site of the whale was. That's just some of the information I'd like to share -- share with you on the -- on the harvest locations.

Then, in this document, your EIS -- it goes to say that there's -- talking about those bowhead -- mig- -- north wood mig- -- spring migrations. That most of the whales or all whales just keep moving up north into the Canadian border and to the McKenzie Delta. But that's not true. BAR-31

Also -- from my personal observation, I've seen whales sitting here in the middle of the summer, when we are out hunting bearded seals on the ice edge. They're here during the summer, too, so this statement here in the book isn't true. And I don't know why it wasn't noted, maybe it's due to the lack of literature that was written by the people that formulated the EIS. Anyway, that's one of the comments I wanted to make. BAR-32

Another one is regarding subsistence harvest patterns. I've -- I've worked for the North Slope Borough Wildlife Management for the past three years. I'm fairly new to the Borough, even though I've lived here all my life. In fact, I've been into the harvest documentation project for the Borough it's fairly recent and new, too.

In just reading the statement on 3C-9, its -- it talks about -- in the middle of the paragraph -- or the paragraph here:

"Subsistence activities which are assigned the highest cultural value by Inupiat provide a sense of identity as well an important economic activity. The importance of hunting to the maintenance of the cultural identity is expected to grow in the near future as social pressures associated with oil development build."

Then it goes on:

"Inupiat's scope and concerns regarding oil development for Sale 144 can can be divided into four categories: One, direct damage to subsistence resource habits or subsistence resources and habitats. Two, disruption of subsistence species during migration. Three, disruptions of access to subsistence areas. And four, loss of Native foods."

I think that's a good -- one of the statements I would support from my own observations from doing the harvest loca- -- kale site locations on bowheads. I can see that is true. Just -- just to see this in the book and from my own

personal observations. I think I'd still -- I still say I'm.....

MR. BROCK: What page was that on, sir? Just so I.....

JEFF WALKER: 3C-9

MR. HARRY BROWER, JR.: Wha- -- 3C-9.

MR. BROCK: 3C-9. Okay. Thank you.

MR. HARRY BROWER, JR.: Yes.

BY MR. HARRY BROWER, JR. (Resuming):

But then like Dr. Albert said -- there's some other comments that were made by Dr. Albert earlier, saying there's a lot of studies that were not incorporated into the document. And I think that's a shame that they weren't included. You know, there's a lot of literature there that could have been useful for making these decisions.

BAR-33

And as to the -- regarding the IWC. There's a -- we're limited to harvest bowheads cause they're on the endangered species. And we're now in the quota -- they have a quota system placed for bowhead whales. And then -- and regards to the IWC on 3C-11, it states:

"Barrow whalers in the fall only if they do not get their quota during their previous spring hunt."

I think that's a misleading statement.

There's quotas that are in place to the communities,

BAR-33

but then there's transferable strikes that are -- that can be transferred to the community that will hunt during the fall. I think this is a very misleading statement. And I think it should be corrected.

And for another instance would be a -- if an oil spill occurred in a whale -- some whales get killed by the oil or whatever from ingest- -- from the food that they eat. They ingest that. And what kind of restrictions are going to come from IWC? Just because of the oil spill?

The first thing that'll probably be is to stop whaling. Because of the oil spill that occurred. I think that are some of the things you need to keep in mind as -- when you are thinking about the OSC and the lease sale.

I think I -- I think I'd like stop here and just thank you folks for coming up here to hear comments and I hope you hear what everybody said. Just put one ear -- put one finger in one ear and just shake your head a little bit and maybe you'll file it up in your brain cells there.

(Laughter)

MR. HARRY BROWER, JR.: Thank you.

BOB BROCK: Thank you. And thanks for your help this evening. Mr. Edwardson.

PUBLIC TESTIMONY OF MR. ROBERT EDWARDSON

Good evening. For the record, my name is Robert Edwardson and I'm -- I'm a member of Native village of Barrow

and I -- the reason why I'm here is I've been listening to this on the air and I've started whaling ever since I was going on 10 years old and my ancestors are blue-blood whalers on my mother's side. And on my father's side, my grandpa was from Norway and our -- these people's concerns are very real.

We are the experts of the ice. Us Inupiats, and Dr. Albert's statements, and all -- all these people's statements are very true and they come from the heart and they work hard and I believe the Department of Interior, the Canadian government has devastated us in all fashions.

Way from the 1800s, beginning when they went commercial whaling, that the Inupiat has been devastated very much and has done a lot of harm to it -- to our people and I believe that the United States and Canadian government had worked hand in hand to -- to eliminate some of our very powerful kinds of people that had existed in the past, which were Shamans. And that is why the government had a ship called the U.S.S. Titus to come up here to eliminate some of our stronger people, and they took them out seven miles out in the sea and shot them.

I mean that -- the kind of devastation we've been going through since -- and this was for commercial whaling. When it's on behalf of the Canadian government and the United State's government, it's all right, it's okay for them to do so. But when it's our turn, or it's been our lifestyle, the

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Canadian government and the Americans have just devastated us. They've stomped over us, like our Mayor said, that it's our -- you know, our backyard.

You're in our backyard and our ocean is our -- our table, our food table, and I believe there is no technology you have out -- anywhere in this world that can handle that Arctic ice pack. And I worked for the oil industry. I've helped build the Trans-Alaska Pipeline in all ways, in their engineering, and I believe that the lease sale is not in the best interests of the Inupiats. It's only in the best interests of the national debt. That is the only reason why you folks want to go out there, to pay your national debt. And the only reason why you have a national debt is you learn just to take. Take, take; that's all you do, take from the people.

And in God we trust. Believe me, Inupiats believe in God very much. And they respect the American flag, and the Canadian flag. That is why we had followed all these entities that Mayor Oleman, former mayor, had mentioned earlier to -- in respect to the United States Constitution. In respect to it. And what do we get? All we do -- all they do is they go stomp right in and go ahead anyway.

And I think it's about time that the United State and our Senators, that they quit being so selfish and look at the reality of it. The reality of it is why America is going broke, because they take and take. They give to other

countries but they don't -- they only take from the Inupiat. They take, they've been devastated us for long time.

And I believe that the Secretary of Interior should finish his job first before they can even have another lease sale by settling Edwardson v. Morton case that was a trespass case we had in Prudhoe Bay. And I believe that the oil -- the big giants or oil giants, just because they're people that want to drive their cars in the Lower 48 doesn't have the right to stomp over us and go spill oil in -- on our table.

And it's -- you know, we've been more reasonable to the United States and the Canadian government of cooperating and creating all these entities just to satisfy you folks. I think that it's -- that the United State's government is too -- the revenues that they owe us that is so -- why the America is broke, 'cause they take. They -- they've never given.

They never give to us, very little maybe. Right now, according to Title 25 we're supposed to be getting 12.5 percent of total production. And what do they give us today is only very little. It's a drop in the bucket of what they're producing.

And I think those oil giants better fight better here and that we are going to go after them. That if they too go out we are going to go after them in the strongest way. That we will pray to our God that we may win this case against them, cause they do -- they do owe us some revenues for already one case. And I think that the oil giants should have respect to the Inupiats. And the Department of Interior has his job to do to go collect on behalf of the Inupiats from -- from the oil giants.

(Off record)

(Tape Change - Tape No. 3 of 3)

(On record)

BY MR. EDWARDSON (Resuming):

And it is a very good document that the -- first leaders of the country had wrote. And I believe if the American people live by that Constitution, that they wouldn't be broke today. They tried to make too many shortcuts and that is why they're -- they're hurting today. They forget their God, being selfish.

And I believe that the Secretary of Interior should fulfill that <u>Edwardson v. Morton</u> trespass case and to pay our corporation, our regional corporation for the trespass and the revenues that the Department of Interior owes us in the name of -- just responsibility. That the job description is prescribed for Department of Interior.

And I thank you for -- folks for coming but you're supposed to notify the entities prior to coming. Like a 30 day notice is required by law to -- in order to have an OCS hearing or of any kind of hearing. And I do respect you folks for listening, and I hope that -- may God help you to carry this

message to the Department of Interior and the oil giants, that the Inupiats are being tired -- they're tired of being stomped over. They are very gentle people. They are more than always cooperating. And I think that at least the government owes us that much.

And I hope our President Clinton takes this very seriously. And I believe we have a wonderful country, that we are under an American flag, and I am a great respecter of the American flag 'cause I had tried to join the military, and I didn't pass my physical. But I am a respecter of the American government. Thank you.

MR. BROCK: Thank you, sir. Do we have anybody else that would like to testify? This is all that have signed up. Yes, sir.

MR. ALBERT: Can I have one more comment?

MR. JOHNNY BROWER: Sure.

PUBLIC TESTIMONY OF MR. JOHNNY BROWER

For the record, again, Johnny Brower. From my past experiences in work in Prudhoe Bay and traveling around, in reading the news the last 35 years, I wouldn't think I would want to live the way some folks has (sic) lived quite some years -- long time ago and have to abandon their village and then make a new -- new land selections to reestablish their village.

And I don't think I would want my community to be covered with a runway, covering and hiding Inupiat land use history material in the same way that it had been conducted in the past in Colville River Delta. And I think it's about time we take out the dirt and start doing some real American stuff.

I, for one, would like to keep my -- keep my status as a Native in my culture and the way -- and the ways of subsistence hunting. And I would like to say, "America, wake up. Start protecting your own Native people." I think it's time to have a new awakening. Thank you.

MR. BROCK: Thank you. Mr. Albert.

FURTHER PUBLIC TESTIMONY OF MR. TOM ALBERT

I'm Tom Albert, Borough Wildlife Department. I forgot to note a thing or two. But in any event, if you'd -- who ever's going to review this for you folks down there. On page 3B-11 -- 3B-11 is where it mentions the Beaufort Sea feeding study. And that's where the North Slope Borough Science Advisory Committee report should be also mentioned. And I'll give you two copies of that. BAR-34

On page 4B-35, in the last paragraph -- 4B-35 last paragraph it talks about high resolution seismic not likely to have significant effects on bowheads. There's no justification for making a statement like that. If you want to make a statement like that you should put some supporting documentation down. It's just inappropriate to say something like that, last paragraph on 4B-35. If you want to say it has BAR-35

no effect, then -- then you need to cite something. BAR-35

On page 2-5, it talks about a site-specific monitoring plan. And on page 4B-41, it talks about mitigating measures which again talks about the monitoring plan. Let me ask you, Bob, or whoever. Does anyone -- do you know whether these monitoring plans will be reviewed in a normal scientific fashion? That is peer-reviewed. Will the program proposal study design be reviewed and will the final report be reviewed? Do -- do you know?

MR. BROCK: That's my impression but no, I don't know that for a fact.

MR. ARNOLD: Okay, I don't think.....

MR. BROCK: It's --- but that's my impression.

MR. ARNOLD: .....any of them have been earlier.

BY MR. ARNOLD (Resuming):

The noise and the lead study that's been referred to a couple of times here and the one that was conducted for you by LGL. As you know, after a big hassle that we, you know, rattled your cage on several years ago. MMS established a scientific review board to review the reports of that group.

So, in your final Environmental Impact Statement, I hope that you'll put in there whether or not these site-specific monitoring plans are going to be peer-reviewed in their proposal stage and in their report stage. Because if they're not, I'm pretty such what we're going to get. And

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that's a standard "no adverse effect noted" study.

If they're peer-reviewed, and actually good studies they'll probably be like that SWEPI study I talked about for the Corona and Hammerhead thing. The best study that I ever saw done up here in -- in offshore monitoring. Which clearly showed impacts which of course is not even mentioned in the EIS. But I hope in the final EIS, it is. Anyway, thanks.

MR. BROCK: Thank you, sir. We appreciate it. We appreciate all of you coming tonight. Nobody else -- anybody else to testify? If not, we will close. I want to thank everybody for coming and I definitely want to thank the North Slope Borough for their assistance in helping us around and getting this -- getting this set up and thanks to all the villages that were involved in this -- these weeks public hearings because we do take this job serious..... Did you want to testify, sir?

MR. RONALD BROWER, SR.: Yes.

MR. BROCK: Okay, hang on just a minute. We just got somebody come in and -- and I don't -- I won't close it -- you just made it in time, sir.

MR. RONALD BROWER, SR.: Where should I stand?

MR. BROCK: Just any one of those mikes right there will do.

MR. RONALD BROWER, SR.: Thank you.

PUBLIC TESTIMONY OF MR. RONALD BROWER, SR.

Good evening. My name is Ronald H. Brower, Sr. I have testified previously in your other reports, and your other presentations and your testimony in Barrow previously.

I've been listening on the radio while I'm working on a project here and I came over as soon as I got done. Sorry for my delay.

MR. BROCK: It's okay.

BY MR. RONALD BROWER, SR. (Resuming):

One of the things that I am concerned about is that -- and not having received the notice nor a copy of the document, is a concern that none of the reports or recommendations from the previous meetings have even been considered or taken into account in your reports.

In my last report here to -- or discussion with you having a chance to review the documents. It was my observation that the data that you are utilizing is some what 20 years or so years old and that there's been advance in technology. Additional research has occurred over the past 20 years which is not even taken into account in the documents that you prepared or present for public comment. BAR-36

There's a first -- being a representative for our villages AFN for the North Slope region. All of our villages are unanimous in their objection to offshore development. Further, the Innupiak in Alaska, Canada, and Greenland have met and have addressed various concerns regarding our homelands.

And one of the things that have come up and I'm sure it's not reflected in your documents is the President Clinton's initiative with regard to the Arctic Council and the formation of the Arctic Council which would be primarily to enhance or to protect the Arctic environment from a global perspective.

Even more important is the development which results from the Earth summit in Rio de Janeiro of June '92 which includes the issue or agenda 21. Which is a major action for a worldwide sustainable development. It describes options for combating degration (sic) of the land, air, and water. Conserving forests and diversity of species of life. It dealt with proverty (sic) and excessive consumption, health, education cities and governments, business people, trade unions, scientists, etc.

And it showed what needed to be done to reduce wasteful and inefficient consumption patterns in some part of the world. Out of the -- this agenda 21, the United was-- the United States was a participant in the development and the declaration of the protection of the Arctic environment.

It was recognized that the ecosystems and environmental threats do not respect national boundaries and that collective actions should be -- would be more effective than actions of an individual state of which we are dealing with here.

The Arctic environment protectional (sic) -- Arctic

Environmental Protection strategy was a plan that was adopted for regional cooperation among the second polar countries to provide for the protection, enhancement, and restoration of the Arctic environment and sustainable utilization of the natural resources.

These same ministers met again in Nuuk and adopted the Nuuk declaration on environment and development in the Arctic. While AEPS is primarily addressing actions among governments, it also recognizes the special relationship of indigenous peoples to their Arctic homeland.

One of the objectives of the strategy is to recognize and to the extent possible, seek to accommodate the traditional cultural needs, values, and practices of the indigenous peoples. The Nuuk Indigenous People Secretariat was established within the AEPS to facilitate communication and enhancement -- enhancement of the participation of the indigenous peoples.

One of the goals is to develop areas of concern which were presented by representatives of ICC, the Sami (ph) Council and the Russia Federation of Association of peoples of the north, Siberia and the Far East of Russia Federation. And to this, ICC had completed an analysis that would -- that was utilized in enhancing the goals of the AEPS.

In one of those objectives is related to indigenous peoples in the -- was to maximize and to protect the

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traditional, cultural, and social, and other developments within indigenous peoples.

As I understand it, your report once again does not reflect those views which the United States has obligated itself to. And it would be important that prior to -- that before issuing this environmental statement that you get in contact with the Department of State to ensure that the principles that the United States have agreed to, to protect the indigenous people, not only in Alaska but throughout the circumpolar Arctic by these agreements to which the United States is a party to, should be applicable in your process.

Because you are not including one of the primary goals that has been identified here which is to en- -- protect and enhance indigenous cultures in -- in their cultural and traditional and sustainable use of the natural resources.

In our case, the major resource we are relying on is the bowhead whale. And the comments I have listened to, indicate that the -- none of the concerns in the Arctic area, have been properly addressed, especially in light of these international agreements which the United States has reached to protect the indigenous peoples, and their use of the resources for sustainable development. It has to coincide with the agreements that have been reached and the development of the Arctic environmental protection strategy. And you should give that serious concern as it addresses our concerns. Thank you.

MR. BROCK: Thank you. And could we be sure -- be sure and get you to sign in please so that we have your address on. Thank you very much. That's very good. Now, we will close the hearing. Thank you all for participating and we are going to be back in touch with the North Slope Borough and all three villages that have been involved in this so far and to -- to work harder on this traditional knowledge, indignious knowledge topic. That's -- that's something that we're really trying to put an effort into and you'll see some changes in it. Thank you very much. Off the record.

(Whereupon, the proceedings in the above-entitled matter were concluded at 11:30 o'clock p.m.)

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626 Cordova, Suite 104
Anchorage, AK 99501
Phone: (907) 272-4084

CERTIFICATION

STATE OF ALASKA)
) ss.
THIRD JUDICIAL DISTRICT)

I, **CINDY S. CARL**, do hereby certify:

(1) That the foregoing pages contain a full, true, and correct transcript of proceedings in the above-entitled matter, transcribed by me, or at my direction and supervision, to the best of my knowledge and ability.

(2) That I have been certified for transcript services by the United States Courts.

(3) That I was certified for transcript services by the Alaska Court System prior to January 1, 1993.

SIGNED AND CERTIFIED:

BY: Cindy S. Carl DATE: 12/5/95

Cindy S. Carl
Certified Court Reporter

CINDY S. CARL
NOTARY PUBLIC
STATE OF ALASKA

Executary Court Reporting
626 Cordova, Suite 104
Anchorage, AK 99501
Phone: (907) 272-4084

BAR-01
These concerns are addressed in Section IV.B.6 of the FEIS.

BAR-02
Cumulative effects are addressed in Section IV.H.6 of the FEIS.

BAR-03
Please see the response to Comment SOA-02.

BAR-04
These concerns are addressed in Section IV.B.6 of the FEIS.

BAR-05
Please see response to BAR-09.

BAR-06
Please see the response to Comment SOA-02.

BAR-07
The DEIS does not identify the Alaskan Beaufort Sea as having "average marine productivity, environmental sensitivity to coastal habitats and sensitivity to marine habitats and marine biota". The relative productivity of the Alaskan Beaufort Sea was not discussed at all in the lower trophics section. The DEIS addressed only the amount of carbon contributed annually by the various lower trophic level communities that exist in the Alaskan Beaufort Sea. Lower trophic level organisms in the Alaskan Beaufort Sea actually have a lower than average level of marine productivity, when compared to almost anyother ocean in the world. These realities have been added to the DEIS.

BAR-08
The DEIS recognizes the importance of marine mammal habitats offshore of Dease Inlet, as shown in Figure III.B.4. The OCS lease tracts offshore of Dease Inlet were leased in Sales 124, 97, and 87; however, these lease tracts were relinquished recently by the oil companies, and the area offshore of Dease Inlet is very unlikely to receive any bids in the proposed Sale 144 (there are no active leases in the Beaufort Sea west of Cape Halkett-Harrison Bay).

BAR-09

Stipulation No. 5 (Subsistence Whaling and other Subsistence Activities) states that: "In enforcing this stipulation, the RS/FO will work with other agencies and the public to assure that potential conflicts are identified and efforts are taken to avoid these conflicts (for example, timing operations to avoid the bowhead whale subsistence hunt). These efforts might include seasonal drilling restrictions, seismic and threshold depth restrictions, and requirements for directional drilling and the use of other technologies deemed appropriate by the RS/FO."

BAR-10
The rationale for the conclusion that the population would recover within 1 to 3 years is discussed in Section IV.B.6 of the FEIS. We believe that a 1- to 3-year recovery time is very conservative based on the following discussion, which uses simple calculations to look at the complexities of population dynamics. Considering that the current bowhead whale population is estimated at 8,000 animals (IWC, 1995) and that the rate of increase in the population since 1978 was about 3.1 percent per year (George, 1995) and possibly as high as 4.5 percent per year (George et al., 1995), the population currently is increasing by an estimated 248 to 360 animals per year. To exceed a 1-year recovery time (to return to the prespill population level), more than 240 to 344 whales would have to die in an oil spill. (These numbers assume that a 3.1-4.5% recruitment rate, respectively, remains constant following the spill, and that recruitment is based on the population remaining after the mortality was suffered.) To exceed a 3-year recovery time, more than 700 to 990 whales would have to die in an oil spill. We believe that mortality of that magnitude is very unlikely to happen even though some habitats, such as the ice-edge habitat of

the bowhead, could make the bowhead more vulnerable to an oil spill than other cetaceans. According to Geraci and St. Aubin (1982) and St. Aubin, Stinson, and Geraci (1984), short-term exposure to spilled oil or other petroleum compounds is unlikely to have serious direct effects on baleen whales. Based on the limited data available, Bratton et al. (1993) concludes that potential contaminants such as petroleum products appear to pose no harm to bowheads or to humans who eat them.

In spite of numerous observations of various species of cetaceans in spills, none of the effects (as discussed in the FEIS) has been detected, or at least documented with any certainty (Geraci and St. Aubin, 1990). While killer whales are quite dissimilar from bowhead whales in many ways, there are some current observations on killer whales associated with the EVOS. Following the EVOS, a number of killer whales are missing from the AB pod in Prince William Sound and are presumed to have died. The cause of death of the killer whales is uncertain. Dahlheim and Matkin (1994) concluded that some of the whales may have died of natural causes and the remainder are dead from either a result of interactions with fisheries or the EVOS, or a combination of both. There is a spatial and temporal correlation between the loss of whales and the EVOS, but there is no clear cause-and-effect relationship.

BAR-11
The issue of noise effects displacing bowhead whales farther offshore is addressed in Section IV.B.6 of the FEIS.

BAR-12
The issue of noise effects displacing bowhead whales farther offshore is addressed in Section IV.B.6 of the FEIS. Information from additional studies on the potential effects of seismic noise on bowhead whales has been added to address these concerns.

BAR-13
The issue of noise effects displacing bowhead whales farther offshore is addressed in Section IV.B.6 of the FEIS. Information from additional studies on the potential effects of seismic noise on bowhead whales has been added to address these concerns.

BAR-14
The issue of noise effects from seismic activities is addressed in Section IV.B.6 of the FEIS. Information from additional studies on the potential effects of seismic noise on bowhead whales has been added to address these concerns. Statements made by some of the whaling captains and the North Slope Borough at various public hearings regarding the distance that whales react to seismic noise also have been added.

BAR-15
The studies mentioned here are referenced in Section IV.B.6 of the FEIS.

BAR-16
The studies mentioned here are referenced in Section IV.B.6 of the FEIS.

BAR-17
Information from additional studies on the potential effects of seismic noise on bowhead whales has been included in Section IV.B.6 of the FEIS to address this concern. Statements made by some of the whaling captains and the North Slope Borough at various public hearings regarding the distance that whales react to seismic noise also haveo been added. A quote from a North Slope Borough official regarding the 7.5-km distance also has been added.

BAR-18
The study mentioned here and information pertaining to the group of four to seven whales are referenced in Section IV.B.6 of the FEIS.

BAR-19
The study mentioned here and information pertaining to the group of four to seven whales are referenced in Section IV.B.6 of the FEIS. Also included in Section IV.B.6 of the FEIS are the specific comments expressed here regarding disbelief of the 7.5-km distance and referencing the feeling that the reaction is more on the order of 10 miles.

BAR-20
The studies mentioned here are referenced in Section IV.B.6 of the FEIS.

BAR-21
The studies mentioned here are referenced in Section IV.B.6 of the FEIS. Also included is a discussion on the limits described by the author of the BBN report and the author's emphasis that the estimates are theoretical only and should not be used to predict whale avoidance at specific locations, as the methods may or may not be valid.

BAR-22
This study was not specifically referenced in the FEIS because ARCO/COPAC never revised the study and did not respond to numerous comments by the National Marine Fisheries Service and Minerals Management Service. Some of the issues were considered significant, such as the inclusion of sightings made in transit or along aerial survey connect legs in the data analysis. There was concern by both agencies that inclusion of those sightings could seriously bias the results.

BAR-23
The study mentioned here is included in Section III.B.5 of the FEIS.

BAR-24
The revised population estimate has been included in Section III.B.5 of the FEIS.

BAR-25
The estimate on the rate of increase that was in Section III.B.5 of the DEIS is not in error. It was stated that the bowhead whale population was increasing ". . .at a rate of about 3 percent/year." That is essentially the same as an "estimated rate of increase of 3.1 percent per year" as suggested in this comment. It also has been suggested by George et al. (1995) that when comparing the total count of whales in 1978 and 1993, there may have been as much as a 4.5-percent annual growth in population size. The DEIS also did not state that the increase in the population is attributable to changes in techniques. The DEIS attributed the population increase to a combination of improved data, better censusing techniques, and an increasing population, with much of the increase likely due to improved data and better censusing techniques. The estimate of population size by the IWC in 1985 was 4,417 whales, based on 1978 and 1982 visual census data and corrected for whales estimated to have passed beyond viewing range (Zeh et al., 1993). (In 1978, the IWC estimated the population at 1,300 whales). A 3.1-percent per year rate of increase in the population (or even a 4.5% per year rate of increase, as suggested in George et al., 1995) is insufficient to account for the current population estimate of 8,000 whales. It is likely that much of the population differential is due to improved data and better censusing techniques.

BAR-26
Please see the response to Comment AEWC-05.

BAR-27
Prior to the initiation of any developmental activities (should recoverable amounts of oil be located), a Developmental EIS must be completed. This document must be specific as to the location of platforms, pipelines, transportation routes, and logistics. At that time, the stakeholders (North Slope communities) will have the opportunity to fully review and comment on the development plan. A review of Stipulations No. 4 and No. 5 should indicate that the North Slope communities will have the opportunity to stay fully apprised of any Beaufort Sea exploration and potential oil development that may occur in Federal waters.

BAR-28
Since publication of the Sale 144 D EIS, MMS, in a series of meetings with the North Slope Borough Mayor's office, the AEWC, and the NSB Department of Wildlife Management, has drafted stipulations and other mitigation

that take into account traditional knowledge concerns. Also, the descriptive and analytical portions of the Sale 144 final EIS text have incorporated by reference and quotation local indigenous knowledge. The MMS treatment of traditional knowledge in the Sale 144 FEIS represents a true and significant departure from previous EIS analyses. The Mayor and other constituencies on the North Slope have encouraged and approved this attempt by MMS.

BAR-29
Please see the response to Comment ASNA-03

BAR-30
Caribou calving "grounds" or calving areas have been well documented in scientific studies conducted by the ADF&G, FWS, and other scientific researchers for many years (see Sec. III.B. 6). These calving areas are quite large areas of tundra habitat located north of the Brooks Range for the four caribou herds that occur on the North Slope. Calving areas or "grounds" are habitat areas that cow caribou migrate to during the spring prior to giving birth to their calves, and thus the calves are born in these habitat areas. The specific areas within these habitats where most of the calving is concentrated varies from year to year.

BAR-31
Some biologists conclude that almost the entire Bering Sea bowhead population migrates to the Beaufort Sea each spring and that few, if any, whales summer in the Chukchi Sea. However, some Russian scientists maintain that some bowheads migrate through the Bering Sea in late spring, swim northwest along the Chukotka coast, and summer in the Chukchi Sea. Records of bowhead sightings from 1975 to 1991 suggest that bowheads regularly may occur along the northwestern Alaskan coast in late summer, but it is unclear whether these are "early autumn" migrants or whales that have summered nearby (Moore et al., 1995).

BAR-32
Additional information regarding the presence of whales in the Chukchi Sea during the summer has been added to Section III.B.5 of the FEIS.

BAR-33
This statement has been changed in text to read: "Barrow whalers continue to hunt in the fall to meet their quota as well as seeking strikes that can be transferred to the community from other villages from the previous spring hunt."

BAR-34
Information about the North Slope Borough Science Advisory Committee report has been added to the text of the FEIS in Section III.B.5.

BAR-35
Some references about high-resolution seismic surveys has been added to the text in of the FEIS in Section IV.B.6.

BAR-36
It isn't clear if this comment pertains to bowhead whales or not. If it does pertain to bowheads, then it is incorrect. Almost all references in the DEIS were < 10 years old and the majority of the references are dated in the 1990's. Many of the studies on the effects of noise on bowhead whales were, in fact, conducted in the mid to late 1980's.

BAR-37
The MMS mandate for leasing on the U.S. OCS comes from NEPA and OCSLA. The MMS intends to honor through its newly negotiated mitigation measures with the North Slope Borough and the AEWC and its recent initiative to incorporate traditional Inupiat knowledge, the intentions and concerns of the subsistence way of life, and as a corollary to honor the spirit of President Clinton's intiative with regard to the Arctic Council, as well as the agreements of the Earth Summit in Rio de Janeiro in June 1992, the Arctic Environmental Protection Strategy (including the Nuuk Indigenous People Secretariat), and the ICC. The MMS has increasingly recognized the traditional cultural needs and values of the Inupiat as its recent initiatives to incorporate traditional knowledge, its vigorous outreach program, its commitment to peer review of monitoring plans, and to the processes for conflict resolution between industry and those who follow a subsistence way of life.

SECTION VI

CONSULTATION AND COORDINATION

VI. CONSULTATION AND COORDINATION

A. DEVELOPMENT OF THE PROPOSAL: The proposed Beaufort Sea Planning Area oil and gas lease Sale 144 is one of 13 proposed Outer Continental Shelf (OCS) sales included in the current (1992-97) 5-Year OCS Oil and Gas Leasing Schedule. Official coordination with other government agencies, industry, and the public regarding this proposed action began on December 10, 1993, with a Call for Information and Nominations and Notice of Intent (NOI) to Prepare an Environmental Impact Statement (EIS), which requested expressions of industry interest in blocks within the Call area and requested comments on environmental issues related to possible oil and gas leasing in the area. As a result of the Call and NOI, 12 comments and/or nominations were received. Five companies commented and nominated blocks, and seven written responses were received from the following: the State of Alaska, Office of the Governor; the North Slope Borough (NSB); U.S. Fish and Wildlife Service (FWS); National Park Service; the Alaska Eskimo Whaling Commission (AEWC); the Wilderness Society; and Greenpeace.

Following evaluation of the area nominations and environmental information received in the process described above, together with other relevant information, the Minerals Management Service submitted a recommendation for area selection to the Secretary of the Interior. On September 13, 1994, the Department of the Interior announced the area selected for further environmental study. (See Sec. I.A for more details.)

B. DEVELOPMENT OF THE EIS: During preparation of this and past EIS's for the Beaufort Sea Planning Area, Federal, State, and local agencies; industry; and the public were consulted to obtain descriptive information, to identify significant effects and issues, and to identify effective mitigation measures and reasonable alternatives to the proposed action. The comments received during the scoping process for Sale 144 also noted that issues raised and mitigating measures and alternatives suggested for past Beaufort Sea Planning Area lease sales were relevant to Sale 144. All of the information received has been considered in preparing the Sale 144 EIS. In addition, scoping meetings, as well as public hearings on the Sale 144 DEIS, were held in Barrow, Nuiqsut, Kaktovik, and Anchorage, Alaska, with local agencies and the public to identify more clearly and specifically issues and alternatives to be studied in the EIS. Scoping information can be found in Section I.D. The North Slope Borough local communities as well as departmental agencies with interest and expertise in the OCS were consulted during the development of the potential mitigating measures for this proposed action (see Sec. II.).

C. LIST OF CONTACTS FOR REVIEW OF THE EIS: The following are the major Federal, State, and local government agencies; special interest groups; members of the oil industry; other organizations; and the public (1) who were contacted, sent copies of the draft EIS for review and will be sent copies of the Final EIS or (2) who provided comment on the draft EIS that addressed the adequacy of the descriptive material or analysis or provided new or additional information (Sec. V) and will be sent copies of the final EIS (if a mailing address has been provided).

Federal

Executive Branch - Departments

Department of Commerce
- National Oceanic and Atmospheric Administration
  - Policy and Strategic Planning
- National Marine Fisheries Service
  - National Marine Mammals Lab
  - Bowhead Whale Project

Department of Defense
- Deputy Assistant Secretary for Environment and Safety
- Environmental Security
- U.S. Air Force
- U.S. Army
- Corps of Engineers

Department of Energy
- Technical Information Center

Department of the Interior
- Alaska Resource Library
- Bureau of Indian Affairs
- Bureau of Land Management
  - Arctic District Office
- Fish & Wildlife Service
  - Fairbanks Ecological Services
- Geological Survey
- National Park Service
  - Subsistence Division
  - Office of Environmental Policy and Compliance

Department of Transportation
- Office of Pipieline Safety
- U.S. Coast Guard

Legislative Branch
- U.S. Senate
  - Sen. Ted Stevens
  - Sen. Frank Murkowski
- U.S. House of Representatives
  - Committee On Resources
  - Committee On Energy and Resources
  - Rep. Don Young

Congressional Budget Office

Administrative Agencies and Other Agencies

- Environmental Protection Agency
  - EIS Filing Section
  - Office of Federal Activities
- Marine Mammal Commission

State of Alaska

- Alaska State Legislature
  - House Resources Committee
    - Rep. E. Maclean
  - Senate Resources Committee
- Alaska Oil & Gas Conservation Commission
- Department of Community & Regional Affairs
- Department of Environmental Conservation
  - Northern Alaska District Office
- Department of Fish & Game
  - Subsistence Division
  - Habitat Division
- Department of Natural Resources
  - Citizens Advisory Commission on Federal Areas
  - Division of Geological and Geophysical Surveys
  - Division of Oil and Gas
  - Division of Water
- Department Of Transportation and Public Facilities

Office of the Governor

- Governor Tony Knowles
- Division of Governmental Coordination
- Office of Management and Budget
- University of Alaska
  - Elmer E. Rasmuson Library
  - Fisheries Industrial Technology Center
  - Geophysical Institute
  - Government Documents Library
  - Marine Advisory Program
  - School Of Fisheries and Ocean Sciences

Local Governments, Native Organizations, and Libraries

- Alaska Eskimo Whaling Commission
- Alaska Pacific University Library
- Alaska Resource Library
- Alaska State Library
- Arctic Development Council
- Arctic Slope Native Association
- Arctic Slope Regional Corp.
- Army Corps of Engineers Library
- Association of Village Council Presidents
- Barrow Whaling Captains Association
- City of Barrow
- City of Kaktovik
- City of Kotzebue
- City of Nome
- City of Nuiqsut
- City of Point Hope
- City of Wainright
- Cully Corporation
- Doyon Corporation
- Eskimo Walrus Commission
- George Francis Memorial Library
- Ilisaavik Library
- Indigenous Peoples Council for Marine Mammals
- Inupiat Community of the Arctic Slope
- Kaktovik Inupiat Corporation
- Kaveolook School Library
- Kegoyah Kozga Public Library, Nome
- Kuukpik Corporation, Nuiqsut
- NANA Regional Corporation, Inc.
- North Slope Borough
  - Office of the Mayor
  - Planning Commission
  - Planning Department
  - School District Library
  - Wildlife Management
- Northern Alaska Environmental Center Library
- Oil Spill Public Information Center
- Olgoonik Corporation
- Point Lay IRA Council
- Rural CAP
- Tigara Corporation
- Tikigaq Library, Point Hope
- Ukpeagvik Inupiat Corporation
- U.S. Fish and Wildlife Service Library
- U.S. Army Corps of Engineers Library
- Village of Nuiqsut
- Village of Point Hope

Canada

- Canadian Wildlife Service, National Wildlife Research Centre
- Department of Indian & Northern Affairs
- Institute of Ocean Sciences, Dept. of Fisheries & Oceans, Sidney, BC
- Inuvialuit Game Council of Canada.
- Joint Secretariat, Fisheries Joint Mgt. Com., Inuvikon, NWT
- Peches et Oceans, Bibiotheque, Institute Maurice-Lamontagne. Mont-Joli, QC

Special-Interest Groups

- Alaska Conservation Foundation
- Alaska Marine Conservation Council
- Alaska Wildlife Alliance
- Greenpeace
- Living Resources Center
- National Audubon Society
- National Resources Defense Council
- National Wildlife Federation
- Native American Fish and Wildlife Society
- Northern Alaska Environmental Center
- Sierra Club
- Trustees for Alaska
- Wildlife Federation Of Alaska
- U.S. Arctic Network

Petroleum Industry

- Alaska Clean Seas
- Alaska Oil and Gas Association
- Alaska Support Industry Alliance
- Amerada Hess Corporation American Petroleum Institute
- AMOCO Canada Petroleum Co.
- AMOCO Production Co.
- ARCO Alaska, Inc
  - Environmental Protection Dept
  - Land Department
- BP Exploration
  - Environmental Affairs
  - Information Resources Center
- Chevron U.S.A. Inc
- Enserch Exploration
- Exxon Company, USA
- Global Marine Drilling
- Marathon Oil Company
- Pennzoil
- Petroleum Information

Phillips Petroleum
Shell Western E&P Inc.
Texaco Inc.
Union-Texas
Unocal
Western Geophysical Co

Associations, Companies, and Other Groups

Alaska Journal of Commerce
Alaska Newspapers Inc
Alaska Public Radio
Anchorage Daily News
Arctic Marine Resources Commission
Arctic Research Commission
Arctic Sounder
Applied Science Associates
Barrow Cable T.V.
Bering Straits Coastal Management Program
Fairbanks Daily News-Miner
KBRW Radio
Nome Chamber of Commerce
North Slope Sentinel
Northwest and Alaska Fisheries Center
Northwestern University
  Center for Urban Affairs and Policy Research
Prince William Sound RCAC
Tundra Times
Waddell Marine Biotech

Individuals

Adams, Billy
Ahgeak, Max
Ahmaogak, Maggie
Ahmaogak, Fred
Akootchook, Issac
Akootchook, Susie
Akpik, Joseph
Albert, Tom
Alward, Judy
Beistline, Earl H.
Bell, Robert K
Bodfish, Berry
Britt, William
Brower, Arnold, Jr
Brower, Charlotte
Brower, Eugene
Brower, Harry, Jr.
Brower, Johnny
Brower, Ronald H., Sr.
Brown, Dr. Jerry
Carroll, Marie Adams
Casteel, Tim Jr.
Driggs, Albert T.
Duffy, David
Edwardson, Robert
Fogleman, Valerie M.
George, Craig
Gilbertson, Dr. Larry
Gronholdt, Paul
Hilde, Carl
Hopson, Edward
Itta, Edward
Kagak, Luke
Knock, Tom
Koonuk, Jake
Koonuk, Ray
Long, Frank
Leavitt, Daniel T.
Ljungbled, Don
Muellenhoff, Dr. William
Napageak, Thomas
Negovanna, Silas
Nukapigak, Issac
Nukapigak, Joe
Okakok, Charlie
Oktollik, Enoch
Oleman, Nate, Jr
Oyagak, Joy
Panik, Peter
Pederson, Michael
Perrige, Dr. Lyle
Perkins, Joseph Jr.
Platt, Fred
Pollock, Rick
Rexford, Delbert
Rexford, Burton
Rexford, Rosabelle
Schaefer, Jack
Simmonds, Abe
Sonsalla, Lon
Steinhauer, Dr. Margarete
Stern, Dr. Richard
Targarook, George
Targarook, Kenneth
Tazruk, Harry
Toovak, Ken
Tukle, Patsy
Tuzroyluke, Rex Jr.
Vorderstrasse, Jim
Whitney, David

D. CONTRIBUTING AUTHORS AND SUPPORTING-STAFF MEMBERS:

Elinore M. Anker, Technical Publications Writer-Editor
Stan Ashmore, Cartographer
Michael Baffrey, Socioeconomic specialist
Rose Baize, Minerals Records Coordinator
Michael Burwell, Socioeconomic Specialist
Jim Craig, Geologist
Raymond R. Emerson, Supervisory Environmental Specialist and Sale 144 Project Chief
Donald J. Hansen, Wildlife Biologist
Ken Holland, Marine Biologist
Tim Holder, Economist
Joel Hubbard, Wildlife Biologist
Jody Lindemann, Technical-Publications Writer-Editor
Kyle Monkelin, Petroleum Engineer
Tom Murrell, Supervisory Petroleum Engineer
Thomas Newbury, Oceanographer
Kristopher Nuttall, EAS Secretary
Mazelle O. Parker, EIS Specialist
Richard T. Prentki, Oceanographer
Richard W. Roberts, Oceanographer
Beverly Sires, Minerals Leasing Specialist
Caryn Smith, Oceanographer
Kay V. Tracy, Senior Technical Publications Writer-Editor
John Tremont, Geographer and Sale 144 Project Coordinator
George Valiulis,Headquarters EIS Project Officer
Frank Wendling, Marine Biologist

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BIBLIOGRAPHY

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APPENDICES

APPENDIX A

PETROLEUM GEOLOGY OF THE BEAUFORT SHELF PROVINCE

RESOURCE ESTIMATES

AND

EXPLORATION AND DEVELOPMENT REPORT

PETROLEUM GEOLOGY OF THE BEAUFORT SHELF PROVINCE

Northern Alaska and the Beaufort Shelf are comprised of a series of basins and intervening highs formed during a complex history of continental breakup and rifting north of Alaska and folding and thrusting to the south (Fig. 1).

In the Middle (?) to late Devonian, a regional orogeny deformed and mildly metamorphosed clastic and carbonate rocks of pre-Mississippian age to form the basement complex (Fig. 2).

From Late Devonian through Jurassic time, sediments shed southward from the northern highland onto a south-facing continental shelf (Fig. 3). Nonmarine clastic sediments of the Endicott Group, marine carbonates of the Lisburne Group, clastics of the Sadlerochit group, and carbonates and clastics of the Shublik and Sag River formations were deposited during this time interval. Together, these rock units are grouped into the Ellesmerian Sequence (Fig. 2).

In the Jurassic, continental rifting began in the vicinity of the present Beaufort Sea coastline, and the northern land mass progressively moved away from Arctic Alaska (Fig. 3). Regional uplift associated with the rift event eroded parts of the Ellesmerian sequence, forming the widespread Lower Cretaceous Unconformity (LCU). A series of rift basins filled with locally derived clastic sediments including rocks of the Kingak and Kuparuk Formations (Fig. 3). These rocks are referred to as the Rift Sequence and are equivalent to the Beaufortian Sequence of Hubbard and others (1987) (Fig. 2).

Coincident with continental rifting, folding and thrusting to the south formed the ancestral Brooks Range. The Brooks Range uplift shed sediments northward into an east-west trending trough called the Colville Basin (Fig. 1). Fluvial and deltaic systems carried sediments to the north, ultimately filling the Colville Basin by the middle Cretaceous time (Fig. 3). The lower part of the deltaic sediment package is characterized by thick sequences of prodelta shale (Torok Formation) with isolated sand bodies deposited in a deepwater marine environment. The upper part of the deltaic sediment package, deposited in shallow marine to nonmarine environments, are more sand rich. These deltaic sediments are referred to as the Brookian Sequence (Fig. 2).

By the middle Cretaceous, seafloor spreading was opening the Arctic oceanic basin north of Alaska. Along the Beaufort continental margin, a series of down-to-the-north normal faults along a deep flexure called the Hinge Line mark the transition from continental to oceanic crust to the north. North of the Hinge Line, a series of Cretaceous and Tertiary basins, such as the Nuwuk and Kaktovik basins, filled with northeastward prograding Brookian sediments. A broad ridge referred to as the Barrow Arch separates the Colville Basin in the south and the Nuwuk and Kaktovik Basins in the north. The Barrow Arch trends parallel to the modern Beaufort Sea coastline, extending westward into the Chukchi Sea (Fig. 1).

By the late Cretaceous, sediments of the Brookian Sequence carried across the Barrow Arch in the western part of the planning area and began building the shelf-margin wedge that fills the Nuwuk basin. These Lower Cretaceous sediments comprise the Torok Formation and Nanushuk Group (Fig. 2).

Throughout the rest of the Cretaceous and the Tertiary, Nuwuk Basin and Kaktovik Basin progressively filled with sediments as the deltas prograded northeastward (Fig. 3). The Colville Group and Sagavanirktok Formation were deposited at this time (Fig. 2). As these basins filled, large scale down-to-the-north listric faults created tilted and rotated blocks of Brookian strata that have been exploration targets in recent drilling. Brooks Range folding and thrusting progressed northward, deforming the Brookian sediments in the southern part of Colville Basin. By the early Tertiary, the deformation reached the Beaufort shelf east of Flaxman Island. Brookian sediments there were deformed into a complex of northeast trending folds and thrusts. These structures, in combination with the down-to-the-north normal faults, result in an extremely complex structural province in that area.

Exploration History

Petroleum exploration of the North Slope and Beaufort Sea began with the establishment of the Naval Petroleum Reserve No. 4 (NPR-4) in 1923 based on data collected by the U.S. Geological Survey (USGS). The Navy, in cooperation with the USGS, drilled 80 holes (44 core holes and 36 test wells) in NPR-4 from 1944 to 1953. As a result of the drilling program, small oil fields were discovered at Umiat, Simpson, and Fish Creek. Gas fields were

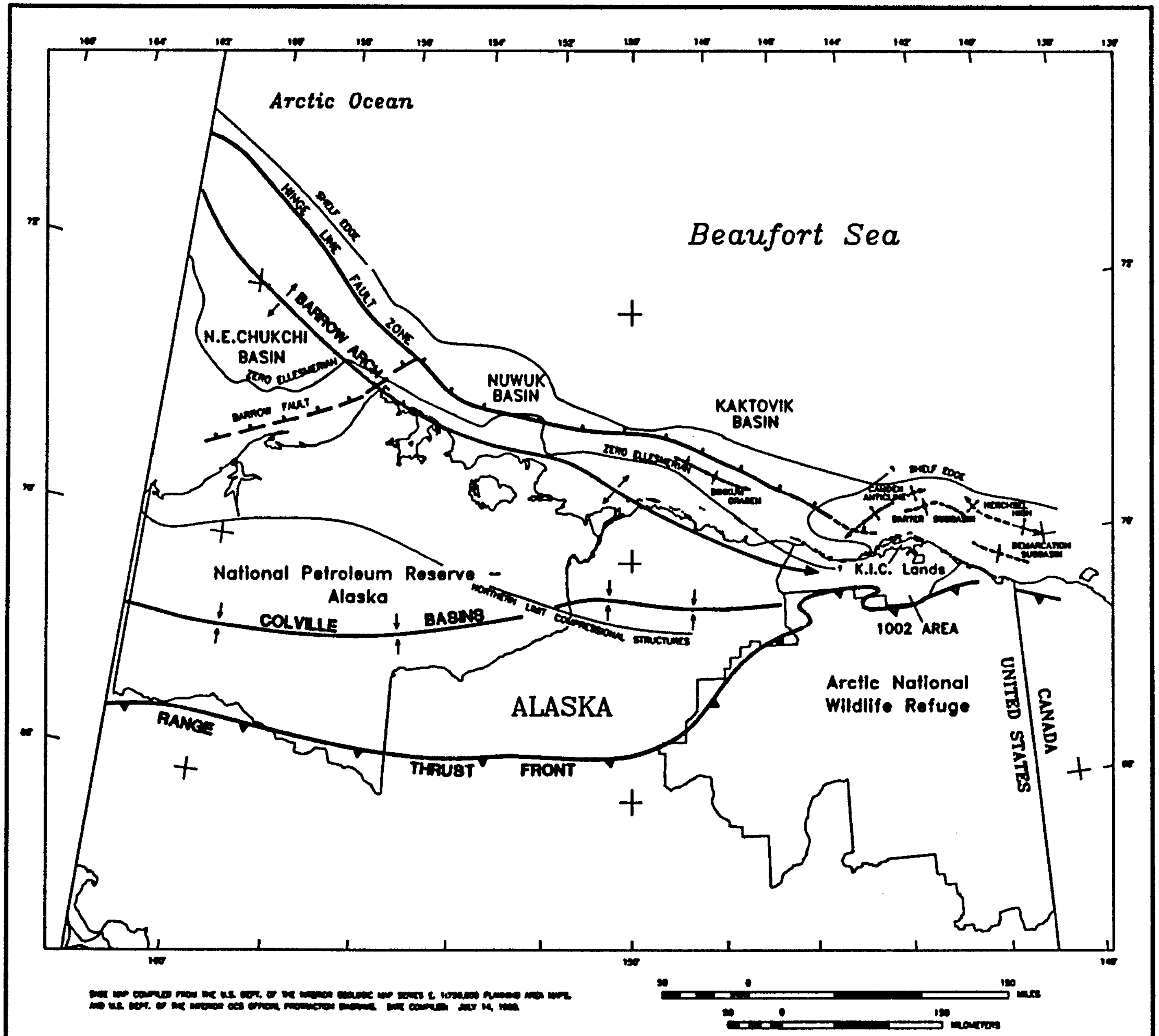

Figure 1. Major Geological Features of Northern Alaska

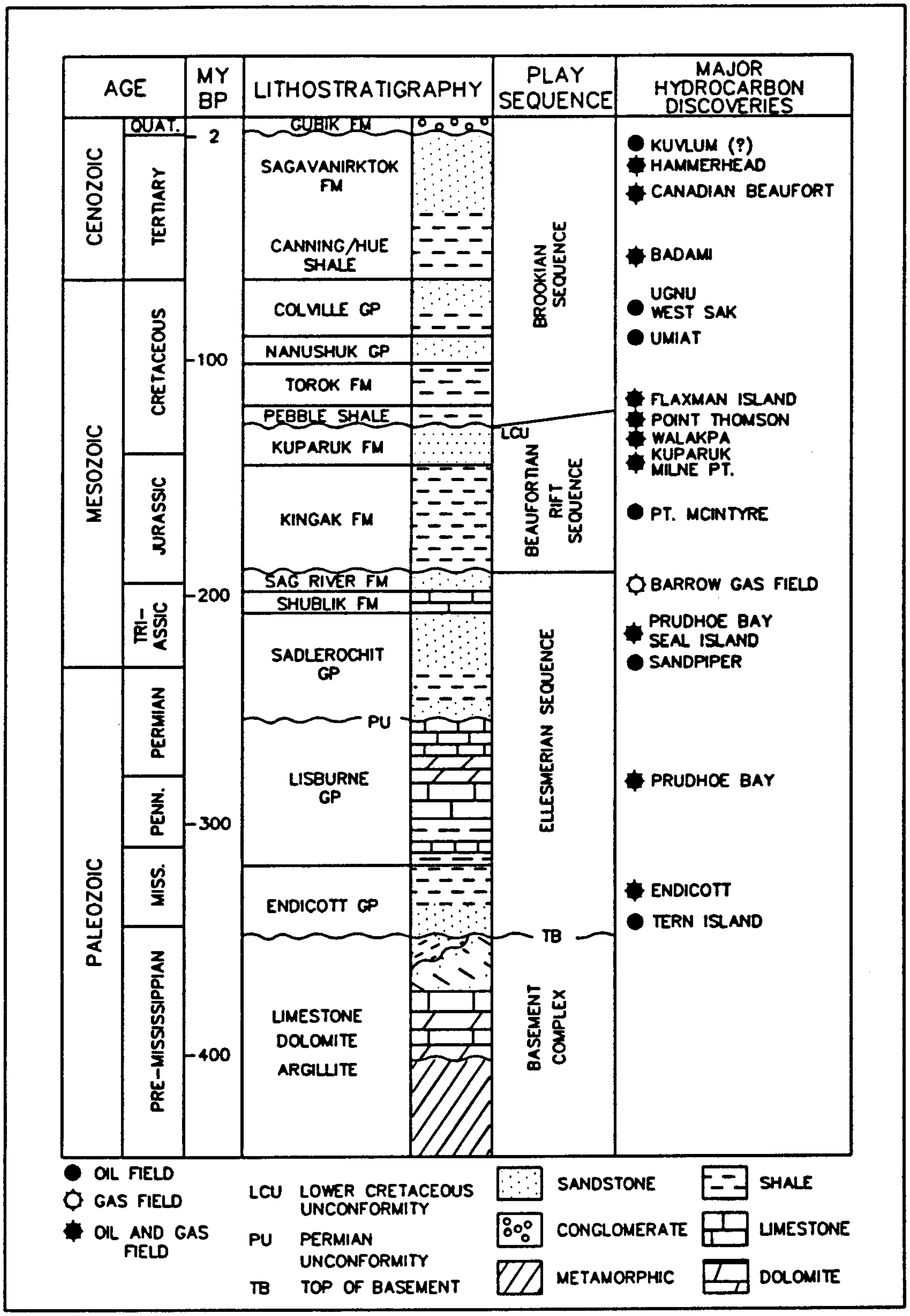

Figure 2. Beaufort Shelf Province Stratigraphic Column

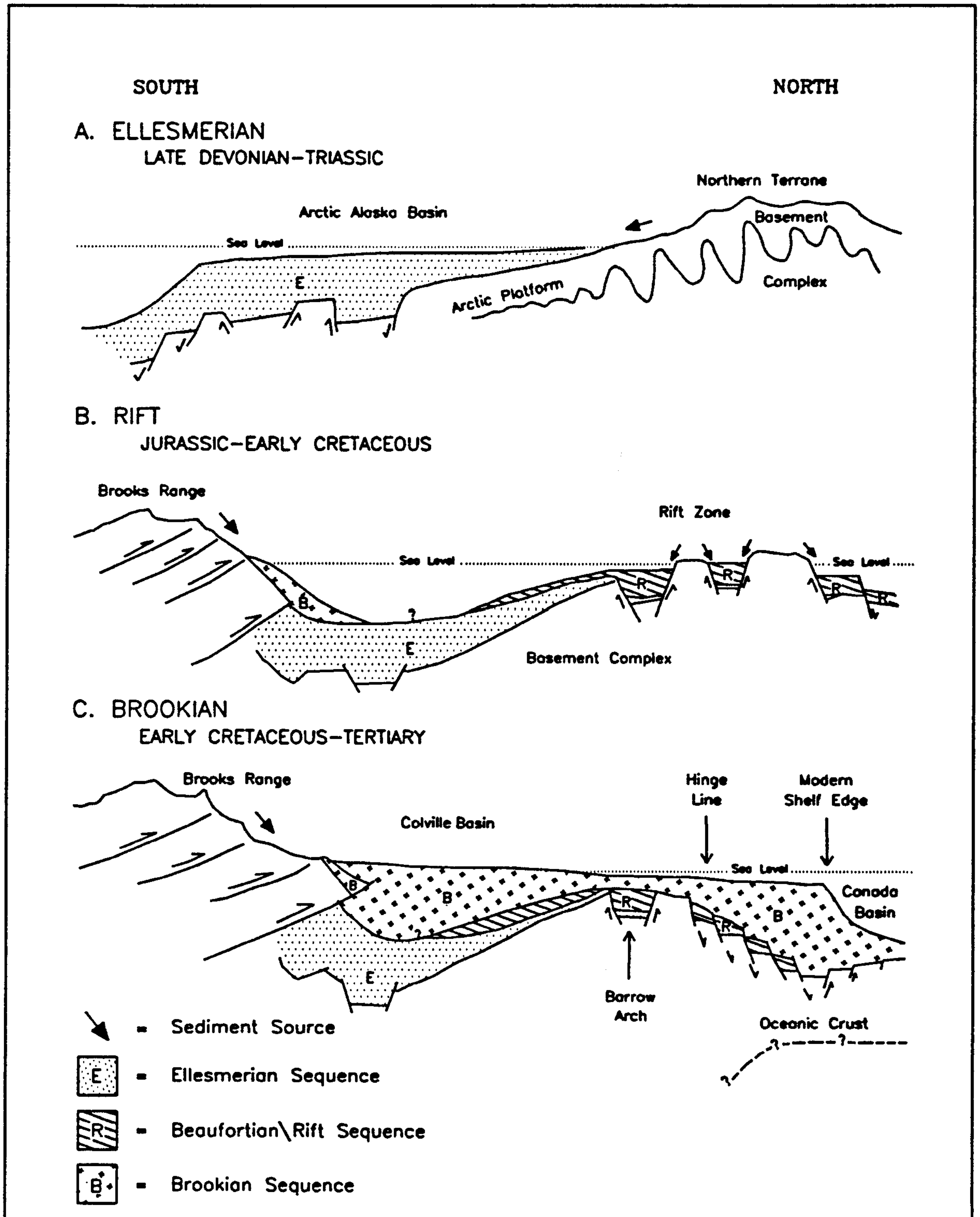

FIGURE 3
Generalized geologic evolution of northern Alaska. Paleogeographic relief is schematically shown during the time periods represented by the Ellesmerian, Rift, and Brookian plate sequences. Modified from Banet, Scherr and Bascle (1991).

discovered at Gubik, South Barrow, Meade, Square Lake, Oumalik, and Wolf Creek. The South Barrow gas field supplied fuel to the Naval Arctic Research Lab for a number of years. The field still provides gas for the village of Barrow.

NPR-4 became the National Petroleum Reserve in Alaska (NPRA) in 1977 when the U. S. Department of the Interior (USDOI) received responsibility for the area. In 1975, federally funded exploration resumed in NPRA and continued for 7 years. Husky Oil, under contract to the USGS, drilled 28 exploratory wells throughout NPRA. The drilling program found gas fields and some oil shows at East Barrow and Walakpa, both of which provide gas for the village of Barrow. The Barrow fields and the Walakpa fields produce gas from sandstones in the Rift Sequence.

The State of Alaska held the first competitive lease sale for the North Slope in late 1964. The State held a second competitive lease sale in 1965 that included the Prudhoe Bay structure. Atlantic Richfield Company (ARCO) and Humble Oil announced the discovery of the giant Prudhoe Bay field in 1968 after drilling the Prudhoe Bay St. No. 1 well. Other potentially commercial oil fields discovered during the flurry of exploration activity following the Prudhoe Bay discovery include Kuparuk (1969); West Sak (1969); Milne Point (1970); Flaxman Island (1975); Point Thomson (1977); and Sag Delta-Duck Island (1978), later called the Endicott field.

The Federal Government and the State of Alaska jointly held the first offshore lease sale (Sale BF-79) in December 1979. Industry high bids totaled $1.056 billion for 86 of the 117 State and Federal tracts offered for lease. Wells drilled on these leases led to oil discoveries at Tern Island (1983) and Seal Island (1984).

The MMS held Sale 71 in October 1982, offering acreage in the central Beaufort Sea. The DOI accepted bonus bids totaling $2.055 billion on 121 of the 338 tracts offered. The Mukluk structure in Harrison Bay received over one billion dollars in high bids, including the highest bid for a single tract of the sale—$227 million. Industry drilled eight wells on Sale 71 leases. The Mukluk, Antares, and Phoenix wells encountered minor amounts of oil in Ellesmerian and Beaufortian reservoirs. The two Sandpiper wells drilled in 1986 encountered significant quantities of gas and condensate.

The first areawide lease sale, Sale 87, offered 1,419 tracts for lease in August 1984. The DOI accepted a total of $872 million in high bids for 231 tracts. The highest concentration of bidding, and the high bid ($55 Million), focused on faulted anticlinal structures in Camden Bay. To date, 10 wells have been drilled on acreage leased in Sale 87. Unocal announced the discovery of the Hammerhead field in 1986 after drilling two wells. Three wells drilled in 1992 and 1993 define ARCO's Kuvlum discovery. Both discoveries have been unitized, but are not currently being developed.

In March 1988, OCS Beaufort Sea Lease Sale 97 offered 3,344 tracts for lease. This sale included for the first time a large area west of Point Barrow in the northeastern Chukchi Sea. Total high bids of $122.6 million were accepted on 234 tracts. To date, two wells have been drilled and abandoned by industry on Sale 97 tracts. The Galahad well encountered minor amounts of gas in Brookian Sequence rocks.

The most recent OCS Beaufort Sea lease sale (Sale 124) offered 3,417 tracts for lease in June 1991. All of these tracts had been offered for lease in at least one of the previous sales. Fifty-seven tracts received bids for a high-bid total of $16.8 million. The Wild Weasel well was drilled by ARCO on the high-bid tract for Sale 124.

Production History

Figure 4 shows the location of many of the oil and gas fields discovered to date on the North Slope, and Figure 2 shows the stratigraphic position of the principle reservoirs. The Prudhoe Bay field contained original recoverable reserves estimated at 12 billion barrels (Bbbl) of oil and 23 trillion cubic feet (Tcf) of gas. Prudhoe Bay is the largest field discovered to date in North America. This discovery made the construction of the Trans-Alaska Pipeline System (TAPS) feasible. Oil production began in 1977 from sandstones of the Ellesmerian Sequence (Ivishak Formation), the main reservoir of the Prudhoe Bay field. Production of the Lisburne reservoir in the Prudhoe Bay field began in 1981. Recoverable reserves for the Lisburne are estimated at 181 million barrels (MMbbl) of oil. The Kuparuk field, producing from the Kuparuk Formation (Rift Sequence) reservoirs began in 1981, with estimated recoverable reserves of 2.2 Bbbl of oil.

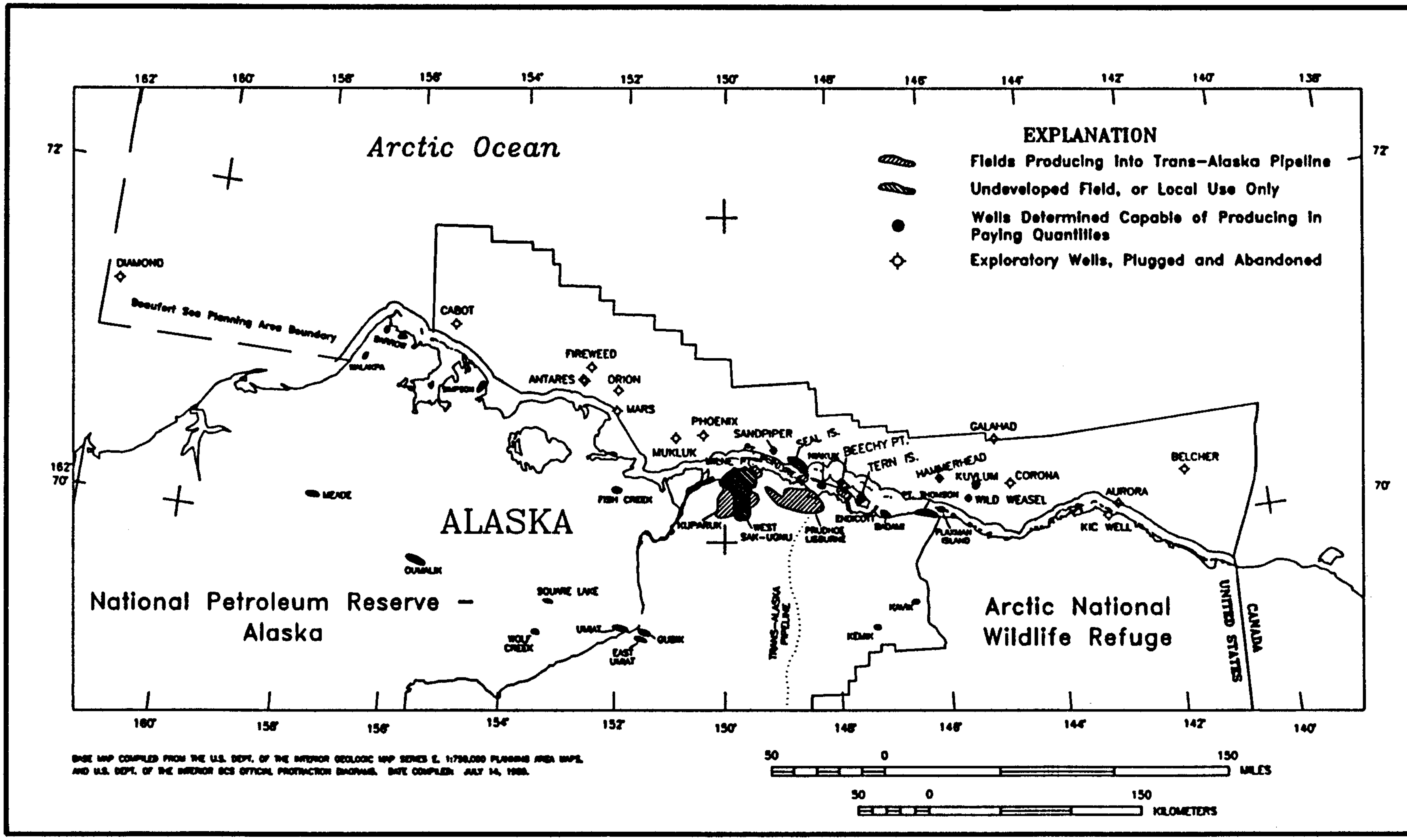

Figure 4. Exploration History of Northern Alaska

Three smaller sized fields have gone into production in the last several years. The Milne Point field (115 MMbbl of recoverable oil) began production in early 1986 from the Kuparuk River Formation (Rift Sequence) and in 1991 from a sandstone in the Brookian Sequence. The Endicott field, the first offshore oil field in the Arctic, came on line in December 1987 with production from the Kekiktuk Formation, which is a member of the Endicott Group (Ellesmerian Sequence). Estimated recoverable reserves in the Endicott field are 505 MMbbl of oil. In late 1993, the Point McIntyre field began producing oil from the Kuparuk River Formation. The field is estimated to contain 360 MMbbl of recoverable oil.

Discoveries made in the last 5 years potentially could be developed in the foreseeable future. BP Exploration (Alaska) Inc. currently is delineating the extent of the Badami field. The oil at Badami is found in Late Cretaceous turbidite reservoirs of Brookian Sequence rocks. Development of other marginally economic fields, such as Seal Island (Sadlerochit Group), Point Thomson (Beaufortian Sequence), Hammerhead (Brookian Sequence), and Kuvlum (Brookian Sequence), depends on future oil prices and environmental constraints.

Plays

The hydrocarbon resources in the Sale 144 area are contained in 14 geologic plays. A play consists of a group of geologically related prospects having similar reservoir rock and trapping mechanisms, and the same hydrocarbon source rock(s) for the prospects in a play should share common structural and/or stratigraphic elements for the possible occurrence of hydrocarbons.

The Undeformed Pre-Mississippian Basement Play (Fig. 5) consists of stratigraphic traps in carbonate or sandstone reservoirs in the pre-Mississippian basement complex. Leaching of carbonate cements in the sandstones and fractures may result in good porosity and permeability development. Potential source rock is the overlying Hue Shale and Canning Formation, which also acts as the seal. No OCS wells have tested this play. There are no fields currently producing from this play.

The Endicott Play (Fig. 5) includes the sandstone reservoirs of the Devonian to Mississippian age Endicott Group. The depositional environment is a regressive and transgressive sequence of swamps, braided streams, flood plain and shallow marine environments. Hydrocarbon traps are formed by anticlines, faulted anticlines, or fault blocks. Two OCS wells had unsuccessful tests in the play. Three OCS wells successfully tested the Tern Island field. The onshore Endicott field produces from this play.

The Lisburne Play (Fig. 6) includes the limestone and dolomite reservoirs of the Mississippian to Pennsylvanian age Lisburne Group, which were deposited as platform carbonates. The structural hydrocarbon traps are anticlines, faulted anticlines, and fault block traps. Potential stratigraphic traps may be associated with porosity pinchouts or paleokarst topography. The source rock is the Shublik Formation or the Pebble Shale Unit. Six OCS wells have tested the play without commercial success. The onshore Lisburne field produces from the play.

The Upper Ellesmerian Play (Fig. 7) includes the sandstone reservoirs of the Triassic age Sag River Formation and Triassic to Permian age Sadlerochit Group (Fig. 2). The depositional environment is marine shelf for the Sag River Formation while the Sadlerochit Group has shallow marine, fluvial, floodplain, alluvial fan, and point-bar sediments. The shaley carbonaceous Shublik Formation may have some porosity, but it usually is considered to be a source rock. The hydrocarbon traps are formed by anticlines, faulted anticlines, faults, or stratigraphic pinchouts. The play has been tested by 13 OCS wells. Three OCS wells discovered and tested two oil fields, Sandpiper and Seal Island. There are three producing fields onshore, including Prudhoe Bay.

The Rift Play (Fig. 8) contains locally derived clastics of the Rift Sequence and Pebble Shale preserved in fault blocks associated with an Early Jurassic to Early Cretaceous rifting event. The reservoirs are marine and fluvial sandstones. The traps can be anticlines, faulted anticlines, fault blocks, unconformity truncations, or stratigraphic terminations of reservoir beds. Potential source rocks may occur in the Shublik Formation, the Kingak Formation (especially in the lower Kingak), the Pebble Shale Formation, and the overlying HRZ (Fig. 2). The play has been tested at two OCS locations with no commercial success. There are several onshore fields in the play, including the South Barrow, East Barrow, and Walakpa gas fields in NPRA, and Kuparuk, Milne Point, Point McIntyre, and Point Thomson fields in the central part of the North Slope.

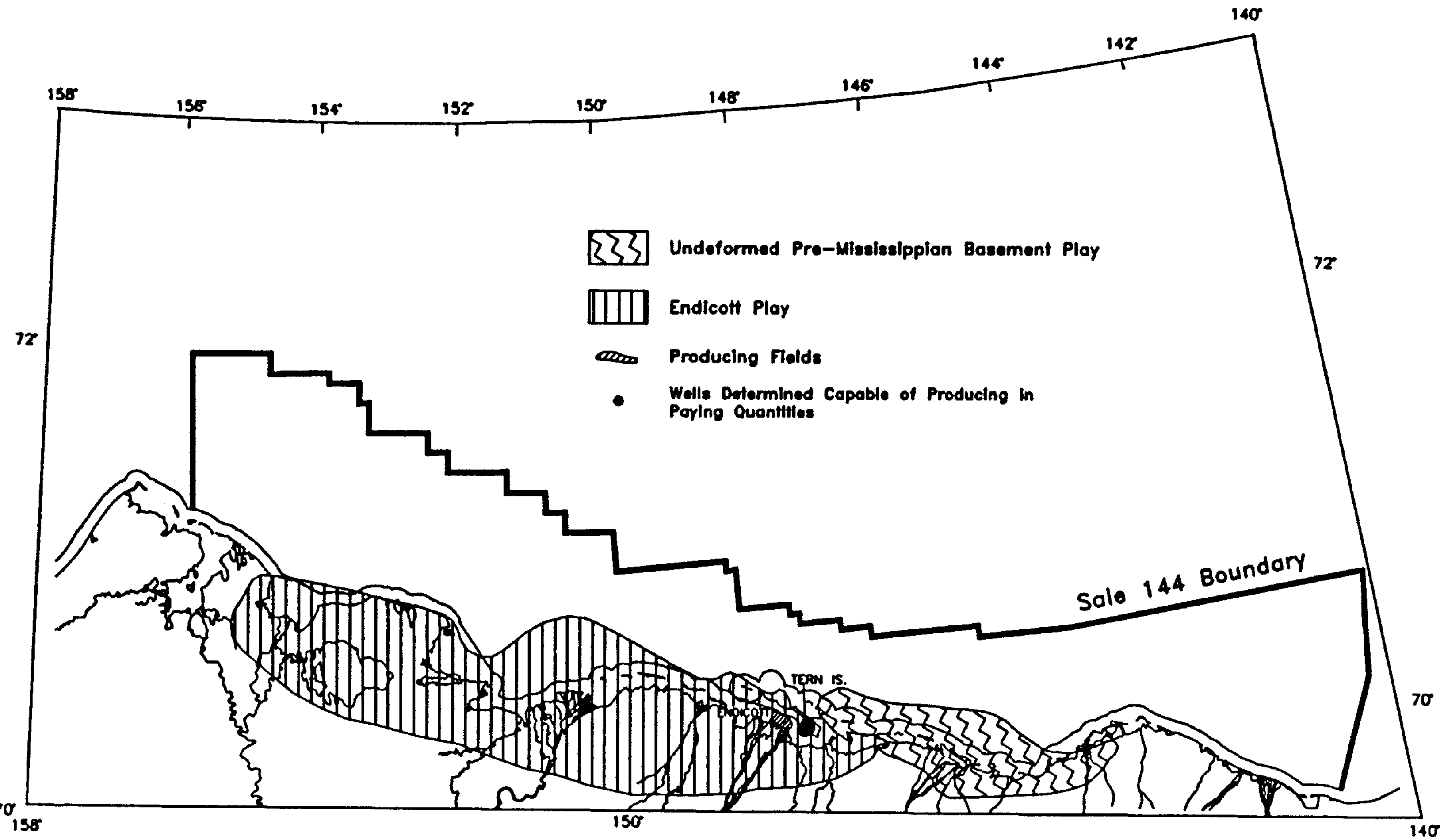

Figure 5. Beaufort Shelf Plays

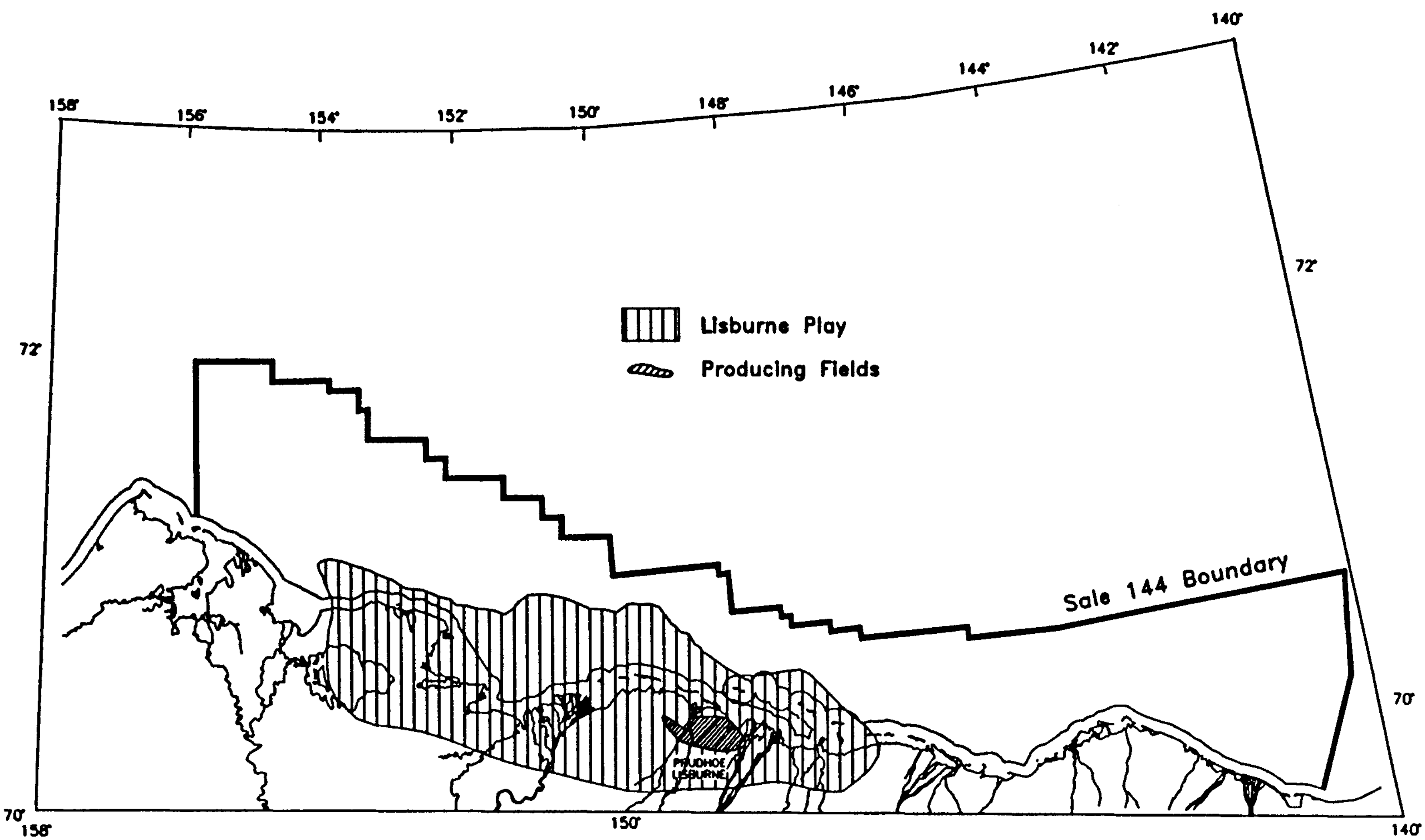

Figure 6. Beaufort Shelf Plays

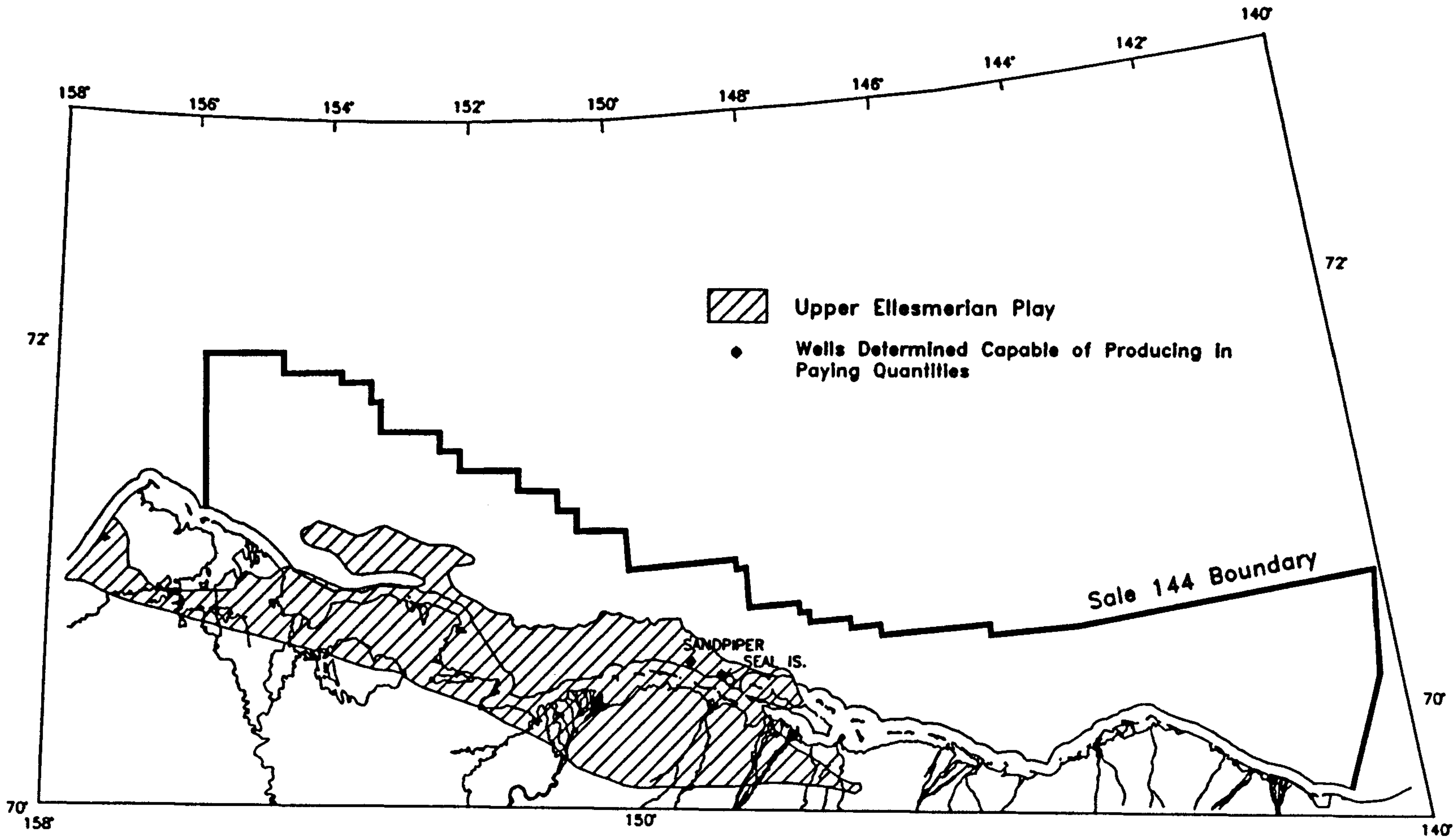

Figure 7. Beaufort Shelf Plays

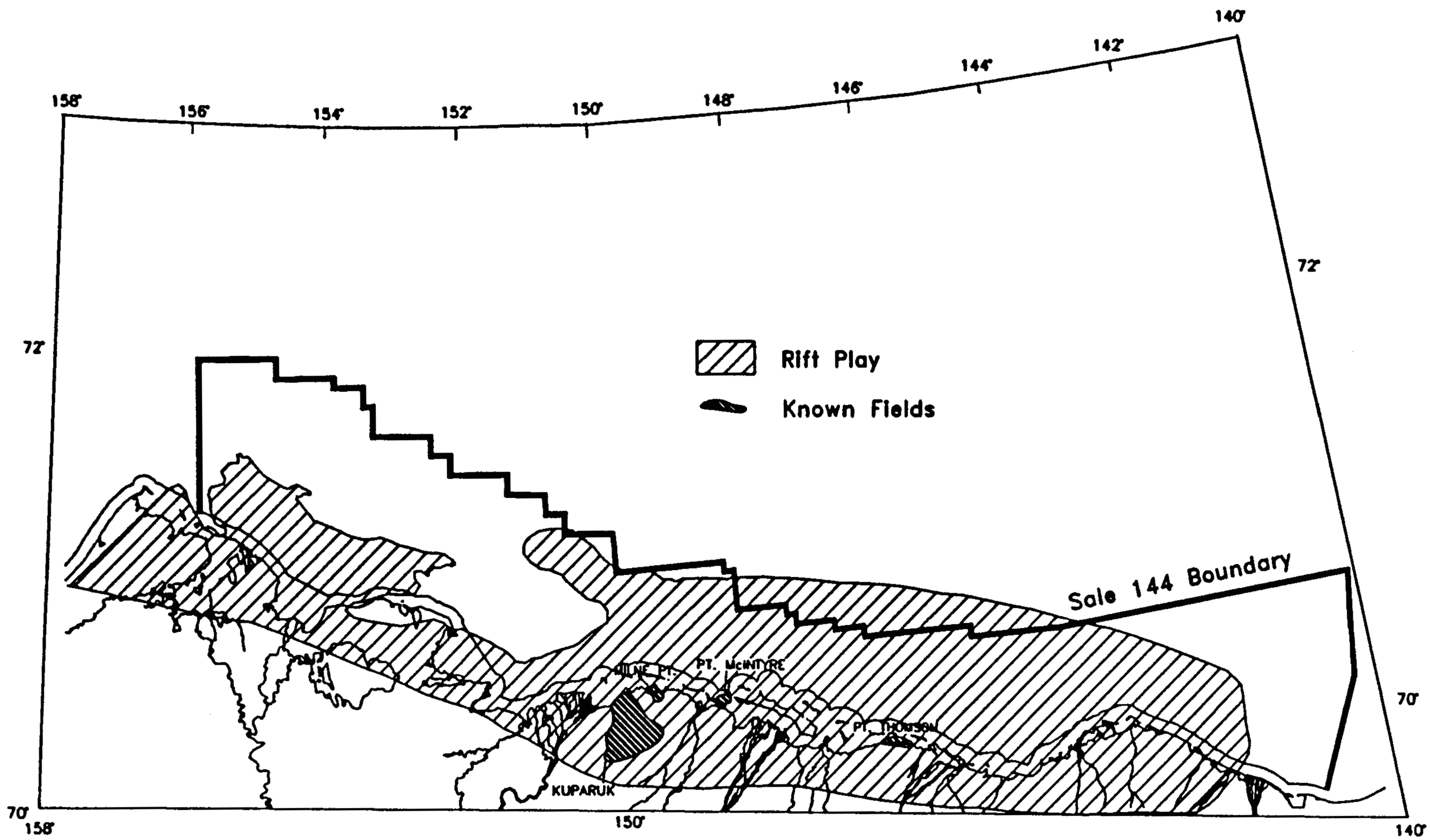

Figure 8. Beaufort Shelf Plays

Brookian Unstructured Western Topset Play (Fig. 9) is located on the unstructured part of the Beaufort shelf south of the hinge line, north of the Barrow Arch, and west of Harrison Bay. The play occurs in the deltaic topset facies of the Brookian Sequence. It consists primarily of the Nanushuk Group. The Nanushuk Group in the play area is likely to be a poor reservoir due to the high clay content of the deltaic sandstones found in other wells in the area. Potential source beds include the Torok Formation, the Pebble Shale, the Kingak shale, and the Shublik Formation. These sources may generate oil and/or gas. Prospects are likely to be primarily stratigraphic traps related to the pinchout of reservoir beds. Prospects in this play have not been tested in the offshore. Oil is present onshore in the Simpson and Fish Creek fields in NPRA, but has not been produced.

The Brookian Faulted Western Topset Play (Fig. 9) is located in the western Beaufort Sea north of the hinge line. It includes Cretaceous deltaic topset facies of the Nanushuk and Colville Group. Reservoir quality is likely to be poor due to the distance from the sediment source and the high clay content. Source rocks are primarily shales of the Torok Formation and Colville Group. These shales are likely to be gas prone. Rotated blocks along listric growth faults provide trapping mechanisms. There are no tested prospects in the play area.

The Brookian Unstructured Western Turbidite Play (Fig. 10) is located on the Beaufort shelf south of the hinge line and west of the Colville River. It includes the Lower Cretaceous prodelta facies rocks of the Torok Formation in the lower part of the Brookian Sequence. Expected reservoirs include turbidite sands deposited in submarine fan environments. Reservoir quality is expected to be poor due to the fine-grained nature of the sands of the deltaic system that delivered sand to the shelf break. The Torok Formation, Pebble Shale, Kingak shale, and Shublik Formation all are potential source rocks for charging reservoirs in this play and include both oil- and gas-prone kerogen. Prospects primarily are stratigraphic traps formed by sand mounds within a shale sequence. Phoenix tested heavy oil in the Torok Formation and Mukluk had several Torok Formation oil shows.

The Brookian Faulted Western Turbidite Play (Fig.10) is located north of the hinge line. It includes Cretaceous prodelta facies of the Torok Formation and lower Colville Group. Expected reservoirs include turbidite sands in submarine fan environments. The reservoir sands are likely to be poor quality due to the fine-grained nature of the sands of the deltaic system that delivered sand to the shelf break. Shales in the Torok Formation and Colville Group provide relatively gas-prone source rocks due to kerogen content and level of thermal maturity due to excessive burial depth. Traps in the play are expected to be primarily stratigraphically controlled. There also is potential for fault traps against listric faults. There have been no tested prospects in the play area.

The Brookian Unstructured Eastern Topset Play (Fig. 11) occurs east of Cape Halkett on the unstructured part of the Beaufort shelf south of the hinge line. It includes Cretaceous deltaic topset facies of the Sagavanirktok Formation and equivalent facies of the Colville Group. Excellent reservoir quality sands occur within the Sagavanirktok Formation in most coastal wells and the sand/shale ratio is expected to increase to the east due to proximity to the Brooks Range sediment source. The Canning Formation, Pebble Shale, Hue Shale, lower Kingak shale, and the Shublik Formation are potentially excellent oil and gas source rocks and underlie the play sequence across most of the play area. The play sequence is sparsely faulted. Most of the prospects are expected to be stratigraphic traps or small offset fault traps. Seals are likely to be a risk factor for many of the prospects because of the coarse-grained nature of the play sequence. Oil was discovered offshore at Hammerhead prospect and onshore at West Sak and Ugnu. In Harrison Bay, the Phoenix well tested oil in the Colville Group.

The Brookian Faulted Eastern Topset Play (Fig. 11) is located north of the hinge line in the central part of the Beaufort Shelf. It includes the Cretaceous and Tertiary deltaic topset facies of the Sagavanirktok Formation and the Colville Group. The Sagavanirktok Formation sandstones offer excellent reservoir characteristics. Potential source rocks are organic-rich marine shales within the Canning Formation that reach thermal maturity north of the hinge line in the Nuwuk and Kaktovik basins. There also is potential for Rift Sequence source rocks derived from the Dinkum Graben. These source rocks are buried below the base of the oil-generation window and would produce gas. Prospects in the play are likely to be fault traps along down-to-the-north listric growth faults. Seals generally are poor due to the high sand content of the Sagavanirktok Formation. One OCS well, Galahad, was drilled in the play area and encountered a gas sand. Frothy brown oil was also collected from that interval.

The Brookian Unstructured Eastern Turbidite Play (Fig. 12) occurs on the unstructured part of the Beaufort shelf south of the hinge line and east of the Colville River. It includes Late Cretaceous and Tertiary prodelta shales and turbidites of the Canning Formation. Reservoirs include turbidite sands in submarine fan environments enclosed in

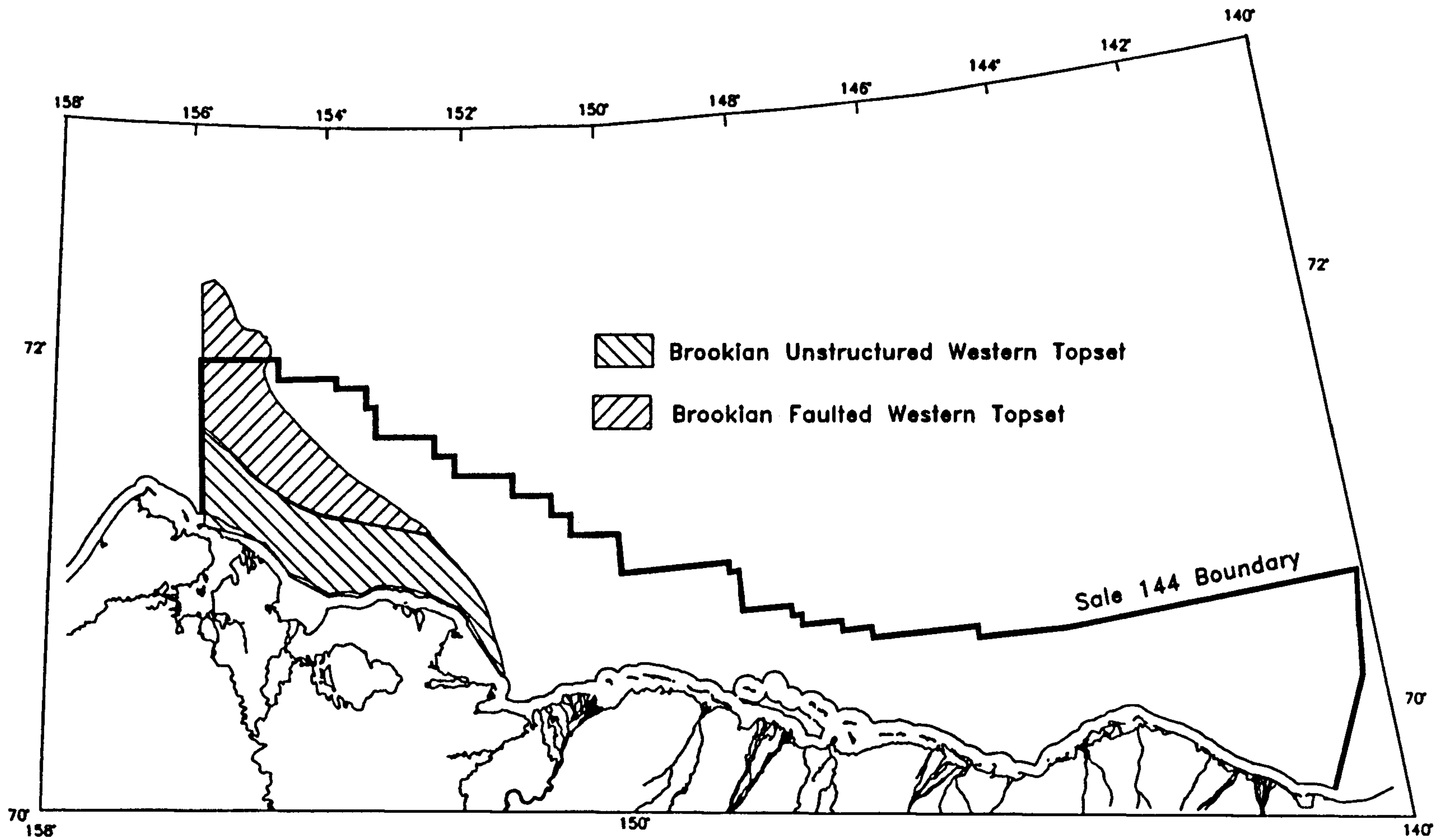

Figure 9. Beaufort Shelf Plays

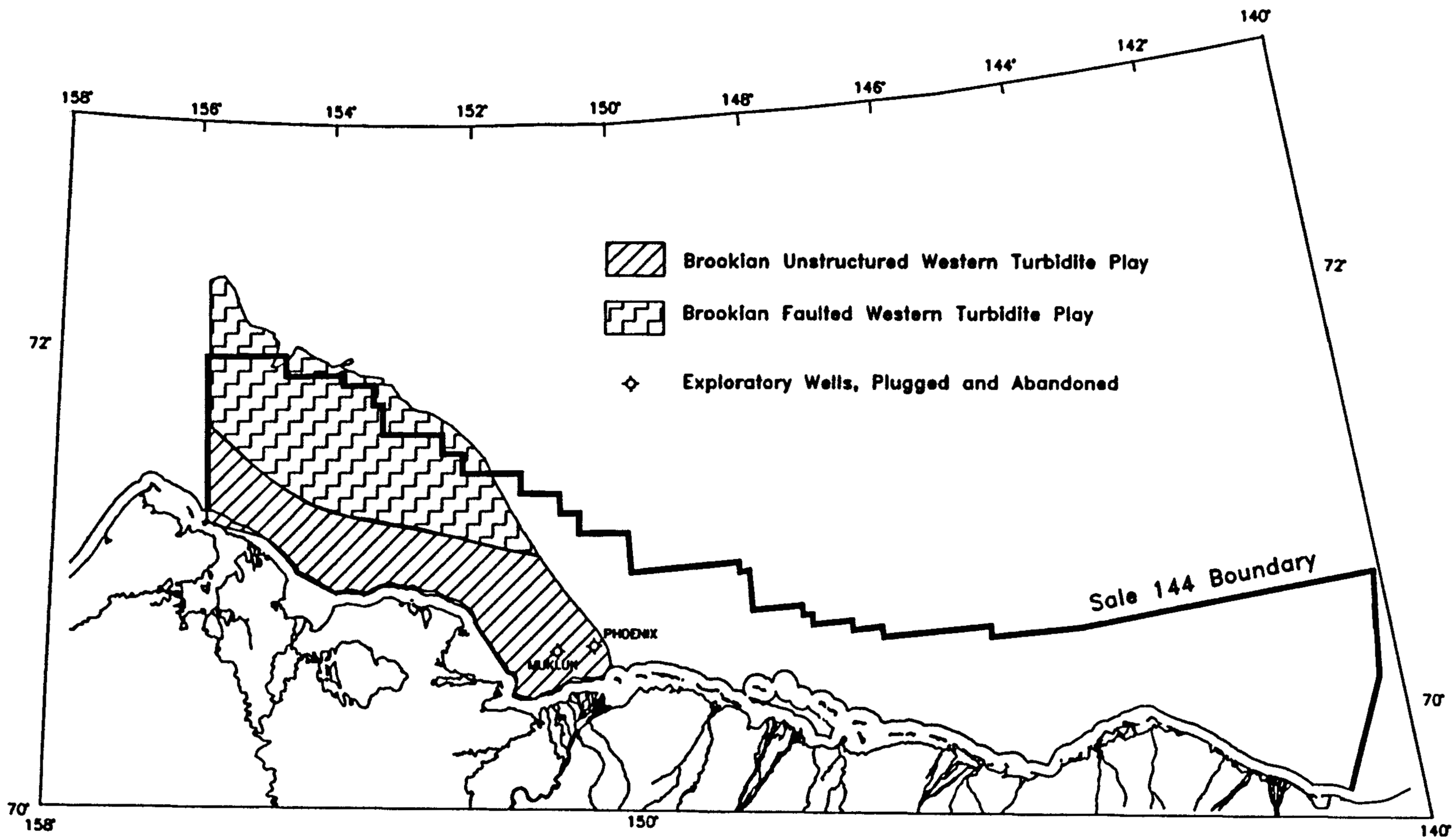

Figure 10. Beaufort Shelf Plays

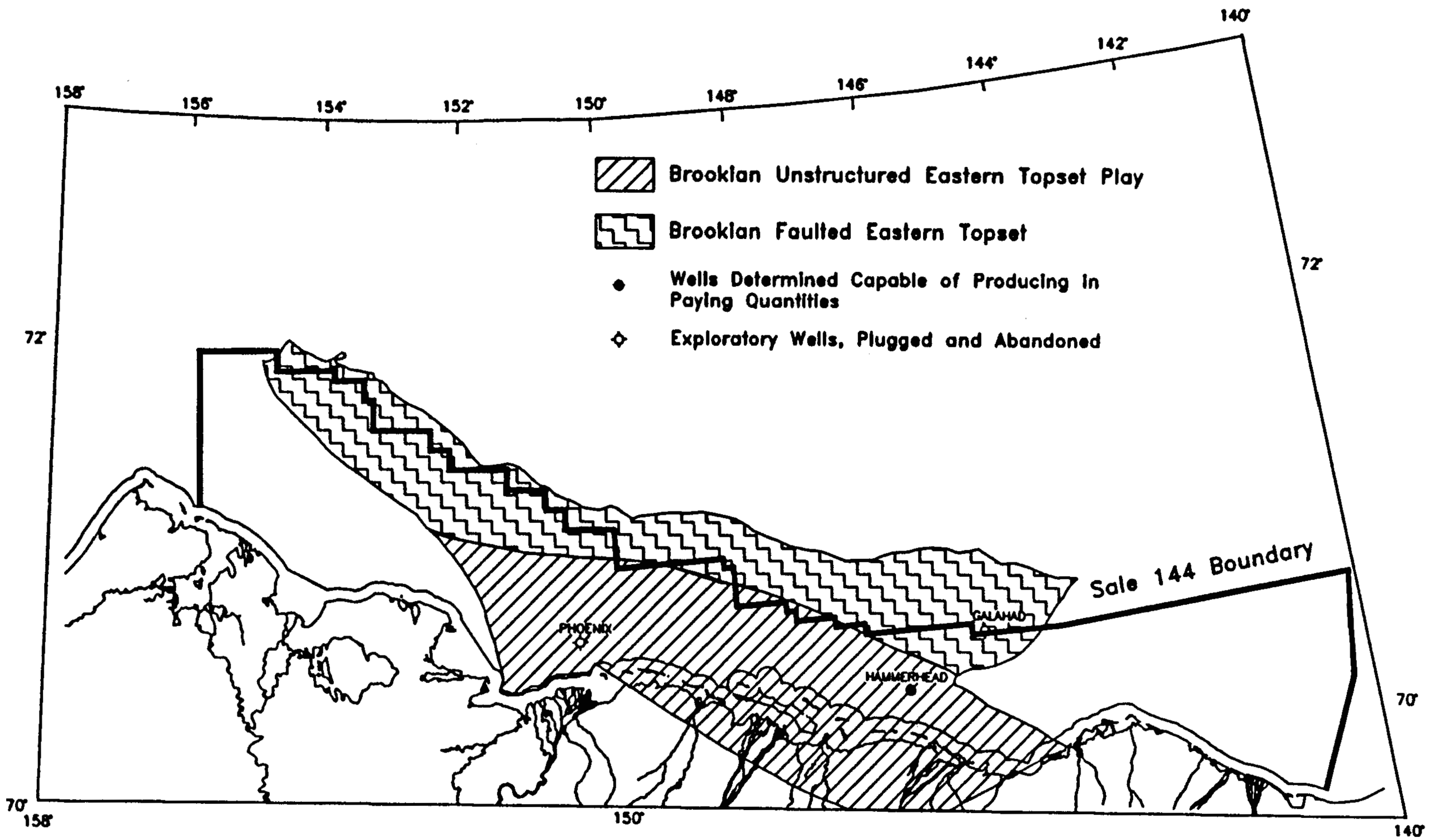

Figure 11. Beaufort Shelf Plays

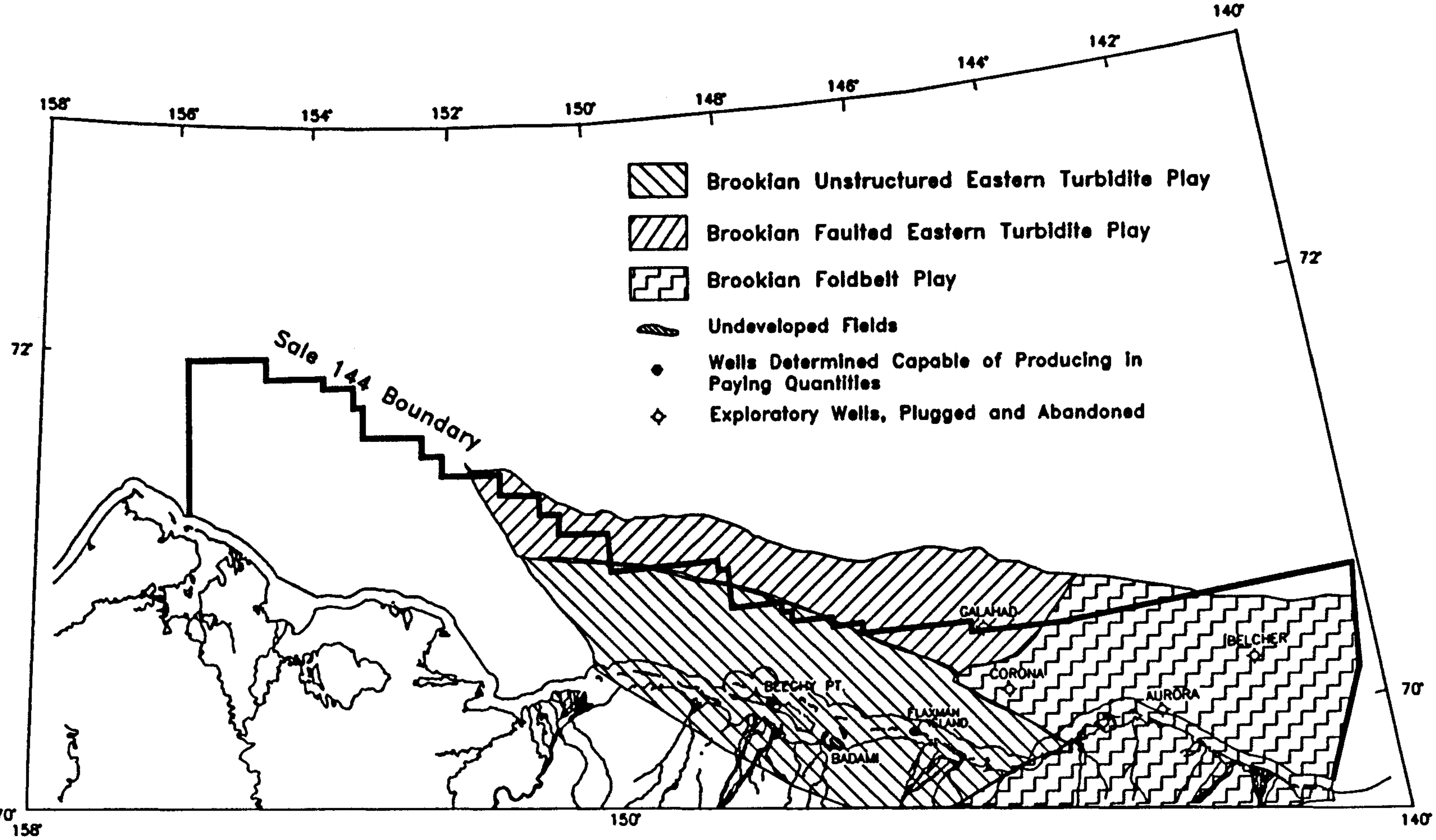

Figure 12. Beaufort Shelf Plays

prodelta shales. Source rocks include relatively gas-prone shales of the Canning Formation and rich, oil-prone rocks of the Hue Shale and Pebble Shale. The base of the play sequence is in direct contact with these source beds. Stratigraphic traps predominate, although small-scale fault traps also occur. Marine shales provide a good seal for trapping hydrocarbons. The OCS Y-191 well, Beechy Pt. No. 2, drilled in Steffanson Sound, flowed oil and gas out of the Canning Formation. Onshore, oil has been tested at rates up to 3,510 barrels per day (BPD) in turbidite sands of the Canning Formation in the Badami field and at Flaxman Island.

The Brookian Faulted Eastern Turbidite Play (Fig. 12) is located north of the hinge line. It includes the Late Cretaceous and Tertiary prodelta shales and turbidites of the Canning Formation. Reservoirs include turbidite sands in a submarine fan environment. The primary source rocks are expected to be gas-prone shales of the Canning Formation. There also is potential for Rift Sequence source rocks beneath the play area; however, these rocks are likely to be buried to below the base of the oil window and most likely only produce gas. Prospects in the play are both stratigraphic traps related to sand mounds within the marine shale sequences and fault traps against hinge-line listric growth faults. No wells have tested the play.

The Brookian Foldbelt Play (Fig. 12) includes Cretaceous and Tertiary Sagavanirktok Formation and Canning Formation topset and prodelta sequences complexly structured by Brooks Range folding and coeval hinge- line faulting. The play area extends from the northern limits of the province boundary offshore to the Brooks Range front onshore. Major structural features included in the play are the Herschel High, the Demarcation Subbasin, the Camden and Marsh Creek anticlines, and adjacent basins. Both shallow marine and prodelta sequences are expected in the play area. Reservoir rock quality has been poor in the OCS wells (Belcher, Corona). However, in adjacent areas of Canada, good-quality reservoir rocks have been found. The Hue Shale and Canning Formation could provide good source potential in the play area. Wells testing the play have encountered gas-prone kerogen. Due to the complex structuring of the play, fault traps, anticlinal traps, and faulted anticlines are expected trap types. Stratigraphic traps in syn- and posttectonic basin fill also are likely. Late-stage structuring may have destroyed earlier formed seals and traps. Three OCS wells unsuccessfully tested the play. Belcher was drilled on an anticline on the Herschel High and encountered no sandstones or hydrocarbon shows. Corona was drilled on the flanks of Camden anticline and encountered only sparse, thin sandstones with no hydrocarbon shows. Aurora was drilled on a large basement high adjacent to the Arctic National Wildlife Refuge and encountered mostly Brookian shales and no hydrocarbon shows.

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OIL AND GAS RESOURCE ESTIMATES

Estimates of undiscovered oil and gas resources provide the basis for identifying high-potential offshore areas for lease offerings and for the assessment of possible environmental effects associated with postsale activities. Resource estimates are used in a number of public and internal planning documents generated by the MMS prior to an OCS lease sale. The EIS is one of the principal documents prepared for an OCS sale proposal and discusses potential effects related to industry activities that could occur up to decades after a particular lease sale. The numerous and diverse effects assessments discussed in the EIS are based largely on the amount of hydrocarbons expected to be discovered and produced as a result of the OCS sale. An estimation of future activity is made by MMS Resource Evaluation (RE) staff from their analyses of geologic, engineering, and economic characteristics of each sale area.

Resource Evaluation in MMS is responsible for estimating two general categories of undiscovered hydrocarbon resources for each sale proposal. The first category, referred to as the resource endowment, includes all oil and gas accumulations in the geologic province that are recoverable by current technology, irrespective of economic considerations. The endowment can include proven reserves in fields currently in production as well as very small hydrocarbon pools that are unlikely ever to be produced profitably. The second category, referred to as the economically recoverable resource potential, includes that portion of the endowment that could be recovered profitably, considering the various engineering and economic aspects of field development and prices for the commodity. The undiscovered resource potential that may exist beneath unleased tracts in the sale proposal and deferral areas is estimated as a proportion of the geologic province estimates. This sale-specific resource estimate (undiscovered, unleased, economically recoverable potential) is used to assess the potential environmental effects associated with future activities that may occur as a result of the sale proposal or alternatives.

Estimating the undiscovered oil and gas resources remaining to be leased and developed in an OCS area is a difficult task because of the uncertainties inherent in the process. The actual existence and size of hydrocarbon accumulations cannot be known with certainty prior to exploratory drilling. The only information concerning the possible size, number, and location of hydrocarbon accumulations is derived from geophysical data that are interpreted to reveal structural anomalies that could form hydrocarbon traps. The presence and characteristics of potential reservoirs, hydrocarbon source rocks, and seals associated with these potential traps is inferred from the analysis of geophysical logs from nearby wells or by more speculative comparisons to similar geologic basins. In a frontier basin with limited prior exploratory drilling, the field sizes and distribution of hydrocarbon resources, or whether recoverable hydrocarbons are present in the basin at all, may not be known. Obviously, an exact prediction of resource volumes under such circumstances is impossible because uncertainties in the geologic data translate directly into uncertainties in the resource estimates produced by computer models. To reflect the uncertainties inherent in the methodology, resource estimates usually are presented as a range of volumes with corresponding probabilities.

To estimate the resource endowment, a computer program (PRASS1) was used to assess the geologic "plays" present in the province. A geologic play is a group of related "prospects" with similar hydrocarbon source, reservoir, and trapping characteristics. Prospects are untested geologic features having the potential for trapping and accumulating oil and gas. The technique of geologic play assessment allows specific information about the geology of an area (such as the ranges of field size and number) to be converted to resource estimates at various probability levels. For the Beaufort Sea province, the resource endowment was assessed in 15 geologic plays, five of which are present in the Barter Island Deferral area. Ignoring economic feasibility, the mean undiscovered resource endowment for the Sale 144 proposal area is estimated to be 3.45 Bbbl of oil and 22 Tcf of gas.

To determine the proportion of the undiscovered resource endowment that could be economically recovered (that is, produced at a profit), the geologic plays were assessed using an economic computer model (PRESTO-4). This computer program uses the types of reservoir engineering data normally employed by the oil industry and infrastructure cost data developed internally by RE to determine the economically recoverable resource volumes at various price levels.

The results of the economic evaluation are summarized on a price-supply graph (Fig. 13) that relates the volumes of resources (horizontal axis) to oil prices (vertical axis). Despite the presentation format, oil price is considered to be the independent variable and resource volume is the dependent variable. Because different price assumptions are used for each of the multiple computer runs, the output of PRESTO-4 has different marginal probabilities for the

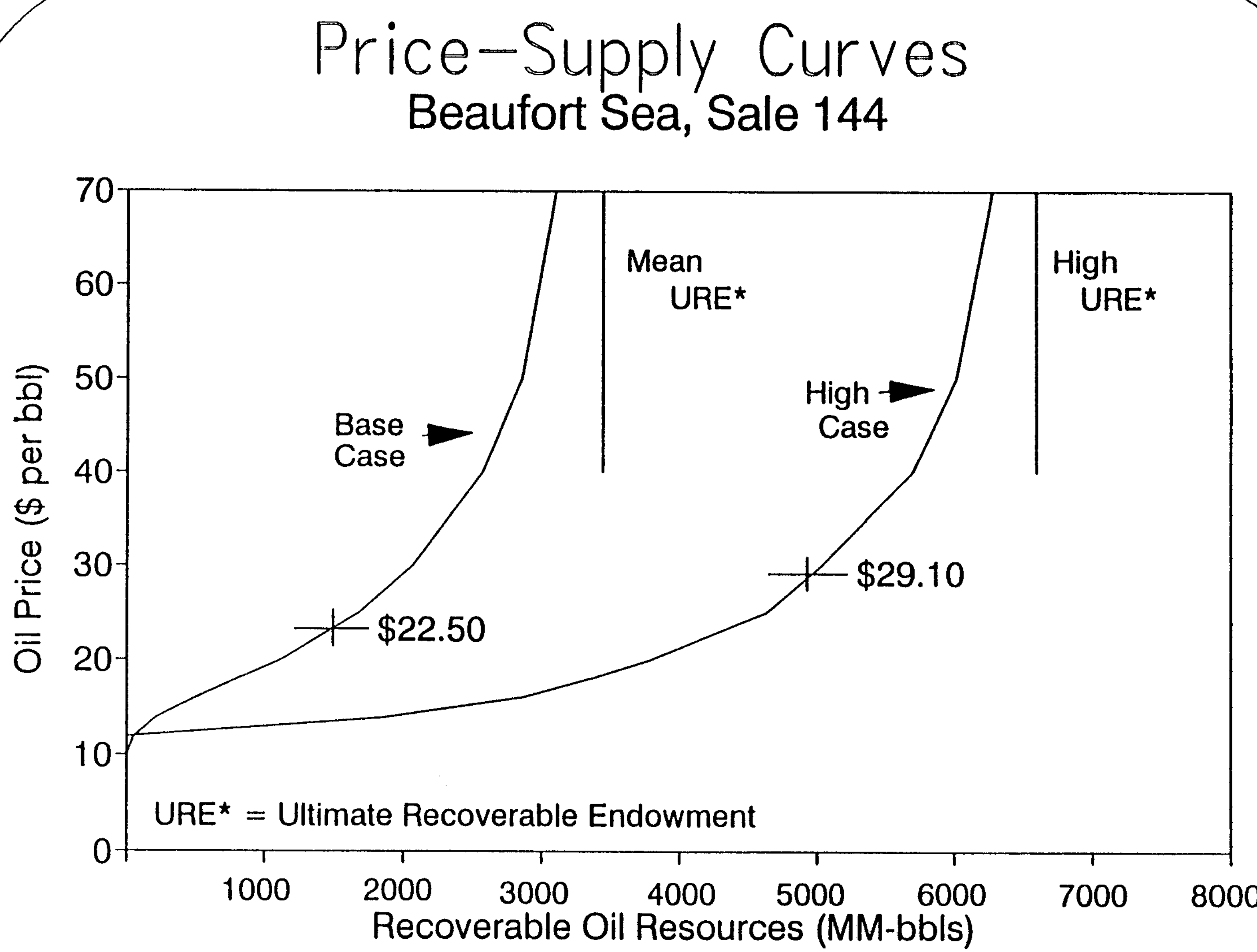

Figure 13. Price-Supply Curves for Economically Recoverable Resources.

economically recoverable resources at each price. To display the results on a single figure, the mean recoverable resource estimates are adjusted to account for the geologic favorability (chance of hydrocarbon resources existing in the area) and the economic viability (probability that these resources can be produced at a profit). The chance of geologic favorability is considered to be 100 percent for the Beaufort Sea province, because oil and gas have been identified by previous drilling in most of the plays. The probability of economic production decreases, as expected, with decreasing oil prices. For example, at a $30-per-barrel oil price, the marginal probability that economically recoverable resources are present in the Sale 144 area is 97 percent. The marginal probability that commercial-sized fields exist in the area drops to 32 percent at an oil price of $16 per barrel.

In addition to the uncertainty in resource estimation caused by geologic conditions, it is important to emphasize that the volume of hydrocarbons ultimately recovered from an area is influenced by uncertain economic factors, such as price expectations, exploration efforts, technological advancements, and corporate strategies. For example, the discovery of a new, highly prospective reservoir in the first exploration wells following the lease sale coupled with higher forecast prices for oil could spark industry interest in exploring an area. Increased exploration could, in turn, result in more discoveries and eventually the production of greater proportions of the undiscovered resource endowment. Of course, a contrary set of circumstances, such as a series of dry exploration tests and low oil prices, could force industry to abandon the area before any significant discoveries are made. In this case, commercial production would not occur despite the high remaining resource potential.

In view of these factors, it is difficult to predict the level of industry interest (bidding) at a future lease sale or the volume of hydrocarbon resources ultimately produced as a result of the sale. The PRESTO computer model provides information on the hydrocarbon resources expected to be present in a particular area as well as the infrastructure needed to produce them; however, it does not predict when the resources will be leased. If the resources are concentrated in a few large and easily identified pools that are close to existing transportation infrastructure, they are apt to be leased and tested early in a leasing program. On the other hand, if the resources are spread over a large number of pools, or are present in subtle traps, it is less likely that they would be leased in the early stages of exploration. Neither of these situations changes the amount of resources estimated to be present in an area, but each set of circumstances will strongly influence the schedule of leasing, exploration, and development of these resources.

Figure 13 displays two price-supply curves. The left curve shows the average (mean) undiscovered resource potential, and the right curve shows the high-side resource potential (5% probability). The undiscovered oil endowment is represented by two vertical bars, one for the mean case and one for the high case. As oil prices increase, the volumes of economically recoverable oil resources increase correspondingly and approach the ultimate recoverable endowment (URE). Thus, the URE represents the undiscovered unleased oil potential in the sale area that could be recovered using current technology and where oil prices are high enough to offset any development costs. In the Beaufort Sea province, there are discovered resources that are noncommercial at the present time, in addition to potential resources that lie beneath active leases. These components of the total resource endowment were subtracted to determine the URE in the Sale 144 area.

To define the activities and possible environmental effects of the proposed sale, representative undiscovered economically recoverable resource volumes must be determined. As in previous environmental assessment documents, three general scenarios corresponding to different economically recoverable resource levels are selected. The base case represents the most likely volume of resources leased, discovered, and produced as a result of the OCS sale. The high case represents an optimistic scenario of future production that is generally accompanied by more environmental effects. The low case is assumed to include only exploration activities with no development or future production. The low case does allow for the possibility that oil or gas discoveries will be made, but assumes that the field size and location will preclude commercial development.

As previously discussed, the volumes of oil and gas recovered profitably are highly dependent on the prices received for these commodities. In previous lease sales, MMS has defined oil and gas prices by means of stipulated price scenarios. The stipulated price scenario consists of a starting price (market price at the time of the sale or immediately thereafter), a discount rate, an inflation rate, and an annual real price change. Together, these parameters describe the pattern of expected future prices (price path). It generally is assumed that the real prices either remain constant or increase but do not decrease over time. Stipulated price scenarios are considered to be appropriate in petroleum provinces where all profitable fields are produced nearly simultaneously. However, for provinces with high resource potential and more numerous fields, such as the Beaufort province, the assumption of nearly simultaneous production does not accurately model production that may be staggered over a number of years.

For Sale 144, a new concept was developed to simplify the stipulated price scenario and to accommodate the effects changes in future oil prices during the staggered production of multiple fields in a province. This approach employs an "equivalent oil price." The equivalent oil price is the single real price that would generate the same present value of gross receipts from the production stream as would be calculated using the stipulated price scenario. In other words, this one price value incorporates both the changes in the oil- production stream and the corresponding yearly changes of variables in the stipulated price scenario. Two stipulated price scenarios were used to calculate the equivalent oil prices representative of the base-case- and high-case-resource levels. For the base case, an equivalent oil price of $22.50 per barrel was computed using a starting price of $18.00 per barrel, a discount rate of 7 percent, an inflation rate of 3 percent, an annual real price growth of 2 percent, and the production stream generated by the PRESTO computer program. For the high case, an equivalent oil price of $29.10 per barrel was computed using a starting price of $21.00 per barrel, a discount rate of 7 percent, an inflation rate of 3 percent, an annual real price growth of 3 percent, and the production stream representing the resources recoverable at the higher price. No equivalent oil price was generated for the low case, because the low case is assumed to include only exploration activities and no future production.

The estimates of recoverable resource potential for the base and high cases are defined by percentiles in resource-probability distributions corresponding to the equivalent prices discussed above. For the base case environmental analyses, we have defined a range of economically recoverable resources between the 75th and 25th percentiles, corresponding resource volumes ranging from 300 to 2,100 MMbbl (Fig. 14). These resource estimates have been rounded to avoid the appearance of high precision in our analysis. This graph indicates that there is an 81.6-percent chance that oil resources can be economically recovered from the Sale 144 area with an equivalent oil price of $22.50 per barrel. There is a 75-percent chance that at least 300 MMbbl can be recovered profitably. Similar relationships between probability and recoverable-resource volumes can be determined using these graphs (Figs. 14, 15). For the high-case-environmental analyses, we have defined a range of economically recoverable resources between the 25th and 5th percentiles, corresponding to a resource range (rounded) of 2,800 to 5,000 MMbbl (Fig. 15). A simple midpoint of the base-case and high-case ranges can be used for generalized environmental analyses. These "single point" resource volumes are 1,200 MMbbl for the base case and 3,900 MMbbl for the high case. For the low case, discoveries could range up to approximately 130 MMbbl; however, offshore fields of this size are not expected to be produced profitably under current oil-price assumptions.

As discussed in the following section, natural gas resources are not expected to be developed as a result of Sale 144, because there is no transportation system to deliver natural gas from Arctic Alaska to southern markets. At the present time, the low market price for natural gas will not support the high costs of the gas- production and -pipeline infrastructure. Even if there were such a gas-pipeline system from the North Slope, there are sufficient proven natural gas reserves within developed field areas to supply the future pipeline for several decades before excess capacity forced the need to explore for and develop new gas fields in the OCS.

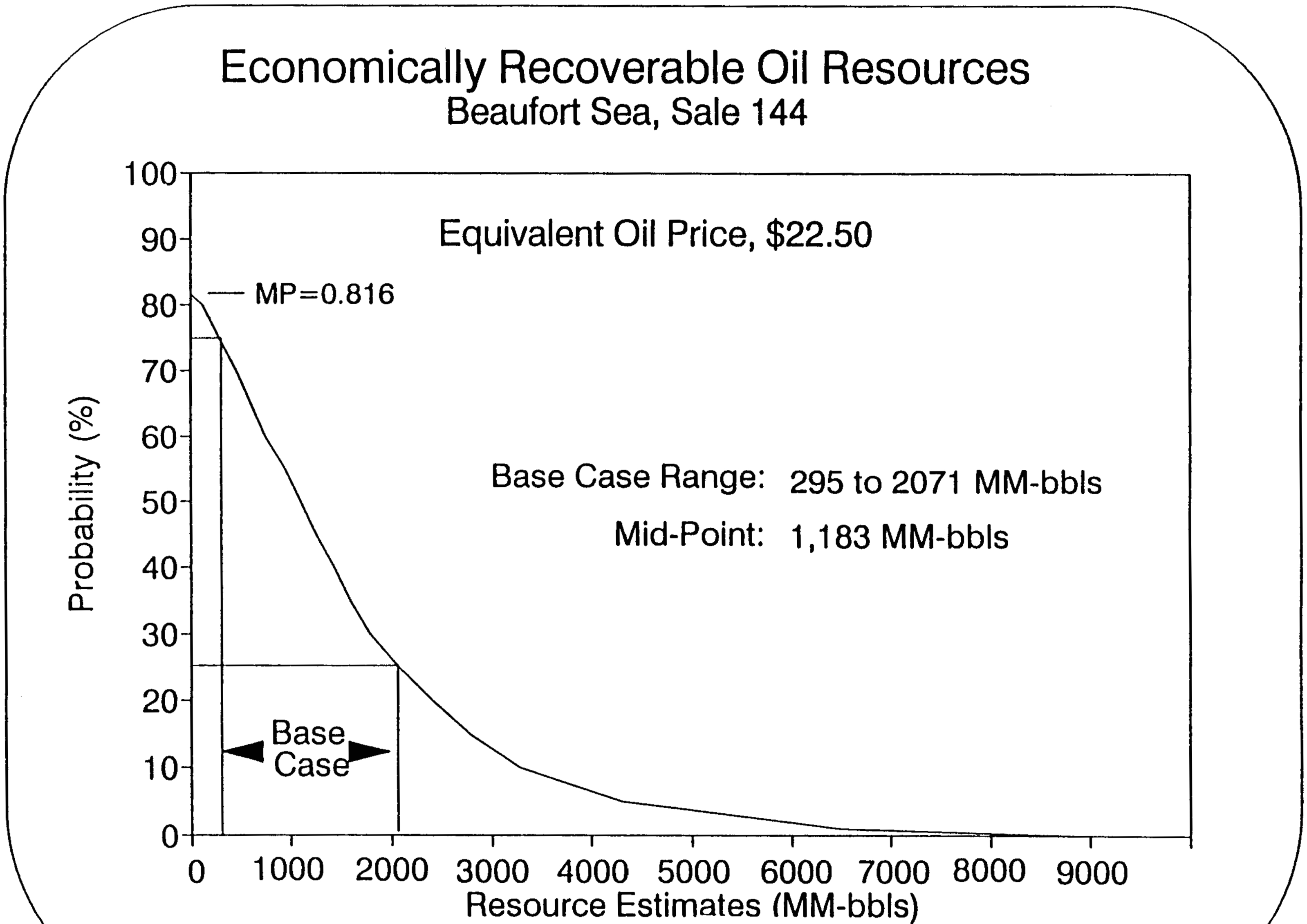

Figure 14. Economically Recoverable Resources for the Base Case.

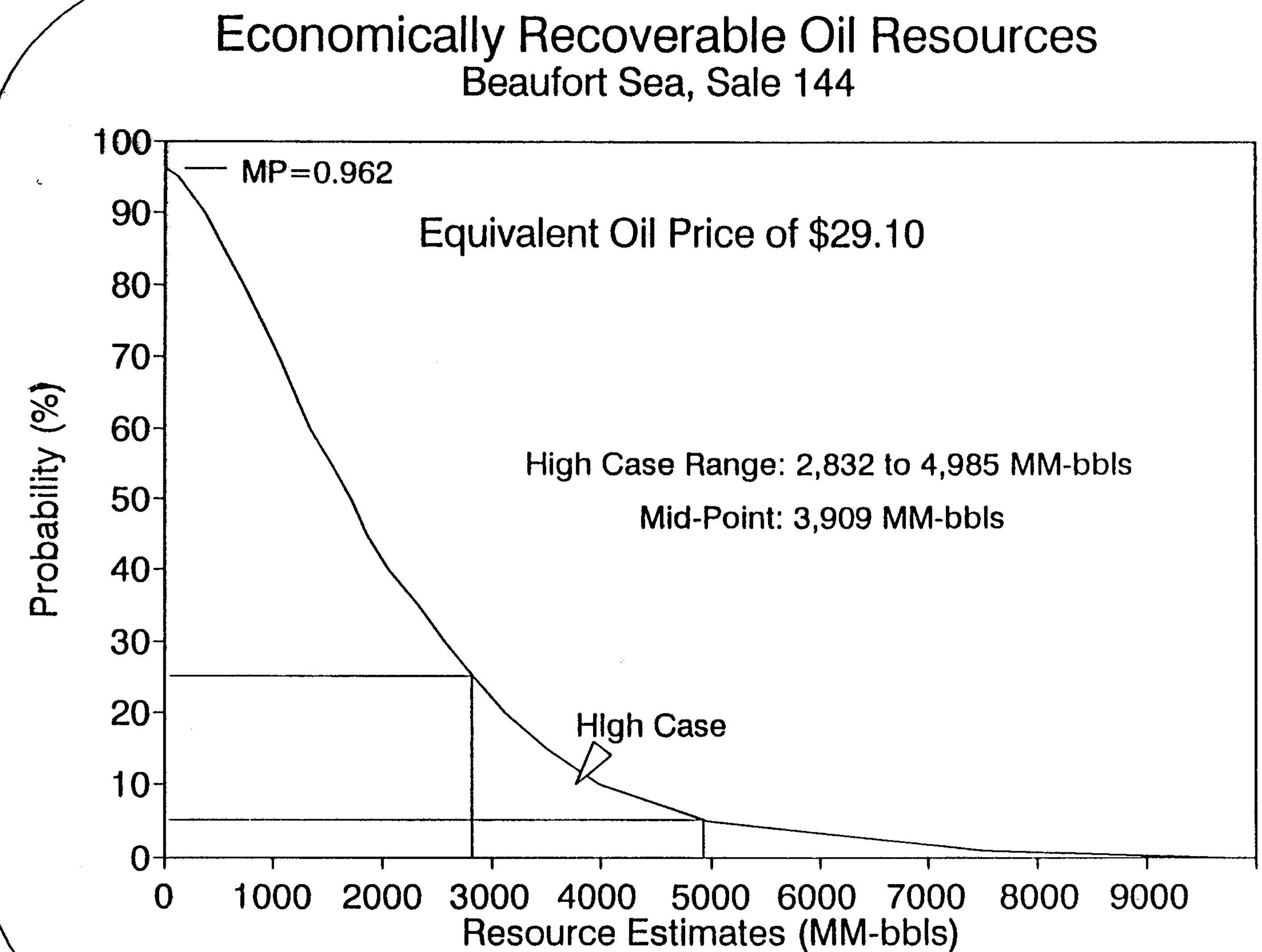

Figure 15. Economically Recoverable Resources for the High Case.

EXPLORATION AND DEVELOPMENT REPORT
Beaufort Sea/Sale 144

Scenarios

Five Exploration and Development (E&D) schedules for the estimated activities resulting from Sale 144 are provided as Tables A-1 through A-5. The first three schedules show the activities associated with ranged resource levels for the low case, base case, and high case. The low case includes only exploration activities (no production). Oil discoveries for the low case could range up to 130 MMbbl; however, economic analyses indicate that resources of this size cannot be produced at a profit and therefore will not be developed in the Federal OCS. The base-case scenario for an equivalent oil price of $22.50 per barrel estimates the infrastructure required for cumulative oil production ranging from 300 to 2,100 MMbbl. The high-case scenario for an equivalent oil price of $29.10 per barrel estimates the infrastructure to support oil production of 2,800 to 5,000 MMbbl from the Sale 144 area. For purposes of environmental analysis, a midpoint in these resource ranges can be used to provide a generalized model of future exploration, development, and production activities. The infrastructure models for the generalized, midpoint base case and high case are given in Table A-4 and Table A-5. There is no change for the generalized low case from Table A-1. The E&D activity schedules assume no litigation or regulatory delays as well as a favorable price for liquid hydrocarbons.

Exploration Activities

Exploration drilling is assumed to begin in the year following Sale 144, currently scheduled for 1997, and continue at a rate of 1 or 2 exploration wells per year. Because of the short open-water drilling season in the Beaufort Sea, it is likely that only one exploration well will be drilled at each site by one drilling rig in a year. In the event of a discovery, however, delineation wells may be drilled by the same exploration rig immediately after a discovery well is abandoned. In this case, two wells may be drilled from one rig in a single season, because rig mobilization has already occurred. It is possible that more than one operator will attempt to drill leased prospects in a given year, and as many as four exploration rigs may be operating simultaneously in the sale area (high case). Artificial ice islands are likely to be employed as drilling platforms for shallow-water areas nearshore, and these operations will be supported by ice roads. Bottom-founded platforms of various designs are most likely to be used to drill prospects further offshore in water depths of 35 to 80 feet (ft) and, because of mobile ice conditions, these operations will be supported by supply boats during the open-water season. For water depths greater than 80 ft, floating drilling rigs (drillships or floating concrete platforms) will be employed to drill exploration wells in open-water and broken-ice conditions, and these operations will be supported by icebreakers. It is unlikely that gravel islands will be constructed solely for exploration drilling in Federal waters.

Development Activities

The development schedules (Table A-2 to Table A-5) were designed around the optimistic assumption that economically viable discoveries will be made in the early stages of exploration after Sale 144. Production platforms could be installed in years 3 to 5 following the discovery well, and most fields will be developed by more than one production platform installed at a rate of one platform per year. Each platform probably will employ two rigs to maximize development drilling and shorten startup times. One of these rigs will remain on each platform for remedial workovers. Gravel islands probably will be constructed for production facilities in water depths less than approximately 35 ft. Production platforms in water depths between 35 and 125 ft are likely to be bottom-founded structures designed for extreme ice conditions and set on prepared seafloor berms. Floating concrete structures anchored to the seafloor and attached to satellite subsea completions may represent the most feasible design for production facilities in water depths deeper than approximately 125 ft.

The installation of offshore pipelines between production platforms and onshore facilities will take 1 to 2 years, considering that route surveys, trenching, and pipeline laying will take place in the relatively short open-water season. New onshore pipeline sections will take 2 to 3 years to complete, with construction activities taking place simultaneously with the offshore pipeline activities. Offshore, we assume that pipelines will be trenched as a protective measure against damage by ice keels in water depths less than 150 ft (45 m). At the landfalls, pipelines will be elevated on linear gravel structures, of 90 m (100 yd) or less to protect them against shoreline-erosion

Table A-1
Exploration and Development Schedule
Beaufort Sea Sale 144, Low Case for the Sale Area Proposal

Year	Exploration Wells	Delineation Wells	Exploration/ Delineation Rigs	Production Platforms	Production/ Service Wells	Production Rigs	Number of Shorebases	Production MMbbl	Pipeline Miles
1997	Lease Sale								
1998	1		1						
1999	1	1	1						
2000		1	1						
2001	1		1						
2002	1		1						
Total	4	2	1[1]	0	0	0	0[2]	0[3]	0

[1]Maximum exploration/delineation or production drilling rigs operating in any single year.

[2]Assumes exploration operations, utilize existing facilities.

[3]Discovered oil volume below threshhold for economic viability (approx. 130 MMbbls).

Table A-2
Exploration and Development Schedule
Beaufort Sea Sale 144 Ranged Base Case for the Sale Area Proposal

	Exploration Wells		Delineation Wells		Exploration/ Delineation Rigs		Production Platforms		Production/ Service Wells		Production Rigs		Number of Shorebases		Production MMbbl		Pipeline Miles	
MMbbl	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100
1997	Lease Sale																			
1998	1	1	1	1	1	1														
1999	1	2	1	2	1	2														
2000	1	2		2	1	2														
2001	1	2		4	1	3														
2002		2		4		3	1	1	6	6	1	1		0.2						
2003		2		4		3	1	2	12	24	3	4		0.2			20			
2004				4		2		3	24	54	4	9		0.3	18			70		
2005								2	10	84	3	12		0.3	25	55		95		
2006								2	4	96	2	12			25	100		60		
2007								1		90	1	9			25	133				
2008										42		6			25	167				
2009												5			25	176				
2010															22	176				

MMbbl	Exploration Wells		Delineation Wells		Exploration/ Delineation Rigs		Production Platforms		Production/ Service Wells		Production Rigs		Number of Shorebases		Production MMbbl		Pipeline Miles	
	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100
2011															19	167		
2012															17	155		
2013															15	141		
2014															13	124		
2015															11	109		
2016															10	94		
2017															9	84		
2018															8	74		
2019															7	65		
2020															6	57		
2021															5	50		
2022															5	43		
2023															4	39		
2024															3	34		
2025																28		
2026																15		

	Exploration Wells		Delineation Wells		Exploration/ Delineation Rigs		Production Platforms		Production/ Service Wells		Production Rigs		Number of Shorebases		Production MMbbl		Pipeline Miles	
MMbbl	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100	300	2100
Total	4	11	2	21	1[1]	3[1]	2	11	54	396	4[1]	12[1]	1.0		300	2100	20	225

[1]oration/delineation or production drilling rigs operating in any single year.

Table A-3
Exploration and Development Schedule
Beaufort Sea Sale 144 Ranged High Case for the Sale Area Proposal

	Exploration Wells		Delineation Wells		Exploration/ Delineation Rigs		Production Platforms		Production/ Service Wells		Production Rigs		Number of Shorebases		Production MMbbl		Pipeline Miles	
MMbbl	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000
1997	Lease Sale																			
1998	1	2	1	1	1	2														
1999	2	2	2	5	2	3														
2000	1	2	5	6	3	4														
2001	2	2	4	6	3	4														
2002	2	2	4	6	3	4	1	1	6	6	1	1								
2003	1	2	5	6	3	4	2	2	26	24	4	4	0.4	0.2						
2004	1	2	5	6	3	4	3	3	72	54	9	9	0.4	0.2			20			
2005	2	2	4	6	3	4	5	3	120	91	15	13	0.4	0.4	37		110	70		
2006	1	2	3	4	2	3	3	4	136	108	17	18	0.4	0.4	74	91	145	85		
2007	2	2	2	2	2	3	3	3	152	114	19	19	0.4	0.4	121	121	60	90		
2008	2	3			2	3	2	3	78	108	13	18		0.2	208	166		50		
2009	1	2			1	2		4	78	114	11	19		0.2	235	181		40		
2010	1	2			1	2		2		114		19			235	272		10		

MMbbl	Exploration Wells		Delineation Wells		Exploration/ Delineation Rigs		Production Platforms		Production/ Service Wells		Production Rigs		Number of Shorebases		Production MMbbl		Pipeline Miles	
	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000
2011		1				1		2		102		17			229	302		35
2012								1		78		13			220	332		25
2013										48		8			206	378		
2014										24		4			181	374		
2015										6		1			159	358		
2016															140	329		
2017															123	304		
2018															108	274		
2019															95	241		
2020															83	212		
2021															74	186		
2022															64	165		
2023															57	144		
2024															48	125		
2025															40	108		
2026															29	93		

MMbbl	Exploration Wells		Delineation Wells		Exploration/ Delineation Rigs		Production Platforms		Production/ Service Wells		Production Rigs		Number of Shorebases		Production MMbbl		Pipeline Miles	
	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000	2800	5000
2027															20	68		
2028															12	59		
2029																42		
2030																35		
2031																17		
2032																15		
2033																7		
Total	19	28	35	48	3[1]	4[1]	19	28	668	991	19[1]	19[1]	2.0		2800	5000	335	395

[1]Maximum exploration/delineation or production drilling rigs operating in any single year.

Table A-4
Exploration and Development Schedule
Beaufort Sea Sale 144 Mid-Point Base Case for the Sale Area Proposal

	Exploration Wells	Delineation Wells	Exploration/ Delineation Rigs	Production Platforms	Production/ Service Wells	Production Rigs	Number of Shorebases	Production MMbbl	Pipeline Miles
MMbbl	1200	1200	1200	1200	1200	1200	1200	1200	1200
1997	Lease Sale								
1998	1	1	1						
1999	2	2	2						
2000	2	2	2						
2001	2	2	2						
2002	1	2	2	1	6	1	0.2		
2003		2	2	2	18	4	0.2		
2004		2	2	2	36	8	0.3		20
2005		1	1	1	54	11	0.3	28	50
2006				1	54	11		56	85
2007				1	42	9		63	30
2008					36	6		91	
2009					18	4		101	
2010					9	4		101	

	Exploration Wells	Delineation Wells	Exploration/ Delineation Rigs	Production Platforms	Production/ Service Wells	Production Rigs	Number of Shorebases	Production MMbbl	Pipeline Miles
MMbbl	1200	1200	1200	1200	1200	1200	1200	1200	1200
2011						3		96	
2012								89	
2013								83	
2014								73	
2015								64	
2016								56	
2017								49	
2018								43	
2019								37	
2020								33	
2021								29	
2022								25	
2023								23	
2024								20	
2025								17	
2026								10	

MMbbl	Exploration Wells 1200	Delineation Wells 1200	Exploration/ Delineation Rigs 1200	Production Platforms 1200	Production/ Service Wells 1200	Production Rigs 1200	Number of Shorebases 1200	Production MMbbl 1200	Pipeline Miles 1200
2027								6	
2028								5	
Total	8	14	2[1]	8	273	11[1]	1.0	1200	185

[1] Maximum exploration/delineation or production drilling rigs operating in any single year.

Table A-5
Exploration and Development Schedule
Beaufort Sea Sale 144 Mid-Point High Case for the Sale Area Proposal

	Exploration Wells	Delineation Wells	Exploration/ Delineation Rigs	Production Platforms	Production/ Service Wells	Production Rigs	Number of Shorebases	Production MMbbl	Pipeline Miles
MMbbl	3900	3900	3900	3900	3900	3900	3900	3900	3900
1997	Lease Sale								
1998	1	1	1						
1999	2	2	2						
2000	2	4	3						
2001	2	4	3						
2002	2	4	3	1	6	1			
2003	2	6	4	2	24	4	0.2		
2004	2	6	4	3	54	9	0.2		
2005	2	4	4	3	78	13	0.2		70
2006	2	4	3	3	84	14	0.4	77	85
2007	2	3	3	3	120	15	0.4	105	30
2008	2	2	2	3	84	15	0.2	142	70
2009	2	1	2	3	120	15	0.2	192	50
2010	1		1	2	84	14	0.2	206	50

MMbbl	Exploration Wells 3900	Delineation Wells 3900	Exploration/ Delineation Rigs 3900	Production Platforms 3900	Production/ Service Wells 3900	Production Rigs 3900	Number of Shorebases 3900	Production MMbbl 3900	Pipeline Miles 3900
2011				2	96	12		292	
2012					72	8		315	
2013					28	4		304	
2014								288	
2015								268	
2016								251	
2017								221	
2018								194	
2019								170	
2020								149	
2021								131	
2022								116	
2023								102	
2024								89	
2025								77	
2026								66	

	Exploration Wells	Delineation Wells	Exploration/ Delineation Rigs	Production Platforms	Production/ Service Wells	Production Rigs	Number of Shorebases	Production MMbbl	Pipeline Miles
MMbbl	3900	3900	3900	3900	3900	3900	3900	3900	3900
2027								46	
2028								38	
2029								27	
2030								17	
2031								15	
Total	24	41	4[1]	25	850	15[1]	2.0	3900	355

processes. Booster stations at the landfalls may be required to maintain pressure in the onshore oil pipeline sections. Onshore, pipelines will be elevated (stilted) or buried as conditions warrant. Much of the pipeline and shore-facility construction will occur at the same time as the offshore platforms are installed and production-well drilling occurs on these platforms.

For economic and logistical reasons, future offshore developments will attempt to use the existing onshore infrastructure (processing facilities and pipeline networks) wherever possible. Consequently, produced oil will be gathered by existing pipeline systems within the Prudhoe Bay/Kuparuk field areas and transported to Pump Station No. 1 of the TAPS. For the base case, we assume that landfalls will be made at Oliktok Point (using the Kuparuk field infrastructure), in the Point McIntyre/West Dock area (using the Prudhoe Bay field infrastructure), and at a point about 20 mi east of Bullen Point. For the high-resource case, we also assume that a pipeline landfall also will occur in the Pitt Point area with the pipeline connecting the fields in the western Beaufort to the Kuparuk field infrastructure. A summary of estimated new pipeline development as a result of Sale 144 is given in Table A-6.

If this aggressive development schedule can be achieved, it will take at least 5 to 7 years after the first discovery well for production to begin from an offshore field. Based on the possible reservoir characteristics of the offshore oil fields, oil production from individual fields will last from 15 to 25 years. Considering the likelihood of staggered exploration discoveries and production startups from widely separated offshore fields, the production stream from the Sale 144 area may continue for many decades. The production streams listed in Tables A-2 through A-5 are composite streams representing the staggered discovery and startup of individual fields.

An important assumption for production from fields developed as a result of Sale 144, as well as for future oil production throughout the Arctic Alaska region, is that TAPS will remain operable as the regional transportation system to southern markets. Several studies have concluded that mechanical flow problems will be encountered at rates lower than approximately 300,000 BPD. The continued operation of TAPS at flow rates lower than 300,000 BPD will require extensive (and expensive) modifications to both the pipeline and pump stations. Considering the present production decline rate of existing North Slope fields, a possible shutdown of TAPS for mechanical reasons could occur around the year 2010 if new fields are not added to the production stream. The economic operational limit for TAPS throughput may be somewhat higher (perhaps 425,000 BPD), reflecting the costs of personnel, pipeline maintenance, and environmental compliance. A higher operational limit could result in a pipeline shutdown as early as the year 2003, considering production only from currently producing fields. For either mechanical or operational reasons, if a TAPS shutdown were to occur, any oil production from new fields would have to rely on tanker transportation to southern markets. It is unlikely that fields in the Beaufort OCS would be able to support such a transportation scenario, and exploration and development activities are likely to end.

Natural Gas

For the E&D activities resulting from Sale 144, it was assumed that liquid hydrocarbons (crude oil and condensate from gas) are the only economically viable commodity in the offshore area. There are several reasons why gas production from the Beaufort OCS is not considered to be feasible. Perhaps the most important reason is that more than 30 Tcf of proven gas reserves are contained within developed fields in the Prudhoe Bay area, and all potential gas production is currently shut in because of the lack of a transportation system to southern markets. This immense volume of proven reserves represents decades of production if and when a gas pipeline is eventually constructed. Consequently, it is highly unlikely that gas will be explored for or developed in the Beaufort OCS until excess capacity in a future North Slope gas pipeline appears imminent. The economic feasibility of a gas pipeline from northern Alaska has been investigated by numerous industry and private groups. These studies have concluded that at the present time, it is not profitable to market natural gas from the North Slope, and no firm plans have been made to begin the construction of the TAGS (Trans Alaska Gas System). Therefore, for purposes of environmental assessment, activities associated with the commercial production of natural gas from Sale 144 can be ignored. Any associated or dissolved gas recovered as a byproduct of oil production will be used to fuel equipment on production platforms or will be reinjected to maintain reservoir pressure to increase oil recovery.

Estimates of Muds and Cuttings for the Base Case

Analysis of geologic play information indicates that exploration and delineation (E/D) wells generally will range from 5,000 to 15,000 ft (true vertical depth). For purposes of environmental analysis, an average E/D well depth of

Table A-6
Estimated Pipeline Development,
Beaufort Sea, Sale 144

Scenario	Resource (MMbbl)	Onshore[1] Length (Mi)	Onshore Size (Dia)	Offshore[2] Length (Mi)	Offshore Size (Dia)	Total[3] Pipelines (Mi)	Landfalls
Base Case	1200[4]	105	16-20"	80	12-18"	185	Bullen Pt., Pt. McIntyre, Oliktok Pt.
High Case	3900[5]	215	20-24"	140	14-24"	355	Bullen Pt., Pt. McIntyre, Oliktok Pt. , Pitt Pt.

[1]Onshore pipelines are elevated (stilted) and insulated.

[2]Offshore pipelines are trenched and insulated.

[3]total length of new pipelines. Does not include connections to existing trunk lines.

[4]For purposes of analysis, the Base Case is represented by the mid-point of the estimated resource range of 300-2,100 MMbbls.

[5]For purposes of analysis, the High Case is represented by the mid-point of the estimated resource range of 2,800-5,000 MMbbls.

10,000 ft is representative of the prospects likely to be tested. Production wells will average 13,000 ft (drilled or measured depth) because they typically include a mix of near-vertical and horizontally extended wells. We assume that 25 percent of the total number of production wells will be employed as service wells, where produced water or gas is reinjected into the subsurface.

Based on these typical well depths, a typical E/D well will use an average of 630 short tons of dry mud and produce approximately 820 short tons of dry rock cuttings. The typical production well will use approximately 150 to 680 short tons of dry mud (80% to 20% recycled mud, respectively) and produce an average of 1180 short tons of dry rock cuttings.

The mud discharged to the marine environment may have this typical composition:

Component	Weight %
Bentonite	6.5
Lignosulfonate	2.0
Lignite	1.4
Caustic	0.7
Lime	0.3
Barite	75.0
Drilled solids	13.0
Soda Ash/ Sodium Bicarbonate	0.4
Cellulose Polymer	0.7
Seawater/Freshwater	as needed
Total	100.0

Source: EPA Type 2, Lignosulfonate Mud.

Changes in Levels of Activity from the Base Case to the Deferral Alternatives

Two deferral areas are under consideration as Sale 144 alternatives. Accepting either deferral alternative will reduce, to varying extent, the economically recoverable resource potential of Sale 144. The reduction of area available for leasing is likely to affect bidding at this OCS sale as well as exploration and development activities following the sale.

The MMS method for estimating undiscovered oil and gas resources is based on an analysis of the geologic play. Since resource estimates are not available at the geologic prospect level, the resources affected by removal of the deferral areas are estimated by assuming that undiscovered resources are uniformly distributed within recognized geologic plays. While the actual distribution of economic-sized fields is probably not areally uniform, there is no way to accurately predict the location of these commercial fields prior to exploration drilling. Geophysical surveys often cannot define subtle subsurface traps containing hydrocarbons, and data interpretations are subjective. Because of these limitations we have estimated the volume of resources contained in the deferral areas by using a proportional reduction of the economically recoverable oil assessed for each geologic play areally distributed in the deferral.

Considering the areal distribution of the affected plays and the logistics of development, removal of the Barter Island Deferral (see Fig.II.D.1) could reduce the overall petroleum potential of Sale 144 by approximately 14 percent. Using the single-point estimate of a generalized base case (1,200 MMBBL), this fraction would amount to 120 MMbbl or one subcommercial-sized oil field. The modifications to E&D activities, should this deferral alternative be adopted, are given in Table A-7.

Although MMS analysis indicates that commercial volumes of oil are not likely to be present in the Barter Island Deferral area, it is possible that industry groups will reach different conclusions and will actively lease and explore this part of the Beaufort OCS. Exploration drilling will contribute to the geologic knowledge of the area and perhaps lead to the discovery of economic-sized fields. Also, future infrastructure spreading toward the eastern Beaufort may provide additional incentive for exploration drilling because the economics of development would be improved by linking new fields to existing infrastructure.

The Nuiqsut Deferral (Fig. II.D.1) occupies the central part of the Beaufort OCS immediately offshore of the core infrastructure area developed around Prudhoe Bay and the TAPS pipeline. Using the same method to scale the play resources potentially affected by this deferral alternative indicates that 40 percent of the economically recoverable resources available in Sale 144 will be removed if this deferral is adopted. Using the single-point estimate for the base case (1,200 MMbbl), this fraction amounts to one or two commercial fields totaling 480 MMbbl. The modifications to E&D activities, should this action occur, are given in Table A-7.

Other factors suggest that this area could be considerably more important to future activities in the Beaufort province. First, its proximity to the core infrastructure on the North Slope means that the economics of development and production will be significantly better than more distant areas of the Beaufort OCS. Therefore, smaller fields could be commercial in this area when they would be noncommercial in more distant localities. Second, this deferral area has experienced petroleum-related activities for nearly 20 years, and activities are likely to continue into the future. Approximately 64 OCS tracts have been leased in five previous Federal OCS sales, including the highest bid tracts in Sales BF, 87, and 97. At present, approximately 25 OCS tracts are in active status, and there is one OCS production unit (Hammerhead) in this deferral area. Numerous undeveloped discoveries indicate a high resource potential for this part of the Beaufort coastal zone. Third, the Nuiqsut deferral encloses Alaska State offshore lands where petroleum-related operations are active. Production from State offshore fields (Endicott, Point McIntyre, and Niakuk fields) adds approximately 220 thousands of barrels per day to the oil stream through TAPS. Development feasibility studies are underway for the Northstar field (just west the deferral area) and the Badami field (State coastal lands). Exploration, including seismic surveys, leasing, and drilling, are active year-round, and a recent State lease sale (Sale 80) was held in December 1995.

Considering the factors outlined above, a restriction of petroleum-related activity in the Nuiqsut Deferral area is both inconsistent with its prior use and will result in a greater reduction of the activities, future oil production, and revenue from Sale 144 than may be represented by the 40 percent estimation. Adoption of this deferral alternative, strategically located in the most optimum area for future development in the offshore Beaufort, will greatly dampen the incentive for leasing and exploration on the Beaufort OCS.

Table A-7
Changes in Levels of Activity from the Base Case to the Nuiqsut Deferral Alternative, Beaufort Sea, Sale 144

Alternative IV	Exploration Wells	Delination Wells	Exploration Rigs	Production Platforms	Prod/Service Wells	Production Rigs	Production Startup	Peak Production[1]	Pipeline Miles[2]
Full Proposal Area	8	14	2	8	273	11	Year 9	101	185
Eastern Deferral	7	13	2	8	273	11	Year 9	101	185
Nuiqsut Deferral	5	9	2	5	158	7	Year 9	63	160

[1]Production of oil is in MMbbl/yr.

[2]Total length of new pipelines. Please refer to Table A-6.

APPENDIX B

OIL-SPILL-RISK ANALYSIS

List of Tables and Page Numbers

Table B-1

Oil-spill occurrence probability estimates for spills greater than or equal to 1<000 barrels resulting over the assumed production life of the proposed action (base case and high case) and the Barter Island Deferral Alternative, OCS Lease Sale 144, Beaufort Sea.

Source	Volume (Bbbl)	Mean Number of Spills				Probability (%Chance) of One or More Spills			
		From Platforms	From Pipelines	From Tankers	Total	From Platforms	From Pipelines	From Tankers	Total
Proposed Action									
Base Case	1.20	0.54	1.58	0.00	2.12	42	70	0	88
High Case	3.90	1.75	5.15	0.00	6.90	83	99	0	>99
Barter Island Deferral Alternative	1.08	0.49	1.42	0.00	1.91	39	76	0	85
Nuiqsut Deferral Alternative	0.72	0.32	0.95	0.00	1.27	27	61	0	72

Table B-2.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource within 3 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location																			
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
Land	n	6	1	6	1	6	1	8	1	4	1	6	1	5	1	7	n	3	n	7
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	41	11	15	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	1	4	15	34	42	5	4	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 6	n	n	n	2	9	19	46	8	15	1	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 7	n	n	n	n	n	n	1	3	44	11	17	1	n	n	n	n	n	n	n	n
Ice/Sea Segment 8	n	n	n	n	n	n	n	n	1	2	50	17	29	1	n	n	n	n	n	n
Ice/Sea Segment 9	n	n	n	n	n	n	n	n	n	n	1	2	20	28	38	17	1	1	n	n
Ice/Sea Segment 10	n	n	n	n	n	n	n	n	n	n	n	n	1	n	27	2	52	2	3	n
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	13	5	35	3
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	1
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	6	2	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	n	n	n	2	n	2	n	n	n	n	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	4	n	1	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	3
Subsis. Res. Area A	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	11	63	4	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area C	n	n	n	1	1	28	3	85	7	91	9	89	9	58	2	1	n	n	n	n
Subsis. Res. Area D	n	n	n	n	n	n	n	n	n	1	4	55	12	**	34	**	37	**	4	6
Fall Feeding Area	4	11	3	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	64	55	37	7	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS	10	9	5	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-3.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource within 3 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location												
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Land	2	2	3	1	2	1	2	1	1	8	13	11	7
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	13	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	36	70	3	n	n	n	n	n	n	n	n	n	3
Ice/Sea Segment 6	n	3	75	6	n	n	n	n	n	n	n	n	6
Ice/Sea Segment 7	n	n	1	43	11	n	n	n	n	n	1	7	n
Ice/Sea Segment 8	n	n	n	n	31	30	1	n	n	1	20	1	n
Ice/Sea Segment 9	n	n	n	n	n	14	**	22	n	33	n	n	n
Ice/Sea Segment 10	n	n	n	n	n	n	2	5	1	n	n	n	n
Ice/Sea Segment 11	n	n	n	n	n	n	n	2	31	n	n	n	n
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	1	n	n	n	n
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	2	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	n	n	n	n	n	n	1	8	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	8	n	n	n
Jago Lagoon	n	n	n	n	n	n	1	1	n	n	n	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area A	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	31	2	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area C	n	1	5	15	21	27	18	n	n	**	90	91	4
Subsis. Res. Area D	n	n	n	n	1	20	**	**	59	**	7	n	n
Fall Feeding Area	8	1	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	82	5	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS	13	n	n	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-4.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource within 10 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location																			
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
Land	4	12	5	12	6	12	6	15	5	9	5	12	5	11	4	12	3	8	2	12
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	14	2	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	46	17	29	3	8	1	2	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	2	8	18	38	48	9	13	1	3	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 6	n	2	1	4	11	21	49	11	23	3	2	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 7	n	n	n	1	1	3	3	6	47	16	23	3	2	1	n	n	n	n	n	n
Ice/Sea Segment 8	n	n	n	n	n	n	n	1	3	5	53	21	37	3	6	1	1	n	n	n
Ice/Sea Segment 9	n	n	n	n	n	n	n	n	n	1	3	5	22	32	41	23	4	6	1	n
Ice/Sea Segment 10	n	n	n	n	n	n	n	n	n	n	1	1	4	3	31	5	57	5	9	1
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	3	16	9	39	7
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	5	6
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	2	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	8	4	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	1	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	n	1	n	3	1	3	n	1	n	n	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	n	n	2	n	1	n	n	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	1	1	2	1	5	n	2	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	4
Subsis. Res. Area A	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	20	69	15	11	7	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area C	n	1	n	3	2	31	6	86	13	93	17	91	14	61	5	6	1	1	n	n
Subsis. Res. Area D	n	n	n	n	n	n	n	1	1	3	7	57	18	**	39	**	41	**	11	11
Fall Feeding Area	6	12	5	3	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	68	59	51	13	15	2	5	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS	11	10	8	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-5.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource within 10 days, OCS Lease Sale 144, Beaufort Sea..

Environmental Resource	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Land	8	8	9	7	6	6	6	5	5	14	18	17	13
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	1	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	2	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	23	5	n	n	n	n	n	n	n	n	n	n	1
Ice/Sea Segment 5	40	76	8	1	n	n	n	n	n	n	n	n	7
Ice/Sea Segment 6	1	5	79	14	1	n	n	n	n	n	n	2	9
Ice/Sea Segment 7	n	1	3	46	18	2	n	n	n	n	3	12	2
Ice/Sea Segment 8	n	n	1	2	34	38	3	n	n	4	24	4	n
Ice/Sea Segment 9	n	n	n	n	1	16	**	32	6	37	2	1	n
Ice/Sea Segment 10	n	n	n	n	n	2	6	10	4	3	1	n	n
Ice/Sea Segment 11	n	n	n	n	n	n	2	6	38	n	n	n	n
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	4	n	n	n	n
Ice/Sea Segment 13	n	n	n	n	n	n	n	1	1	n	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	5	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	1	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	1	1	n	n	n	n	n	2	10	n
Gwydyr Bay	n	n	n	n	n	1	n	n	n	9	1	n	n
Jago Lagoon	n	n	n	n	n	1	2	1	1	1	n	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area A	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	46	13	2	n	n	n	n	n	n	n	n	n	2
Subsis. Res. Area C	1	3	9	25	34	38	26	4	n	**	91	93	7
Subsis. Res. Area D	n	n	n	1	5	28	**	**	65	**	10	2	n
Fall Feeding Area	10	3	1	n	n	n	n	n	n	n	n	n	1
Summer Feed. Area 1	n	n	n	n	n	n	n	n	1	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	86	16	2	n	n	n	n	n	n	n	n	n	2
Chukchi SLS	15	1	n	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-6.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource within 30 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
Land	7	19	10	19	11	19	11	22	11	15	10	18	11	18	11	20	9	16	10	21
Ice/Sea Segment 1	3	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	4	5	4	1	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	29	4	10	2	3	n	2	n	1	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	49	25	43	7	18	2	8	n	3	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	4	11	21	43	53	15	24	3	10	1	1	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 6	1	3	2	6	13	25	52	16	33	6	7	1	2	n	1	n	n	n	n	n
Ice/Sea Segment 7	n	1	n	2	2	5	5	9	50	21	30	6	10	1	6	1	3	n	n	n
Ice/Sea Segment 8	n	n	n	n	n	1	1	3	5	8	56	25	45	6	16	2	10	2	2	n
Ice/Sea Segment 9	n	n	n	n	n	n	n	1	1	2	4	7	23	38	43	33	10	13	6	2
Ice/Sea Segment 10	n	n	n	n	n	n	n	n	n	1	2	3	7	6	36	10	62	9	16	3
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	n	n	n	1	2	2	5	5	19	14	44	12
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1	4	4	8	9
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	2	2	3	5	2
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	2
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	7	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	9	7	9	1	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	2	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	n	1	1	4	1	4	1	2	n	n	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	n	1	3	n	2	n	1	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	1	1	4	1	7	n	2	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	3	n	5
Subsis. Res. Area A	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	27	76	28	21	21	6	13	1	4	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area C	n	2	1	4	5	33	9	87	19	94	29	92	25	67	13	13	3	6	1	1
Subsis. Res. Area D	n	n	n	n	n	n	n	2	3	5	10	60	24	**	43	**	45	**	19	17
Fall Feeding Area	7	13	6	4	3	1	1	n	1	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	3	4
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	71	64	68	22	32	6	16	1	5	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS	13	14	14	2	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	1
Boundary Segment 2	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1	1	2	2	1
Boundary Segment 3	n	n	n	n	n	n	n	n	n	n	n	n	1	n	1	n	1	n	1	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-7.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource within 30 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Land	13	14	14	12	11	12	13	11	13	21	23	22	18
Ice/Sea Segment 1	2	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	6	2	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	5	1	1	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	37	10	2	n	n	n	n	n	n	n	n	n	2
Ice/Sea Segment 5	42	82	16	5	1	n	n	n	n	n	n	1	14
Ice/Sea Segment 6	2	7	82	24	6	1	1	n	n	n	1	7	14
Ice/Sea Segment 7	1	2	5	50	27	5	1	1	n	1	7	19	3
Ice/Sea Segment 8	n	n	1	3	37	48	9	5	1	8	28	7	1
Ice/Sea Segment 9	n	n	n	1	3	18	**	43	18	40	4	1	n
Ice/Sea Segment 10	n	n	n	n	1	4	11	15	7	5	2	1	n
Ice/Sea Segment 11	n	n	n	n	n	1	4	9	48	2	n	n	n
Ice/Sea Segment 12	n	n	n	n	n	n	1	3	6	n	n	n	n
Ice/Sea Segment 13	n	n	n	n	n	n	1	2	4	1	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	1	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	11	2	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	1	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	1	1	2	1	n	n	n	n	3	12	1
Gwydyr Bay	n	n	n	n	n	1	n	n	n	11	2	n	n
Jago Lagoon	n	n	n	n	n	2	3	1	2	2	1	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	1	n	n	n	n
Subsis. Res. Area A	1	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	59	28	9	2	n	n	n	n	n	n	n	n	5
Subsis. Res. Area C	2	4	12	34	49	52	39	13	4	**	93	94	9
Subsis. Res. Area D	n	n	n	2	6	36	**	**	70	**	14	3	n
Fall Feeding Area	11	3	1	1	n	n	n	n	n	n	n	n	1
Summer Feed. Area 1	n	n	n	n	n	n	n	1	2	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	93	31	6	2	n	n	n	n	n	n	n	n	5
Chukchi SLS	23	3	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 2	n	n	n	n	n	n	1	1	2	n	n	n	n
Boundary Segment 3	n	n	n	n	n	n	1	n	n	1	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent. Boundary Segments with all values less than 0.5 percent are not shown.

Table B-8.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 3 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location																			
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
20	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
23	n	2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
24	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
27	n	n	n	1	n	3	1	1	n	n	n	n	n	n	n	n	n	n	n	n
28	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n
29	n	n	n	n	n	1	n	2	n	n	n	n	n	n	n	n	n	n	n	n
30	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n
31	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n
34	n	n	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n
35	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n
36	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
37	n	n	n	n	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n
38	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	1	n	n	n	n
39	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	2	n	n	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	1	n	n
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	1
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	2
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-9.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 3 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location												
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
21	1	n	n	n	n	n	n	n	n	n	n	n	n
23	1	1	n	n	n	n	n	n	n	n	n	n	n
26	n	n	1	n	n	n	n	n	n	n	n	n	2
27	n	n	2	n	n	n	n	n	n	n	n	n	4
32	n	n	n	n	n	n	n	n	n	n	n	1	n
33	n	n	n	n	1	n	n	n	n	n	n	9	n
34	n	n	n	n	1	n	n	n	n	n	11	n	n
35	n	n	n	n	n	n	n	n	n	n	1	n	n
36	n	n	n	n	n	n	n	n	n	1	n	n	n
37	n	n	n	n	n	n	n	n	n	5	n	n	n
38	n	n	n	n	n	n	1	n	n	1	n	n	n
41	n	n	n	n	n	n	1	1	n	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-10.
Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 10 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
20	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	1	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	n	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
23	1	4	1	3	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
24	n	1	1	3	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
25	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	1	n	2	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
27	n	n	n	2	1	5	2	1	1	n	n	n	n	n	n	n	n	n	n	n
28	n	n	n	n	n	2	1	2	1	n	n	n	n	n	n	n	n	n	n	n
29	n	n	n	n	n	1	n	4	1	1	n	n	n	n	n	n	n	n	n	n
30	n	n	n	n	n	n	n	2	n	1	n	n	n	n	n	n	n	n	n	n
31	n	n	n	n	n	1	n	2	n	1	n	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	n	n	2	n	1	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	1	1	2	1	1	n	n	n	n	n	n	n	n
34	n	n	n	n	n	n	n	n	1	2	1	3	1	n	n	n	n	n	n	n
35	n	n	n	n	n	n	n	n	n	1	1	2	1	1	n	n	n	n	n	n
36	n	n	n	n	n	n	n	n	n	n	n	3	1	1	n	n	n	n	n	n
37	n	n	n	n	n	n	n	n	n	n	n	2	1	2	1	1	n	n	n	n
38	n	n	n	n	n	n	n	n	n	n	n	1	1	3	1	3	n	n	n	n
39	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	2	n	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	3	n	n	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	3	1	2	n	n
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	1
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	3
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3
46	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1
48	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-11.
Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 10 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
20	1	n	n	n	n	n	n	n	n	n	n	n	n
21	2	n	n	n	n	n	n	n	n	n	n	n	n
22	1	n	n	n	n	n	n	n	n	n	n	n	n
23	2	2	n	n	n	n	n	n	n	n	n	n	n
24	1	1	1	n	n	n	n	n	n	n	n	n	1
26	n	1	1	n	n	n	n	n	n	n	n	n	3
27	n	2	3	1	n	n	n	n	n	n	n	n	6
28	n	n	1	1	n	n	n	n	n	n	n	n	1
29	n	n	1	1	n	n	n	n	n	n	n	1	n
30	n	n	n	1	n	n	n	n	n	n	n	1	n
31	n	n	n	n	n	n	n	n	n	n	n	1	n
32	n	n	n	1	n	n	n	n	n	n	n	2	n
33	n	n	n	1	2	n	n	n	n	n	1	9	n
34	n	n	n	1	2	1	n	n	n	n	12	1	n
35	n	n	n	n	1	1	1	n	n	1	2	1	n
36	n	n	n	n	n	1	1	n	n	3	1	n	n
37	n	n	n	n	n	1	1	n	n	6	1	n	n
38	n	n	n	n	n	n	2	1	n	1	n	n	n
39	n	n	n	n	n	n	n	1	n	n	n	n	n
40	n	n	n	n	n	n	1	1	n	1	n	n	n
41	n	n	n	n	n	n	1	1	1	1	n	n	n
42	n	n	n	n	n	n	n	1	1	n	n	n	n
43	n	n	n	n	n	n	n	n	1	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-12.
Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 30 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
19	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
20	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	2	3	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	1	3	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
23	1	5	2	5	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
24	1	2	1	4	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
25	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	1	1	3	1	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n
27	n	1	1	2	2	6	3	2	1	1	n	n	n	n	n	n	n	n	n	n
28	n	n	n	n	1	2	1	3	1	1	n	n	n	n	n	n	n	n	n	n
29	n	n	n	n	1	2	1	5	1	2	1	n	n	n	n	n	n	n	n	n
30	n	n	n	n	n	n	n	2	1	1	n	n	n	n	n	n	n	n	n	n
31	n	n	n	n	n	1	n	2	1	1	n	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	1	n	2	1	2	1	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	1	1	2	1	2	1	1	n	n	n	n	n	n	n	n
34	n	n	n	n	n	n	1	1	1	3	2	4	1	n	n	n	n	n	n	n
35	n	n	n	n	n	n	n	n	1	1	1	3	1	1	n	n	n	n	n	n
36	n	n	n	n	n	n	n	n	n	1	1	3	1	2	1	n	n	n	n	n
37	n	n	n	n	n	n	n	n	n	n	1	3	1	3	1	1	n	n	n	n
38	n	n	n	n	n	n	n	n	n	1	1	1	1	4	1	3	1	1	n	n
39	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	2	n	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	n	1	3	1	4	n	n	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1	4	1	2	1	n
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1	3	1	2
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	1	2	1	4
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	4
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	3
46	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	2
47	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1
48	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-13.
Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 30 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
20	1	n	n	n	n	n	n	n	n	n	n	n	n
21	2	1	n	n	n	n	n	n	n	n	n	n	n
22	2	1	n	n	n	n	n	n	n	n	n	n	n
23	2	3	n	n	n	n	n	n	n	n	n	n	1
24	2	2	1	n	n	n	n	n	n	n	n	n	1
25	1	1	n	n	n	n	n	n	n	n	n	n	1
26	n	1	1	n	n	n	n	n	n	n	n	n	3
27	1	3	4	2	n	n	n	n	n	n	n	n	8
28	n	n	2	2	n	n	n	n	n	n	n	n	1
29	n	1	1	2	1	n	n	n	n	n	n	3	1
30	n	n	n	1	n	n	n	n	n	n	n	2	n
31	n	n	1	1	n	n	n	n	n	n	n	1	1
32	n	n	1	1	n	n	n	n	n	n	n	2	n
33	n	n	n	1	2	1	n	n	n	n	1	10	1
34	n	n	1	1	2	2	n	n	n	n	14	2	n
35	n	n	n	n	1	1	1	n	n	3	2	2	n
36	n	n	n	1	1	2	1	n	n	3	1	n	n
37	n	n	n	n	n	1	1	n	n	6	2	n	n
38	n	n	n	n	1	1	2	1	n	2	1	n	n
39	n	n	n	n	n	1	n	1	n	1	n	n	n
40	n	n	n	n	n	n	2	1	n	1	n	n	n
41	n	n	n	n	n	1	2	1	2	1	n	n	n
42	n	n	n	n	n	n	n	1	1	n	n	n	n
43	n	n	n	n	n	n	n	1	1	n	n	n	n
44	n	n	n	n	n	n	n	1	1	n	n	n	n
45	n	n	n	n	n	n	n	n	1	n	n	n	n
47	n	n	n	n	n	n	n	n	1	n	n	n	n
48	n	n	n	n	n	n	n	n	1	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-14.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain environmental resource within 3 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
Land	n	5	1	5	1	5	1	8	1	3	1	6	n	4	n	5	n	3	n	6
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	39	9	16	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	n	1	13	30	41	3	4	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 6	n	n	n	n	7	16	44	6	14	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 7	n	n	n	n	n	n	n	1	42	7	16	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 8	n	n	n	n	n	n	n	n	n	1	48	14	29	1	n	n	n	n	n	n
Ice/Sea Segment 9	n	n	n	n	n	n	n	n	n	n	n	n	19	23	37	16	1	2	n	n
Ice/Sea Segment 10	n	n	n	n	n	n	n	n	n	n	n	n	n	n	24	1	51	1	3	n
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	12	2	33	2
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	8	3	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area A	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	11	63	4	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area C	n	n	n	n	n	26	2	84	6	91	7	89	8	58	2	2	n	n	n	n
Subsis. Res. Area D	n	n	n	n	n	n	n	n	n	n	2	54	10	**	32	**	37	**	4	6
Fall Feeding Area	3	8	2	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	63	54	38	7	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS	14	12	7	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-15.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain environmental resource within 3 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location												
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Land	2	2	2	1	1	1	1	1	1	7	11	11	5
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	12	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	33	68	2	n	n	n	n	n	n	n	n	n	2
Ice/Sea Segment 6	n	1	73	4	n	n	n	n	n	n	n	n	2
Ice/Sea Segment 7	n	n	n	38	7	n	n	n	n	n	n	4	n
Ice/Sea Segment 8	n	n	n	n	28	27	n	n	n	1	17	n	n
Ice/Sea Segment 9	n	n	n	n	n	12	**	23	n	29	n	n	n
Ice/Sea Segment 10	n	n	n	n	n	n	1	2	1	n	n	n	n
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	27	n	n	n	n
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	3	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area A	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	32	2	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area C	n	n	3	12	20	24	19	n	n	**	89	91	1
Subsis. Res. Area D	n	n	n	n	1	17	**	**	60	**	3	n	n
Fall Feeding Area	7	1	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	81	5	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS	17	n	n	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent. Boundary Segments with all values less than 0.5 percent are not shown.

Table B-16.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain environmental resource within 10 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
Land	2	8	3	8	4	9	4	12	4	7	4	9	3	7	3	9	2	6	1	9
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	15	1	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	44	14	31	2	9	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	1	2	15	33	46	6	15	1	3	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 6	n	n	n	1	8	17	46	8	23	1	2	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 7	n	n	n	n	n	n	1	1	45	10	23	1	3	1	n	n	n	n	n	n
Ice/Sea Segment 8	n	n	n	n	n	n	n	n	1	1	50	15	38	2	7	1	1	n	n	n
Ice/Sea Segment 9	n	n	n	n	n	n	n	n	n	n	1	1	19	26	40	21	4	7	1	n
Ice/Sea Segment 10	n	n	n	n	n	n	n	n	n	n	n	n	1	1	25	1	55	2	10	n
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	13	4	36	4
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	2
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	10	5	6	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area A	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	19	69	15	11	7	2	2	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area C	n	n	n	1	1	27	4	85	10	93	15	91	13	61	5	6	1	1	n	n
Subsis. Res. Area D	n	n	n	n	n	n	n	n	n	1	4	55	15	**	36	**	40	**	12	11
Fall Feeding Area	4	8	4	3	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	67	57	54	12	18	2	6	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS	15	14	10	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-17.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain environmental resource within 10 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Land	5	6	6	6	5	5	4	3	3	11	14	14	8
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	1	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	1	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	21	4	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	35	74	7	1	n	n	n	n	n	n	n	n	4
Ice/Sea Segment 6	n	2	76	12	1	n	n	n	n	n	n	1	3
Ice/Sea Segment 7	n	n	1	40	13	1	n	n	n	n	1	7	n
Ice/Sea Segment 8	n	n	n	n	29	35	3	n	n	2	20	1	n
Ice/Sea Segment 9	n	n	n	n	n	13	**	35	7	31	1	n	n
Ice/Sea Segment 10	n	n	n	n	n	n	2	3	2	1	n	n	n
Ice/Sea Segment 11	n	n	n	n	n	n	n	2	32	n	n	n	n
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	1	n	n	n	n
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	6	1	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	n	n	n	n	n	n	n	1	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	1	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area A	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	47	15	2	n	n	n	n	n	n	n	n	n	1
Subsis. Res. Area C	n	1	4	22	34	37	28	4	n	**	91	93	2
Subsis. Res. Area D	n	n	n	n	1	24	**	**	66	**	4	n	n
Fall Feeding Area	7	3	1	n	n	n	n	n	n	n	n	n	1
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	86	18	2	n	n	n	n	n	n	n	n	n	1
Chukchi SLS	20	1	n	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent. Boundary Segments with all values less than 0.5 percent are not shown.

Table B-18.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain environmental resource within 30 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location																			
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
Land	3	13	4	13	5	12	6	15	5	9	5	11	5	10	4	12	3	8	3	11
Ice/Sea Segment 1	4	3	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	5	6	4	1	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	31	2	10	n	3	n	2	n	1	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	47	20	46	4	20	1	9	n	3	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	1	4	16	36	51	9	26	2	12	1	1	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 6	n	n	1	1	9	18	48	9	34	3	8	1	2	n	n	n	n	n	n	n
Ice/Sea Segment 7	n	n	n	n	1	1	2	2	46	12	30	3	12	1	7	n	3	n	n	n
Ice/Sea Segment 8	n	n	n	n	n	n	n	n	2	2	52	17	47	3	20	2	13	2	2	n
Ice/Sea Segment 9	n	n	n	n	n	n	n	n	n	n	1	2	20	29	42	29	10	16	8	3
Ice/Sea Segment 10	n	n	n	n	n	n	n	n	n	n	n	n	2	1	26	2	59	2	18	1
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	14	5	40	6
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	3	2
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	9	n	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	12	9	12	1	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area A	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	25	76	30	22	25	7	15	1	4	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area C	n	n	1	1	2	28	4	86	14	94	27	93	25	67	13	14	3	7	1	1
Subsis. Res. Area D	n	n	n	n	n	n	n	n	1	1	5	55	18	**	39	**	42	**	20	16
Fall Feeding Area	4	8	4	3	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	69	61	72	19	37	5	19	1	6	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS	18	19	19	3	5	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-19.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain environmental resource within 30 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Land	7	7	7	7	6	6	6	5	4	13	16	16	10
Ice/Sea Segment 1	3	1	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	8	2	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	4	1	1	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	33	8	2	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	37	79	13	4	n	n	n	n	n	n	n	n	8
Ice/Sea Segment 6	n	2	78	19	5	n	1	n	n	n	n	3	4
Ice/Sea Segment 7	n	n	1	42	20	4	1	1	n	n	2	10	1
Ice/Sea Segment 8	n	n	n	1	29	45	9	6	1	3	23	2	n
Ice/Sea Segment 9	n	n	n	n	n	14	**	46	23	32	1	n	n
Ice/Sea Segment 10	n	n	n	n	n	1	2	4	3	1	n	n	n
Ice/Sea Segment 11	n	n	n	n	n	n	1	2	39	n	n	n	n
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	2	n	n	n	n
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	14	2	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	n	n	n	n	n	n	n	2	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	2	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area A	2	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	62	33	10	1	n	n	n	n	n	n	n	n	6
Subsis. Res. Area C	n	1	5	31	51	52	42	15	4	**	93	95	3
Subsis. Res. Area D	n	n	n	n	2	33	**	**	73	**	5	1	n
Fall Feeding Area	7	3	1	n	n	n	n	n	n	n	n	n	1
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	94	34	7	2	n	n	n	n	n	n	n	n	3
Chukchi SLS	30	4	n	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-20.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain environmental resource within 3 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location																			
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
Land	n	11	1	8	1	10	1	11	n	5	1	8	1	9	1	11	1	6	n	10
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	45	17	13	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	2	13	21	43	45	9	4	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 6	n	1	n	6	13	28	52	13	15	1	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 7	n	n	n	n	n	2	3	9	51	23	17	2	n	n	n	n	n	n	n	n
Ice/Sea Segment 8	n	n	n	n	n	n	n	n	2	7	56	27	29	2	n	n	n	n	n	n
Ice/Sea Segment 9	n	n	n	n	n	n	n	n	n	n	1	6	24	42	40	22	1	1	n	n
Ice/Sea Segment 10	n	n	n	n	n	n	n	n	n	n	n	n	3	1	36	5	56	4	2	n
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	18	14	41	7
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	4
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	n	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	n	n	n	7	n	8	n	2	n	n	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	n	n	5	n	4	n	n	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	3	1	14	n	4	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	n	10
Subsis. Res. Area A	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	13	63	5	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area C	n	n	n	2	1	35	6	87	11	91	14	89	10	58	2	1	n	n	n	n
Subsis. Res. Area D	n	n	n	n	n	n	n	n	n	2	7	61	17	**	40	**	39	**	3	6
Fall Feeding Area	6	22	4	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	67	60	35	8	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-21.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain environmental resource within 3 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Land	3	1	4	2	2	2	4	2	1	9	17	13	12
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	18	1	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	45	76	4	n	n	n	n	n	n	n	n	n	6
Ice/Sea Segment 6	n	8	82	13	n	n	n	n	n	n	n	n	18
Ice/Sea Segment 7	n	n	4	57	22	n	n	n	n	n	1	18	1
Ice/Sea Segment 8	n	n	n	1	40	41	1	n	n	3	30	4	n
Ice/Sea Segment 9	n	n	n	n	n	19	**	18	n	47	2	n	n
Ice/Sea Segment 10	n	n	n	n	n	1	7	13	3	1	n	n	n
Ice/Sea Segment 11	n	n	n	n	n	n	n	7	46	n	n	n	n
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	2	n	n	n	n
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	2	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	1	1	n	n	n	n	n	6	33	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	32	1	n	n
Jago Lagoon	n	n	n	n	n	n	2	2	1	1	n	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area A	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	28	2	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area C	n	2	12	24	25	34	16	n	n	**	91	92	12
Subsis. Res. Area D	n	n	n	n	3	29	**	**	57	**	20	1	n
Fall Feeding Area	14	1	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	83	4	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS	n	n	n	n	n	n	n	n	n	n	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-22.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain environmental resource within 10 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
Land	8	24	11	23	12	24	12	25	9	16	9	21	9	22	8	21	5	15	5	24
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	11	4	3	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	51	25	22	7	4	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	7	23	27	52	51	17	9	3	1	1	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 6	1	6	3	14	19	35	57	22	21	7	1	1	n	n	n	n	n	n	n	n
Ice/Sea Segment 7	n	1	1	3	3	10	10	19	56	34	22	6	1	1	n	n	n	n	n	n
Ice/Sea Segment 8	n	n	n	n	n	1	1	6	8	17	61	37	33	8	3	1	n	n	n	n
Ice/Sea Segment 9	n	n	n	n	n	n	n	n	1	3	7	15	29	51	44	30	4	3	n	1
Ice/Sea Segment 10	n	n	n	n	n	n	n	n	n	1	3	5	12	11	47	17	63	16	7	2
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	n	n	n	1	2	3	7	9	26	27	48	17
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	4	6	12	17
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	3	5	2
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	3	7	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	n	2	1	11	2	13	2	4	n	n	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	1	1	7	1	5	n	1	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	2	3	10	4	20	1	6	n	1
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1	7	1	14
Subsis. Res. Area A	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	23	69	14	10	5	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area C	n	3	1	8	6	42	15	89	22	92	25	90	18	61	6	4	1	1	n	n
Subsis. Res. Area D	n	n	n	n	n	n	n	2	3	10	16	66	29	**	46	**	45	**	8	12
Fall Feeding Area	12	24	9	4	3	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	4	9
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	71	64	44	16	8	3	2	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-23.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain environmental resource within 10 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Land	17	15	17	12	10	11	12	9	10	25	30	24	27
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	3	1	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	28	5	1	n	n	n	n	n	n	n	n	n	3
Ice/Sea Segment 5	53	82	10	2	n	n	n	n	n	n	n	1	15
Ice/Sea Segment 6	5	16	87	22	3	1	n	n	n	n	1	6	28
Ice/Sea Segment 7	1	3	11	62	33	2	1	n	n	1	7	28	8
Ice/Sea Segment 8	n	n	2	6	48	47	5	1	n	11	36	12	1
Ice/Sea Segment 9	n	n	n	n	5	26	**	23	1	55	8	2	n
Ice/Sea Segment 10	n	n	n	n	1	7	20	31	10	10	3	1	n
Ice/Sea Segment 11	n	n	n	n	n	n	6	18	55	2	n	n	n
Ice/Sea Segment 12	n	n	n	n	n	n	n	2	11	n	n	n	n
Ice/Sea Segment 13	n	n	n	n	n	n	n	2	4	n	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	4	1	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	1	4	4	2	n	n	n	n	10	36	2
Gwydyr Bay	n	n	n	n	1	3	n	n	n	34	3	n	n
Jago Lagoon	n	n	n	n	n	3	7	4	3	6	1	n	n
Beaufort Lagoon	n	n	n	n	n	n	n	2	2	n	n	n	n
Subsis. Res. Area A	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	40	6	2	n	n	n	n	n	n	n	n	n	3
Subsis. Res. Area C	2	8	23	33	34	41	21	1	n	**	92	92	20
Subsis. Res. Area D	n	n	n	3	14	38	**	**	61	**	29	7	n
Fall Feeding Area	18	2	1	n	n	n	n	n	n	n	n	n	1
Summer Feed. Area 1	n	n	n	n	n	n	n	n	2	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	87	10	3	n	n	n	n	n	n	n	n	n	4
Chukchi SLS	n	n	n	n	n	n	n	n	n	n	n	n	n

Hypothetical Spill Location: P1–P13

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-24.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain environmental resource within 30 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
	Hypothetical Spill Location																			
Land	21	38	27	37	29	40	29	42	26	34	25	38	28	43	29	44	27	41	30	51
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	3	2	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	22	12	10	5	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 4	56	39	32	17	10	5	3	n	1	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 5	10	32	33	64	58	30	17	9	4	2	1	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 6	3	11	6	22	25	46	64	35	31	16	4	2	3	1	1	n	1	n	n	n
Ice/Sea Segment 7	n	2	2	6	5	16	14	29	62	49	29	15	3	3	2	2	2	1	1	n
Ice/Sea Segment 8	n	n	n	1	1	3	4	11	14	28	65	50	40	16	4	3	2	2	1	1
Ice/Sea Segment 9	n	n	n	n	n	1	n	2	3	7	13	22	34	64	48	42	9	6	2	2
Ice/Sea Segment 10	n	n	n	n	n	n	n	1	1	3	9	10	22	21	63	34	70	28	10	8
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	n	n	2	3	8	8	15	17	36	41	57	31
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	n	n	1	2	4	5	13	12	24	29
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	2	1	4	3	7	7	11	17	8
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	3	7
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	6	9	4	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	1	n	1	n	5	3	17	4	18	4	6	1	n	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	2	2	11	1	8	n	2	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	2	4	6	15	5	26	2	9	1	1
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	1	1	3	3	1	11	1	20
Subsis. Res. Area A	1	1	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	32	76	21	18	9	5	4	1	1	1	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area C	1	7	4	14	13	49	24	90	33	94	34	92	26	65	13	9	4	3	3	2
Subsis. Res. Area D	n	n	n	n	n	2	1	6	8	18	23	73	40	**	56	**	53	**	15	20
Fall Feeding Area	16	26	12	7	6	3	4	1	1	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	5	6	12	16
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS Area	75	72	55	30	16	9	6	1	2	n	n	n	n	n	n	n	n	n	n	n
Chukchi SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	2	1	5
Boundary Segment 2	n	n	n	n	n	n	n	n	n	n	n	1	1	3	3	5	6	6	9	4
Boundary Segment 3	n	n	n	n	n	n	n	n	n	n	1	1	3	2	3	1	3	1	2	1
Boundary Segment 4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-25.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain environmental resource within 30 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Land	32	32	33	28	26	30	35	29	38	45	42	41	44
Ice/Sea Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	1	2	n	n	n	n	n	n	n	n	n	n	1
Ice/Sea Segment 3	11	2	n	n	n	n	n	n	n	n	n	n	1
Ice/Sea Segment 4	48	16	3	1	n	n	n	n	n	n	n	n	7
Ice/Sea Segment 5	57	89	25	9	2	n	n	n	n	n	n	2	32
Ice/Sea Segment 6	8	20	94	41	8	2	1	1	n	1	2	19	44
Ice/Sea Segment 7	2	6	18	71	49	9	3	1	1	1	22	46	12
Ice/Sea Segment 8	n	1	4	11	59	56	9	3	1	24	44	24	3
Ice/Sea Segment 9	n	n	n	3	9	31	**	31	4	65	11	5	n
Ice/Sea Segment 10	n	n	n	1	6	15	37	48	18	18	6	2	n
Ice/Sea Segment 11	n	n	n	n	1	5	13	30	76	7	2	n	n
Ice/Sea Segment 12	n	n	n	n	n	1	3	9	19	1	n	n	n
Ice/Sea Segment 13	n	n	n	n	n	2	3	9	17	4	1	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	4	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Pearl Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	5	1	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	3	6	6	5	n	n	n	n	13	40	3
Gwydyr Bay	n	n	n	n	1	4	n	n	n	37	7	1	n
Jago Lagoon	n	n	n	n	2	6	11	5	6	8	2	n	n
Beaufort Lagoon	n	n	n	n	n	n	2	2	3	1	n	n	n
Subsis. Res. Area A	1	1	1	n	n	n	n	n	n	n	n	n	1
Subsis. Res. Area B	51	13	4	2	n	n	n	n	n	n	n	n	4
Subsis. Res. Area C	5	13	32	42	42	51	29	6	2	**	93	93	27
Subsis. Res. Area D	n	n	1	7	19	48	**	**	62	**	42	11	2
Fall Feeding Area	21	5	3	2	n	n	n	n	n	n	n	n	2
Summer Feed. Area 1	n	n	n	n	n	n	n	4	9	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n
Chukchi S.Coast.Area	n	n	n	n	n	n	n	n	n	n	n	n	1
Chukchi SLS Area	91	24	6	2	n	n	n	n	n	n	n	n	10
Chukchi SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 1	n	n	n	n	n	n	n	1	2	n	n	n	n
Boundary Segment 2	n	n	n	n	n	n	3	6	8	2	n	n	n
Boundary Segment 3	n	n	n	n	n	1	3	1	2	2	n	n	n

Note: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5 percent are not shown.

Table B-26.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain land segment within 3 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
20	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
23	n	2	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
24	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
27	n	n	n	n	n	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n
28	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n
29	n	n	n	n	n	1	n	2	n	n	n	n	n	n	n	n	n	n	n	n
30	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n
31	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n
34	n	n	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n
35	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n
36	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
37	n	n	n	n	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n
38	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	1	n	n	n	n
39	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	1	n	n
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	1
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-27.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain land segment within 3 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
21	1	n	n	n	n	n	n	n	n	n	n	n	n
23	1	1	n	n	n	n	n	n	n	n	n	n	n
26	n	n	1	n	n	n	n	n	n	n	n	n	2
27	n	n	1	1	n	n	n	n	n	n	n	n	3
30	n	n	n	n	n	n	n	n	n	n	n	1	n
32	n	n	n	n	n	n	n	n	n	n	n	1	n
33	n	n	n	n	1	n	n	n	n	n	n	8	n
34	n	n	n	n	1	n	n	n	n	n	10	n	n
35	n	n	n	n	n	n	n	n	n	1	1	n	n
36	n	n	n	n	n	n	n	n	n	2	n	n	n
37	n	n	n	n	n	n	n	n	n	4	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-28.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain land segment within 10 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
20	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	n	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
23	n	3	1	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
24	n	1	n	3	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
25	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	n	n	1	n	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
27	n	n	n	1	n	3	1	1	1	n	n	n	n	n	n	n	n	n	n	n
28	n	n	n	n	n	1	n	2	1	n	n	n	n	n	n	n	n	n	n	n
29	n	n	n	n	n	1	n	3	1	1	n	n	n	n	n	n	n	n	n	n
30	n	n	n	n	n	n	n	2	n	1	n	n	n	n	n	n	n	n	n	n
31	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	1	n	1	1	n	n	n	n	n	n	n	n	n
34	n	n	n	n	n	n	n	n	n	1	1	2	1	n	n	n	n	n	n	n
35	n	n	n	n	n	n	n	n	n	n	n	2	1	1	n	n	n	n	n	n
36	n	n	n	n	n	n	n	n	n	n	n	3	1	1	n	n	n	n	n	n
37	n	n	n	n	n	n	n	n	n	n	n	1	n	2	1	1	n	n	n	n
38	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	2	n	n	n	n
39	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	2	n	n	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	1	n	n
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	1
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	2
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-29.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain land segment within 10 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
20	1	n	n	n	n	n	n	n	n	n	n	n	n
21	1	n	n	n	n	n	n	n	n	n	n	n	n
22	1	n	n	n	n	n	n	n	n	n	n	n	n
23	1	2	n	n	n	n	n	n	n	n	n	n	n
24	n	1	1	n	n	n	n	n	n	n	n	n	1
26	n	1	1	n	n	n	n	n	n	n	n	n	2
27	n	1	2	1	n	n	n	n	n	n	n	n	3
28	n	n	1	1	n	n	n	n	n	n	n	n	n
29	n	n	n	1	1	n	n	n	n	n	n	1	n
30	n	n	n	1	1	n	n	n	n	n	n	1	n
31	n	n	n	n	n	n	n	n	n	n	n	1	n
32	n	n	n	1	n	n	n	n	n	n	n	1	n
33	n	n	n	n	1	1	n	n	n	n	1	8	n
34	n	n	n	n	1	2	n	n	n	n	11	1	n
35	n	n	n	n	n	1	1	n	n	2	1	n	n
36	n	n	n	n	n	1	1	n	n	2	n	n	n
37	n	n	n	n	n	1	1	n	n	5	1	n	n
38	n	n	n	n	n	n	1	1	n	1	n	n	n
40	n	n	n	n	n	n	1	n	n	n	n	n	n
41	n	n	n	n	n	n	1	1	1	n	n	n	n
42	n	n	n	n	n	n	n	n	1	n	n	n	n
43	n	n	n	n	n	n	n	n	1	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-30.
Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain land segment within 30 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
19	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
20	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	n	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	n	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
23	n	4	1	4	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
24	n	1	n	3	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
25	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	1	n	1	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
27	n	n	n	1	1	5	1	2	1	n	n	n	n	n	n	n	n	n	n	n
28	n	n	n	n	n	1	1	2	1	1	n	n	n	n	n	n	n	n	n	n
29	n	n	n	n	n	1	n	4	1	1	n	n	n	n	n	n	n	n	n	n
30	n	n	n	n	n	n	n	2	n	1	n	n	n	n	n	n	n	n	n	n
31	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	1	n	2	1	1	n	n	n	n	n	n	n	n
34	n	n	n	n	n	n	n	n	1	1	1	3	1	n	n	n	n	n	n	n
35	n	n	n	n	n	n	n	n	n	n	n	3	1	1	n	n	n	n	n	n
36	n	n	n	n	n	n	n	n	n	n	n	3	1	1	1	1	n	n	n	n
37	n	n	n	n	n	n	n	n	n	n	n	2	n	2	1	1	n	n	n	n
38	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	3	n	1	n	n
39	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	2	n	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	3	n	n	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	n	2	n	n
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	1
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	3
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
46	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-31.
Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain land segment within 30 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
19	1	1	n	n	n	n	n	n	n	n	n	n	n
20	1	n	n	n	n	n	n	n	n	n	n	n	n
21	1	1	n	n	n	n	n	n	n	n	n	n	n
22	1	n	n	n	n	n	n	n	n	n	n	n	n
23	1	2	n	n	n	n	n	n	n	n	n	n	n
24	n	1	1	n	n	n	n	n	n	n	n	n	1
25	n	n	n	n	n	n	n	n	n	n	n	n	1
26	n	1	1	n	n	n	n	n	n	n	n	n	2
27	n	1	2	1	n	n	n	n	n	n	n	n	4
28	n	n	1	1	n	n	n	n	n	n	n	n	n
29	n	n	n	1	1	n	n	n	n	n	n	2	n
30	n	n	n	1	1	n	n	n	n	n	n	2	n
31	n	n	1	n	n	n	n	n	n	n	n	1	n
32	n	n	n	1	n	n	n	n	n	n	n	2	n
33	n	n	n	1	1	1	n	n	n	n	1	9	n
34	n	n	n	n	1	2	n	n	n	n	12	1	n
35	n	n	n	n	n	1	1	n	n	2	1	n	n
36	n	n	n	n	1	1	1	n	n	3	n	n	n
37	n	n	n	n	n	1	1	1	n	5	1	n	n
38	n	n	n	n	n	1	1	1	n	1	n	n	n
40	n	n	n	n	n	n	1	n	n	n	n	n	n
41	n	n	n	n	n	n	1	1	1	n	n	n	n
42	n	n	n	n	n	n	n	1	1	n	n	n	n
43	n	n	n	n	n	n	n	n	1	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-32.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain land segment within 3 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
	Hypothetical Spill Location																			
20	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
23	n	4	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
24	n	1	n	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
25	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	1	n	2	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
27	n	n	n	1	n	6	1	1	n	n	n	n	n	n	n	n	n	n	n	n
28	n	n	n	n	n	2	n	1	n	n	n	n	n	n	n	n	n	n	n	n
29	n	n	n	n	n	1	n	2	n	n	n	n	n	n	n	n	n	n	n	n
30	n	n	n	n	n	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n
31	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	n	n	1	n	1	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	n	n	1	n	2	n	n	n	n	n	n	n	n	n	n
34	n	n	n	n	n	n	n	n	n	2	1	2	n	n	n	n	n	n	n	n
35	n	n	n	n	n	n	n	n	n	n	n	2	n	n	n	n	n	n	n	n
36	n	n	n	n	n	n	n	n	n	n	n	2	n	1	n	n	n	n	n	n
37	n	n	n	n	n	n	n	n	n	n	n	2	n	2	n	n	n	n	n	n
38	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	1	n	n	n	n
39	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	1	n	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	4	n	n	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	4	n	1	n	n
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	1
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	2
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3
46	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-33.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain land segment within 3 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
	Hypothetical Spill Location												
21	1	n	n	n	n	n	n	n	n	n	n	n	n
22	1	n	n	n	n	n	n	n	n	n	n	n	n
23	1	n	n	n	n	n	n	n	n	n	n	n	n
24	n	1	n	n	n	n	n	n	n	n	n	n	n
26	n	n	1	n	n	n	n	n	n	n	n	n	3
27	n	n	3	n	n	n	n	n	n	n	n	n	9
29	n	n	n	1	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	n	n	n	n	n	n	2	n
33	n	n	n	n	1	n	n	n	n	n	n	10	n
34	n	n	n	n	1	n	n	n	n	n	14	1	n
35	n	n	n	n	n	1	n	n	n	n	3	n	n
36	n	n	n	n	n	1	n	n	n	1	1	n	n
37	n	n	n	n	n	n	1	n	n	6	n	n	n
38	n	n	n	n	n	n	1	n	n	1	n	n	n
40	n	n	n	n	n	n	n	1	n	n	n	n	n
41	n	n	n	n	n	n	2	1	n	n	n	n	n
42	n	n	n	n	n	n	n	n	1	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-34.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain land segment within 10 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
	Hypothetical Spill Location																			
19	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
20	1	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	2	4	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	1	4	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
23	2	7	4	5	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
24	n	3	2	5	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n
25	n	1	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	1	1	4	2	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n
27	n	1	1	5	3	9	5	3	1	n	n	n	n	n	n	n	n	n	n	n
28	n	n	n	1	1	4	2	4	1	1	n	n	n	n	n	n	n	n	n	n
29	n	n	n	n	n	3	1	5	1	1	n	n	n	n	n	n	n	n	n	n
30	n	n	n	n	n	n	n	2	1	1	n	n	n	n	n	n	n	n	n	n
31	n	n	n	n	n	1	n	3	1	1	n	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	n	n	3	1	2	n	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	1	n	3	1	3	1	1	n	n	n	n	n	n	n	n
34	n	n	n	n	n	n	n	1	1	4	3	4	n	n	n	n	n	n	n	n
35	n	n	n	n	n	n	n	n	n	1	2	4	1	1	n	n	n	n	n	n
36	n	n	n	n	n	n	n	n	n	1	1	4	2	2	n	n	n	n	n	n
37	n	n	n	n	n	n	n	n	n	n	1	4	2	3	1	n	n	n	n	n
38	n	n	n	n	n	n	n	n	n	n	1	2	1	6	2	3	n	n	n	n
39	n	n	n	n	n	n	n	n	n	n	n	n	n	2	1	2	n	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	1	1	5	1	6	1	1	n	n
41	n	n	n	n	n	n	n	n	n	n	n	1	1	3	2	7	2	3	n	n
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1	4	1	2
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	3	1	5
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	5
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	5
46	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	4
47	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2
48	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-35.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain land segment within 10 days, OCS Lease Sale 144, Beaufort Sea.

Hypothetical Spill Location

Land Segment	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
21	4	1	n	n	n	n	n	n	n	n	n	n	n
22	3	1	n	n	n	n	n	n	n	n	n	n	n
23	4	3	1	n	n	n	n	n	n	n	n	n	1
24	4	3	1	n	n	n	n	n	n	n	n	n	1
25	n	1	n	n	n	n	n	n	n	n	n	n	n
26	1	1	1	n	n	n	n	n	n	n	n	n	4
27	1	5	8	1	n	n	n	n	n	n	n	n	14
28	n	1	3	1	n	n	n	n	n	n	n	n	3
29	n	n	2	3	n	n	n	n	n	n	n	1	1
30	n	n	n	2	n	n	n	n	n	n	n	1	n
31	n	n	1	1	n	n	n	n	n	n	n	1	n
32	n	n	n	n	n	n	n	n	n	n	n	3	n
33	n	n	n	1	3	n	n	n	n	n	1	12	1
34	n	n	n	1	3	1	n	n	n	n	17	3	n
35	n	n	n	n	2	2	n	n	n	1	5	1	n
36	n	n	n	n	n	3	n	n	n	4	2	n	n
37	n	n	n	n	n	1	1	n	n	9	2	n	n
38	n	n	n	n	n	1	4	1	n	4	1	n	n
39	n	n	n	n	n	1	1	1	n	1	n	n	n
40	n	n	n	n	n	n	2	2	n	3	n	n	n
41	n	n	n	n	n	1	4	2	2	2	1	n	n
42	n	n	n	n	n	n	n	1	3	n	n	n	n
43	n	n	n	n	n	n	n	1	2	n	n	n	n
44	n	n	n	n	n	n	n	n	1	n	n	n	n
45	n	n	n	n	n	n	n	n	1	n	n	n	n
47	n	n	n	n	n	n	n	n	1	n	n	n	n
48	n	n	n	n	n	n	n	n	1	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-36.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain land segment within 30 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
19	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
20	2	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	5	6	3	1	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
22	3	5	3	2	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n
23	4	9	6	6	3	2	1	1	1	n	n	n	n	n	n	n	n	n	n	n
24	2	4	4	5	3	2	2	1	1	1	n	n	n	n	n	n	n	n	n	n
25	n	2	1	2	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	3	2	6	3	3	2	n	1	n	n	n	n	n	n	n	n	n	n	n
27	1	3	3	7	7	12	7	5	4	1	1	1	1	n	1	n	n	n	n	n
28	n	1	1	2	3	6	4	6	3	2	1	n	n	n	n	n	n	n	n	n
29	n	1	1	1	2	4	3	7	2	4	1	n	n	n	n	n	n	n	n	n
30	n	n	n	1	1	1	2	3	1	1	n	n	n	n	n	n	n	n	n	n
31	n	n	n	n	1	2	1	3	1	2	1	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	1	1	4	2	2	1	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	2	1	5	2	4	2	2	n	n	n	n	n	n	n	n
34	n	n	n	1	n	2	1	3	3	6	4	6	2	1	n	n	n	n	1	1
35	n	n	n	n	n	1	1	2	2	4	3	5	2	2	n	n	n	n	n	n
36	n	n	n	n	n	n	n	1	1	2	2	4	3	4	n	n	n	n	n	n
37	n	n	n	n	n	n	n	n	1	1	2	6	3	4	2	1	n	n	n	n
38	n	n	n	n	n	n	n	n	1	2	3	4	3	7	3	5	1	n	n	n
39	n	n	n	n	n	n	n	n	n	n	1	1	1	3	2	2	1	1	n	n
40	n	n	n	n	n	n	n	n	n	n	1	2	1	8	2	8	1	1	n	n
41	n	n	n	n	n	n	n	n	n	n	1	2	3	5	3	11	3	5	1	1
42	n	n	n	n	n	n	n	n	n	n	n	1	1	1	2	2	2	6	2	3
43	n	n	n	n	n	n	n	n	n	n	n	1	1	1	2	1	2	6	3	6
44	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	2	2	3	3	7
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	2	2	6
46	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	3	1	6
47	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	4
48	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1	4
49	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1
57	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n
58	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-37.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain land segment within 30 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
	Hypothetical Spill Location												
20	1	n	1	n	n	n	n	n	n	n	n	n	n
21	5	1	1	1	n	n	n	n	n	n	n	n	1
22	4	1	n	n	n	n	n	n	n	n	n	n	n
23	6	4	1	1	n	n	n	n	n	n	n	1	2
24	8	5	1	n	1	n	n	n	n	n	n	1	2
25	1	1	n	n	n	n	n	n	n	n	n	n	n
26	1	2	2	n	n	n	n	n	n	n	n	n	5
27	2	11	10	4	1	1	n	n	n	n	1	1	21
28	1	1	5	3	1	n	n	n	n	1	n	1	4
29	2	1	3	6	2	n	n	1	n	n	n	5	3
30	n	1	2	2	n	n	n	n	n	n	n	1	1
31	n	1	1	2	1	n	n	n	1	n	n	2	1
32	n	1	1	2	1	n	n	n	n	n	n	3	1
33	n	1	n	2	5	2	n	n	n	n	1	13	2
34	n	n	2	3	5	2	n	n	n	n	20	5	1
35	n	n	1	1	3	3	3	n	n	4	5	5	1
36	n	n	n	2	1	5	1	n	n	5	3	1	n
37	n	n	n	1	1	3	2	n	n	10	6	n	n
38	n	n	n	n	2	2	5	1	n	4	2	2	n
39	n	n	n	n	n	2	1	2	n	4	n	n	n
40	n	n	n	n	1	2	4	4	1	4	1	n	n
41	n	n	n	n	1	3	7	4	4	3	1	n	n
42	n	n	n	n	n	1	n	1	4	1	1	n	n
43	n	n	n	n	n	1	2	2	3	1	n	n	n
44	n	n	n	n	n	n	1	2	2	1	n	n	n
45	n	n	n	n	n	n	n	1	2	n	n	n	n
46	n	n	n	n	n	n	n	1	1	n	n	n	n
47	n	n	n	n	n	n	1	n	4	n	n	n	n
48	n	n	n	n	n	n	n	1	2	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-38.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource within 180 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location																			
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
Land	22	30	18	34	18	32	19	40	19	32	17	37	16	39	14	36	12	31	20	45
Ice/Sea Segment 1	10	10	8	5	5	2	4	n	2	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	7	9	9	3	5	1	3	n	1	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	39	14	25	6	12	1	5	n	3	n	1	n	1	n	n	n	1	n	1	n
Ice/Sea Segment 4	51	42	56	21	34	11	18	1	10	n	3	1	1	1	1	n	2	n	1	n
Ice/Sea Segment 5	4	20	22	61	60	35	39	12	20	2	6	1	4	1	4	1	4	n	2	n
Ice/Sea Segment 6	1	5	2	11	15	41	59	34	52	19	14	2	9	1	7	1	6	1	3	n
Ice/Sea Segment 7	n	1	n	3	2	13	9	24	58	43	46	15	18	2	16	1	15	1	7	1
Ice/Sea Segment 8	n	n	n	n	n	2	1	9	7	22	61	47	62	17	26	5	20	6	13	1
Ice/Sea Segment 9	n	n	n	n	n	n	n	1	1	3	5	13	28	61	46	59	16	26	11	6
Ice/Sea Segment 10	n	n	n	n	n	n	n	n	1	3	9	9	16	17	57	31	76	27	24	6
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	n	n	3	3	9	9	12	12	29	31	57	31
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	n	n	5	5	7	6	11	6	19	21
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	3	4	9	16	7
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	5	6
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	15	12	15	6	13	2	8	n	3	n	1	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	2	1	1	n	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	9	1	8	n	4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	9	17	17	5	13	2	4	n	4	n	1	n	n	n	n	n	1	n	n	n
Peard Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	2	4	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	1	n	3	1	9	1	10	4	6	2	1	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	n	1	6	n	5	n	3	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	1	4	9	3	12	1	7	1	1
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	3	n	7	n	14
Subsis. Res. Area A	2	2	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	30	83	38	34	33	14	24	4	14	2	5	1	2	n	1	n	2	n	1	n
Subsis. Res. Area C	n	2	1	7	6	40	13	88	26	95	40	95	38	78	26	34	9	19	8	5
Subsis. Res. Area D	n	n	n	n	n	1	n	2	3	12	12	68	32	**	51	**	54	**	29	29
Fall Feeding Area	7	13	6	4	3	1	1	n	1	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	1	6	6	11	8	15	14
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	2	n
Southern SLS Area	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Northern SLS Area	72	77	77	39	52	18	30	3	16	1	5	1	3	1	3	1	3	1	2	n
Northern SLS	14	27	23	9	17	3	8	n	6	n	2	n	2	n	2	n	2	n	n	n
Boundary Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	1
Boundary Segment 2	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1	1	2	3	1
Boundary Segment 3	n	n	n	n	n	n	n	n	n	n	n	n	1	n	1	n	1	n	1	n
Boundary Segment 16	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 17	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 18	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 19	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 20	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 24	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 25	2	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 26	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 27	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5% are not shown.

Table B-39.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain environmental resource within 180 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Land	19	23	23	22	21	25	23	12	27	40	43	41	29
Ice/Sea Segment 1	13	12	3	1	n	n	n	n	n	n	n	n	1
Ice/Sea Segment 2	11	5	2	1	n	n	n	n	n	n	n	n	2
Ice/Sea Segment 3	20	4	2	n	n	n	1	n	n	n	n	n	1
Ice/Sea Segment 4	56	27	13	4	1	1	1	1	n	1	n	1	14
Ice/Sea Segment 5	43	93	39	18	4	1	1	1	n	1	1	2	40
Ice/Sea Segment 6	2	8	91	52	17	3	2	1	1	1	2	21	36
Ice/Sea Segment 7	1	2	14	63	52	11	2	2	2	2	21	39	12
Ice/Sea Segment 8	n	n	1	8	50	68	20	19	9	22	44	18	1
Ice/Sea Segment 9	n	n	n	1	3	24	**	57	29	54	4	2	n
Ice/Sea Segment 10	n	n	n	n	5	12	34	48	18	14	5	1	n
Ice/Sea Segment 11	n	n	n	n	2	7	10	22	72	7	1	n	n
Ice/Sea Segment 12	n	n	n	n	n	2	5	10	8	3	n	n	n
Ice/Sea Segment 13	n	n	n	n	n	n	1	4	14	1	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	3	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	19	12	4	2	n	n	n	n	n	n	n	n	1
Ice/Sea Seg. 1 SLS	n	2	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	2	1	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	4	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	24	9	4	1	n	n	n	n	n	n	n	n	2
Peard Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	2	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	1	1	4	6	n	n	n	n	12	18	1
Gwydyr Bay	n	n	n	n	n	1	n	n	n	19	4	n	n
Jago Lagoon	n	n	n	n	n	6	7	1	8	3	1	n	n
Beaufort Lagoon	n	n	n	n	n	n	1	1	1	n	n	n	n
Subsis. Res. Area A	3	1	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	74	38	21	8	3	1	n	n	n	n	1	1	15
Subsis. Res. Area C	2	4	17	44	62	70	56	31	22	**	95	95	21
Subsis. Res. Area D	n	n	n	2	9	49	**	**	81	**	30	5	n
Fall Feeding Area	11	3	1	1	n	n	n	n	n	n	n	n	1
Summer Feed. Area 1	n	n	n	n	n	n	2	10	11	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	1	2	n	n	n	n
Southern SLS Area	n	n	n	n	n	n	n	n	n	n	n	n	n
Northern SLS Area	97	51	22	7	2	1	1	1	n	1	1	1	22
Northern SLS	36	16	6	2	1	n	n	n	n	n	n	n	3
Boundary Segment 2	n	n	n	n	n	n	1	1	2	n	n	n	n
Boundary Segment 3	n	n	n	n	n	n	1	n	n	1	n	n	n

Notes: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5% are not shown.

Table B-40.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain environmental resource within 180 days, OCS Lease Sale 144, Beaufort.

	Hypothetical Spill Location																			
Environmental Resource	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
Land	20	27	14	33	14	28	16	38	16	31	13	35	11	36	9	33	6	27	13	40
Ice/Sea Segment 1	10	13	10	7	6	2	5	n	2	n	1	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	9	11	11	4	7	2	4	n	1	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	45	13	28	6	15	1	6	n	4	n	1	n	1	n	n	n	1	n	1	n
Ice/Sea Segment 4	49	42	63	22	42	11	22	1	13	n	3	n	2	1	1	1	2	n	1	n
Ice/Sea Segment 5	2	16	18	59	61	35	46	11	24	2	8	1	5	1	5	1	5	n	2	n
Ice/Sea Segment 6	n	3	1	6	11	39	57	32	58	18	17	2	10	1	8	1	8	1	4	n
Ice/Sea Segment 7	n	n	n	2	1	11	7	21	57	39	52	14	22	1	20	1	19	2	8	1
Ice/Sea Segment 8	n	n	n	n	n	1	n	7	5	18	60	43	69	16	33	6	26	8	17	1
Ice/Sea Segment 9	n	n	n	n	n	n	n	n	n	2	3	9	25	59	46	64	18	32	14	7
Ice/Sea Segment 10	n	n	n	n	n	n	n	n	n	2	7	7	12	13	52	27	76	24	28	5
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	n	n	2	3	7	7	9	9	25	25	56	28
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	n	n	5	4	7	6	9	4	16	16
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	6	13	6
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	5	5
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	19	16	20	8	18	3	11	1	3	n	1	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	1	2	1	1	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	12	1	11	n	6	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	12	23	23	6	17	2	6	n	5	n	1	n	n	n	1	n	1	n	n	n
Peard Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	1	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	1	n	2	n	6	n	6	4	6	2	1	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	n	n	3	n	4	n	3	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	3	6	2	7	1	6	1	1
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	5	n	12
Subsis. Res. Area A	2	2	2	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	29	85	42	39	40	16	30	4	18	1	6	1	3	n	1	n	2	n	1	n
Subsis. Res. Area C	n	1	1	4	3	37	9	87	23	96	41	96	42	82	30	42	11	24	10	6
Subsis. Res. Area D	n	n	n	n	n	n	n	1	1	8	8	65	29	**	48	**	53	**	33	32
Fall Feeding Area	4	8	4	3	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	1	5	5	10	7	13	11
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	2	n
Southern SLS Area	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Northern SLS Area	70	78	84	41	63	19	37	4	20	1	6	1	4	1	3	1	4	1	2	1
Northern SLS	19	35	31	12	23	4	10	1	7	n	3	n	2	n	2	n	2	n	1	n
Boundary Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n
Boundary Segment 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n
Boundary Segment 16	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 17	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 18	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 19	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 20	2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 24	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 25	3	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 26	3	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 27	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5% are not shown.

Table B-41.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain environmental resource within 180 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location												
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Land	14	19	20	20	18	22	17	6	20	38	42	40	23
Ice/Sea Segment 1	16	15	3	1	n	n	n	n	n	n	n	n	2
Ice/Sea Segment 2	14	6	2	1	n	n	n	n	n	n	n	n	2
Ice/Sea Segment 3	21	4	2	n	n	n	1	1	n	1	n	n	1
Ice/Sea Segment 4	58	30	17	4	1	1	1	1	n	1	n	n	16
Ice/Sea Segment 5	38	95	42	21	4	1	1	1	1	1	1	1	41
Ice/Sea Segment 6	n	3	90	56	20	3	2	1	1	1	1	19	32
Ice/Sea Segment 7	n	n	12	60	52	11	2	2	2	2	18	35	12
Ice/Sea Segment 8	n	n	n	8	45	70	23	25	12	20	42	13	n
Ice/Sea Segment 9	n	n	n	n	n	22	**	66	38	50	1	n	n
Ice/Sea Segment 10	n	n	n	n	4	9	30	44	16	10	5	1	n
Ice/Sea Segment 11	n	n	n	n	1	6	7	17	69	5	1	n	n
Ice/Sea Segment 12	n	n	n	n	n	2	5	9	4	3	n	n	n
Ice/Sea Segment 13	n	n	n	n	n	n	n	3	10	n	n	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	3	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	25	16	5	2	n	n	n	n	n	n	n	n	2
Ice/Sea Seg. 1 SLS	1	2	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	2	1	1	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	5	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	32	13	5	2	n	n	n	n	n	n	n	n	3
Peard Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	1	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	n	n	3	6	n	n	n	n	11	10	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	12	3	n	n
Jago Lagoon	n	n	n	n	n	5	5	n	8	1	n	n	n
Beaufort Lagoon	n	n	n	n	n	n	1	n	1	n	n	n	n
Subsis. Res. Area A	3	1	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	81	46	26	10	3	1	n	1	n	1	1	1	17
Subsis. Res. Area C	n	1	12	44	69	75	64	39	28	**	96	96	18
Subsis. Res. Area D	n	n	n	n	6	49	**	**	87	**	25	2	n
Fall Feeding Area	8	3	1	n	n	n	n	n	n	n	n	n	1
Summer Feed. Area 1	n	n	n	n	n	n	2	10	10	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	1	2	n	n	n	n
Southern SLS Area	n	n	n	n	n	n	n	n	n	n	n	n	n
Northern SLS Area	98	59	26	8	2	1	1	1	n	1	1	1	23
Northern SLS	48	21	7	3	1	n	n	n	n	n	n	n	4

Notes: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5% are not shown.

Table B-42.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain environmental resource within 180 days, OCS Lease Sale 144, Beaufort.

Environmental Resource	Hypothetical Spill Location L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
Land	28	39	30	38	30	42	31	46	29	37	28	41	30	48	30	47	30	45	39	60
Ice/Sea Segment 1	11	2	4	1	2	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	3	3	2	2	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 3	24	16	13	8	2	1	1	1	1	1	1	1	1	n	1	n	1	n	n	n
Ice/Sea Segment 4	57	41	33	21	12	9	5	1	2	1	2	1	1	1	n	n	n	n	n	n
Ice/Sea Segment 5	11	34	35	66	58	34	19	13	5	3	3	2	1	1	1	n	n	n	n	n
Ice/Sea Segment 6	3	12	6	23	25	48	64	39	32	21	6	4	4	2	2	1	2	n	1	n
Ice/Sea Segment 7	n	2	2	7	5	18	15	33	63	55	30	20	4	4	3	2	2	1	1	n
Ice/Sea Segment 8	n	n	n	1	1	4	4	14	14	32	66	56	42	19	5	3	2	2	1	1
Ice/Sea Segment 9	n	n	n	n	n	1	n	2	3	8	13	24	35	69	49	46	12	7	2	2
Ice/Sea Segment 10	n	n	n	n	n	n	n	1	2	5	14	16	29	29	72	45	74	36	11	10
Ice/Sea Segment 11	n	n	n	n	n	n	n	n	n	n	5	5	13	13	20	22	40	48	61	39
Ice/Sea Segment 12	n	n	n	n	n	n	n	n	n	n	1	n	7	6	9	9	18	14	29	36
Ice/Sea Segment 13	n	n	n	n	n	n	n	n	n	n	n	2	1	4	3	8	9	16	27	12
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	4	7	10
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	7	2	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	1	1	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Peard Bay	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	6	9	4	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	1	n	1	n	6	3	18	4	19	6	7	2	n	n	n	n	n	n	n
Gwydyr Bay	n	n	n	n	n	n	n	n	n	2	2	12	1	9	n	3	n	n	n	n
Jago Lagoon	n	n	n	n	n	n	n	n	n	n	2	4	7	17	6	28	2	10	1	2
Beaufort Lagoon	n	n	n	n	n	n	n	n	n	n	n	n	1	1	3	4	1	13	1	22
Subsis. Res. Area A	1	1	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Subsis. Res. Area B	34	77	23	20	12	7	7	3	3	2	1	1	1	n	n	n	n	n	n	n
Subsis. Res. Area C	1	8	4	14	13	50	24	90	35	94	37	92	29	66	15	11	4	3	3	2
Subsis. Res. Area D	n	n	n	n	n	2	1	6	8	21	25	76	44	**	60	**	55	**	17	22
Fall Feeding Area	16	27	12	8	6	3	4	1	1	n	n	n	n	n	n	n	n	n	n	n
Summer Feed. Area 1	n	n	n	n	n	n	n	n	n	n	n	n	n	1	7	7	13	11	19	24
Summer Feed. Area 2	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	1	2	1
Southern SLS Area	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Northern SLS Area	76	75	57	34	20	14	9	3	4	2	2	1	1	1	1	n	1	n	n	n
Northern SLS	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	2	3	5
Boundary Segment 2	n	n	n	n	n	n	n	n	n	n	n	1	1	3	3	5	6	6	10	4
Boundary Segment 3	n	n	n	n	n	n	n	n	n	n	1	1	3	2	3	1	3	1	2	1
Boundary Segment 4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n
Boundary Segment 15	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 19	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 20	3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5% are not shown.

Table B-43.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain environmental resource within 180 days, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Land	33	33	34	30	29	34	39	29	46	48	46	45	46
Ice/Sea Segment 1	3	2	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 2	2	3	1	n	n	n	n	n	n	n	n	n	1
Ice/Sea Segment 3	16	3	1	1	1	1	n	n	n	n	1	1	1
Ice/Sea Segment 4	49	18	4	2	2	1	n	n	n	1	1	1	11
Ice/Sea Segment 5	59	89	29	11	3	2	1	n	n	1	2	3	35
Ice/Sea Segment 6	8	20	95	42	11	4	2	1	n	2	4	25	48
Ice/Sea Segment 7	2	6	18	74	50	13	4	2	1	3	29	51	12
Ice/Sea Segment 8	n	1	4	11	63	59	12	3	1	31	50	33	3
Ice/Sea Segment 9	n	n	n	3	9	32	**	31	4	68	12	8	n
Ice/Sea Segment 10	n	n	n	1	10	20	47	57	23	25	6	2	n
Ice/Sea Segment 11	n	n	n	n	5	10	17	36	81	12	2	n	n
Ice/Sea Segment 12	n	n	n	n	n	4	7	12	19	1	n	n	n
Ice/Sea Segment 13	n	n	n	n	n	2	3	9	27	4	1	n	n
Ice/Sea Segment 14	n	n	n	n	n	n	n	n	4	n	n	n	n
Ice/Sea Segment 15	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 16	2	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Segment 17	1	1	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 1 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 2 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 3 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Ice/Sea Seg. 4 SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Peard Bay	n	n	n	n	n	n	n	n	n	n	n	n	n
Elson Lagoon	5	1	n	n	n	n	n	n	n	n	n	n	n
Simpson Lagoon	n	n	3	6	6	7	n	n	n	n	15	41	3
Gwydyr Bay	n	n	n	n	1	4	n	n	n	38	9	1	n
Jago Lagoon	n	n	n	n	2	8	13	5	8	8	2	n	n
Beaufort Lagoon	n	n	n	n	n	n	2	2	3	1	n	n	n
Subsis. Res. Area A	1	2	1	n	n	n	n	n	n	n	n	n	1
Subsis. Res. Area B	53	14	6	4	2	n	n	n	n	n	1	2	6
Subsis. Res. Area C	5	13	33	42	43	55	31	9	2	**	94	93	29
Subsis. Res. Area D	n	n	1	7	21	49	**	**	64	**	46	15	2
Fall Feeding Area	21	5	3	2	n	n	n	n	n	n	n	n	2
Summer Feed. Area 1	n	n	n	n	n	n	5	12	14	n	n	n	n
Summer Feed. Area 2	n	n	n	n	n	n	n	n	1	n	n	n	n
Southern SLS Area	n	n	n	n	n	n	n	n	n	n	n	n	1
Northern SLS Area	92	28	9	5	2	1	1	n	n	1	1	2	17
Northern SLS	n	n	n	n	n	n	n	n	n	n	n	n	n
Boundary Segment 1	n	n	n	n	n	n	n	1	2	n	n	n	n
Boundary Segment 2	n	n	n	n	n	n	3	6	8	2	n	n	n
Boundary Segment 3	n	n	n	n	n	1	3	1	2	2	n	n	n

Notes: ** = Greater than 99.5 percent; n = Less than 0.5 percent.
Boundary Segments with all values less than 0.5% are not shown.

Table B-44.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 180 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location																			
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
19	1	2	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
20	1	3	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	2	4	2	2	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
22	1	4	1	1	1	1	1	n	1	n	n	n	n	n	n	n	n	n	n	n
23	2	9	3	10	2	3	1	1	1	n	n	n	n	n	n	n	n	n	n	n
24	1	3	3	5	3	1	2	n	1	n	n	n	n	n	n	n	n	n	n	n
25	n	1	n	1	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	2	1	5	2	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n
27	n	1	1	6	4	10	4	4	2	2	1	n	n	n	n	n	n	n	n	n
28	n	n	n	1	1	7	4	8	5	4	1	1	1	n	1	n	n	n	n	n
29	n	n	n	n	1	3	1	10	3	8	2	1	1	n	n	n	n	n	n	n
30	n	n	n	n	n	1	1	3	1	2	n	1	n	n	n	n	n	n	n	n
31	n	n	n	n	n	2	n	3	1	1	1	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	1	n	3	1	2	1	1	n	n	n	n	n	n	n	n
33	n	n	n	n	n	1	1	3	1	3	2	4	1	n	n	n	n	n	n	n
34	n	n	n	n	n	n	1	2	1	4	2	8	2	3	1	1	n	n	n	n
35	n	n	n	n	n	n	n	n	1	2	1	6	1	5	1	1	n	1	n	n
36	n	n	n	n	n	n	n	n	n	2	1	4	1	4	1	3	n	n	n	n
37	n	n	n	n	n	n	n	n	n	n	1	5	1	5	1	3	n	1	n	n
38	n	n	n	n	n	n	n	n	n	1	1	3	1	6	1	6	1	2	n	1
39	n	n	n	n	n	n	n	n	n	n	n	1	n	3	1	2	n	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	n	1	6	1	5	n	1	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	2	2	2	7	1	5	1	1
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	1	7	1	4
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1	5	1	8
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	2	1	8
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	1	5
46	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	4
47	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4
48	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1
57	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	3	n
58	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	4

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-45.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location will contact a certain land segment within 180 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
15	1	n	n	n	n	n	n	n	n	n	n	n	n
19	1	1	n	n	n	n	n	n	n	n	n	n	n
20	1	2	n	n	n	n	n	n	n	n	n	n	n
21	3	1	1	n	n	n	n	n	n	n	n	n	n
22	2	1	1	1	n	n	n	n	n	n	n	n	n
23	3	3	2	2	1	n	n	n	n	n	n	n	2
24	5	2	1	n	1	n	n	n	n	n	n	n	1
25	1	1	1	n	n	n	n	n	n	n	n	n	1
26	1	2	1	n	n	n	n	n	n	n	n	n	3
27	1	7	4	4	1	n	n	n	n	n	n	1	14
28	n	n	7	3	3	1	1	n	n	n	n	2	3
29	n	1	1	6	4	1	n	n	n	n	2	8	1
30	n	n	n	1	1	n	n	n	n	n	n	4	n
31	n	n	1	1	n	n	n	n	n	n	n	1	1
32	n	n	1	1	1	1	n	n	n	n	n	3	n
33	n	n	n	1	2	5	n	n	n	n	3	12	1
34	n	n	1	1	2	3	1	n	n	2	25	3	n
35	n	n	n	n	1	1	4	1	n	7	3	5	n
36	n	n	n	1	1	2	1	n	n	10	3	n	n
37	n	n	n	n	n	1	1	n	n	9	4	n	n
38	n	n	n	n	1	1	2	1	n	3	1	n	n
39	n	n	n	n	n	1	n	1	n	4	n	n	n
40	n	n	n	n	n	3	2	1	n	1	n	n	n
41	n	n	n	n	n	2	5	1	6	1	n	n	n
42	n	n	n	n	n	n	2	1	3	n	n	n	n
43	n	n	n	n	n	n	1	1	1	n	n	n	n
44	n	n	n	n	n	n	n	1	1	n	n	n	n
45	n	n	n	n	n	n	n	n	1	n	n	n	n
47	n	n	n	n	n	n	n	n	4	n	n	n	n
48	n	n	n	n	n	n	n	n	1	n	n	n	n
56	n	n	n	n	n	n	n	n	1	n	n	n	n
58	n	n	n	n	n	n	n	n	2	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-46.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season will contact a certain land segment within 180 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
	Hypothetical Spill Location																			
19	n	2	1	1	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n
20	1	3	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	1	3	1	2	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
22	n	3	1	1	1	1	1	n	1	n	n	n	n	n	n	n	n	n	n	n
23	1	9	2	11	2	3	1	1	1	n	1	n	n	n	n	n	n	n	n	n
24	n	2	2	5	3	1	1	n	1	n	n	n	n	n	n	n	n	n	n	n
25	n	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	2	1	4	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
27	n	1	1	6	3	9	3	4	2	2	1	n	n	n	n	n	n	n	n	n
28	n	n	n	1	1	7	3	9	5	4	1	1	1	n	1	n	n	n	n	n
29	n	n	n	n	n	2	1	11	3	9	2	2	1	n	n	n	n	n	n	n
30	n	n	n	n	n	n	n	3	n	2	n	1	n	n	n	n	n	n	n	n
31	n	n	n	n	n	1	n	3	n	1	1	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	1	n	3	n	2	1	1	n	n	n	n	n	n	n	n
33	n	n	n	n	n	1	n	2	n	3	2	4	1	n	n	n	n	n	n	n
34	n	n	n	n	n	n	n	1	1	3	1	8	2	3	1	1	n	n	n	n
35	n	n	n	n	n	n	n	n	n	2	n	6	1	6	1	2	n	1	n	n
36	n	n	n	n	n	n	n	n	n	1	n	4	1	4	1	3	n	1	n	n
37	n	n	n	n	n	n	n	n	n	n	n	4	n	5	1	4	n	1	n	n
38	n	n	n	n	n	n	n	n	n	n	n	2	n	6	1	7	n	2	1	1
39	n	n	n	n	n	n	n	n	n	n	n	1	n	2	n	2	n	n	n	n
40	n	n	n	n	n	n	n	n	n	n	n	n	1	5	n	4	n	n	n	n
41	n	n	n	n	n	n	n	n	n	n	n	n	2	2	2	6	1	4	1	1
42	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	n	8	n	5
43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	4	n	9
44	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	8
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	4
46	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	n	3
47	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4
48	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1
57	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	3	n
58	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	3	3

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-47.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the winter season ill contact a certain land segment within 180 days, OCS Lease Sale 144, Beaufort Sea.

	Hypothetical Spill Location												
Land Segment	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
15	1	n	n	n	n	n	n	n	n	n	n	n	n
19	2	2	n	n	n	n	n	n	n	n	n	n	n
20	2	2	n	n	n	n	n	n	n	n	n	n	1
21	2	1	1	n	n	n	n	n	n	n	n	n	n
22	1	1	1	1	n	n	n	n	n	n	n	n	n
23	1	2	3	2	1	n	n	n	n	n	n	n	3
24	3	1	1	n	n	n	n	n	n	n	n	n	1
25	n	n	1	n	n	n	n	n	n	n	n	n	1
26	1	2	1	n	n	n	n	n	n	n	n	n	2
27	1	6	2	4	1	n	n	n	n	n	n	1	11
28	n	n	7	3	3	2	1	n	n	n	n	2	3
29	n	n	n	5	5	2	1	n	n	n	2	8	n
30	n	n	n	1	2	n	n	n	n	n	n	5	n
31	n	n	n	n	n	n	n	n	n	n	n	1	n
32	n	n	1	1	1	1	n	n	n	n	n	3	n
33	n	n	n	1	1	5	n	n	n	n	4	11	n
34	n	n	n	n	1	3	1	1	n	3	26	2	n
35	n	n	n	n	n	1	3	1	1	7	2	4	n
36	n	n	n	n	1	1	1	n	n	11	3	n	n
37	n	n	n	n	n	1	1	1	n	9	3	n	n
38	n	n	n	n	n	1	1	1	1	3	n	n	n
39	n	n	n	n	n	n	n	n	n	4	n	n	n
40	n	n	n	n	n	3	1	n	n	n	n	n	n
41	n	n	n	n	n	1	4	1	7	n	n	n	n
42	n	n	n	n	n	n	3	1	3	n	n	n	n
43	n	n	n	n	n	n	n	n	1	n	n	n	n
47	n	n	n	n	n	n	n	n	4	n	n	n	n
56	n	n	n	n	n	n	n	n	2	n	n	n	n
58	n	n	n	n	n	n	n	n	1	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-48.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain land segment within 180 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
	Hypothetical Spill Location																			
19	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
20	2	2	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
21	5	6	3	1	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
22	4	5	3	2	1	n	1	n	n	n	n	n	n	n	n	n	n	n	n	n
23	4	9	7	6	3	2	1	1	1	n	n	n	n	n	n	n	n	n	n	n
24	3	4	4	5	3	2	2	1	1	1	n	n	n	n	n	n	n	n	n	n
25	n	2	1	2	1	1	1	n	n	n	n	n	n	n	n	n	n	n	n	n
26	n	3	2	7	3	3	2	n	1	n	n	n	n	n	n	n	n	n	n	n
27	1	3	3	7	8	12	7	5	4	1	1	1	1	n	1	n	n	n	n	n
28	n	1	1	2	3	6	5	6	5	3	1	n	n	n	n	n	n	n	n	n
29	n	1	1	1	2	4	3	8	3	5	2	n	n	n	n	n	n	n	n	n
30	n	n	n	1	1	1	2	3	1	1	n	n	n	n	n	n	n	n	n	n
31	n	n	n	n	1	3	1	3	1	2	1	n	n	n	n	n	n	n	n	n
32	n	n	n	n	n	2	1	4	2	2	1	n	n	n	n	n	n	n	n	n
33	n	n	n	n	n	2	1	6	2	4	3	2	n	n	n	n	n	n	n	n
34	n	n	n	1	n	2	1	4	3	7	4	7	2	1	n	n	n	n	1	1
35	n	n	n	n	n	1	1	2	2	4	3	6	2	3	n	n	n	n	n	n
36	n	n	n	n	n	n	n	1	1	2	2	5	3	4	n	1	n	n	n	n
37	n	n	n	n	n	n	n	n	1	1	2	7	3	5	2	2	n	n	n	n
38	n	n	n	n	n	n	n	n	1	2	3	4	3	8	3	5	1	1	n	n
39	n	n	n	n	n	n	n	n	n	n	1	2	1	3	2	2	1	1	n	n
40	n	n	n	n	n	n	n	n	n	n	1	2	2	9	2	8	1	1	n	n
41	n	n	n	n	n	n	n	n	n	n	1	2	4	5	3	12	3	5	1	1
42	n	n	n	n	n	n	n	n	n	n	n	1	1	1	2	3	2	7	2	3
43	n	n	n	n	n	n	n	n	n	n	n	1	1	1	2	2	2	7	3	7
44	n	n	n	n	n	n	n	n	n	n	n	n	n	1	2	2	2	3	3	9
45	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	2	2	7
46	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	n	4	1	7
47	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	n	5
48	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1	1	4
49	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	1	1
57	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	2	n	4	1
58	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	4	4

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-49.

Conditional probabilities (expressed as percent chance) that an oil spill starting at a particular location in the summer season will contact a certain land segment within 180 days, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Hypothetical Spill Location P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
20	1	n	1	n	n	n	n	n	n	n	n	n	n
21	5	1	1	1	n	n	n	n	n	n	n	n	1
22	4	1	n	n	n	n	n	n	n	n	n	n	n
23	6	4	1	1	n	n	n	n	n	n	n	1	2
24	9	5	1	n	1	n	n	n	n	n	n	1	2
25	1	1	n	n	n	n	n	n	n	n	n	n	n
26	1	2	2	n	n	n	n	n	n	n	n	n	5
27	2	12	10	4	1	1	n	n	n	n	1	1	22
28	1	1	6	3	4	n	n	n	n	1	n	2	4
29	2	1	3	8	2	n	n	1	n	n	n	6	3
30	n	1	2	2	n	n	n	n	n	n	n	1	1
31	n	1	1	2	1	n	n	n	1	n	n	2	1
32	n	1	1	2	1	n	n	n	n	n	n	3	1
33	n	1	n	2	5	5	n	n	n	n	1	13	2
34	n	n	2	3	5	2	n	n	n	n	21	5	1
35	n	n	1	1	3	3	5	n	n	6	5	7	1
36	n	n	n	2	1	5	1	n	n	5	3	1	n
37	n	n	n	1	1	3	2	n	n	10	7	n	n
38	n	n	n	n	2	2	5	1	n	4	2	2	n
39	n	n	n	n	n	2	1	2	n	6	n	n	n
40	n	n	n	n	1	2	4	4	1	4	1	n	n
41	n	n	n	n	1	4	8	4	6	3	1	n	n
42	n	n	n	n	n	1	n	1	4	1	1	n	n
43	n	n	n	n	n	1	2	2	3	1	n	n	n
44	n	n	n	n	n	n	1	2	2	1	n	n	n
45	n	n	n	n	n	n	n	1	2	n	n	n	n
46	n	n	n	n	n	n	n	1	1	n	n	n	n
47	n	n	n	n	n	n	1	n	5	n	n	n	n
48	n	n	n	n	n	n	n	1	2	n	n	n	n
56	n	n	n	n	n	n	n	n	1	n	n	n	n
58	n	n	n	n	n	n	n	n	4	n	n	n	n

Notes: ** = Greater than 99.5 percent; n = less than 0.5 percent.
Rows with all values less than 0.5 percent are not shown.

Table B-50.

Combined probabilities (expressed as percent chance) of one or more spillsgreater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting a certain environmental resource over the assumed production life of the lease area, OCS Lease Sale 144, Beaufort Sea.

Environmental Resource	Within 3 days								Within 10 days								Within 30 days							
	Base Case		High Case		Barter I. Deferral Alternative		Nuiqsut Deferral Alternative		Base Case		High Case		Barter I. Deferral Alternative		Nuiqsut Deferral Alternative		Base Case		High Case		Barter I. Deferral Alternative		Nuiqsut Deferral Alternative	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
Land	9	0.1	26	0.3	8	0.1	5	0.1	18	0.2	48	0.7	17	0.2	11	0.1	28	0.3	66	1.1	26	0.3	18	0.2
Ice/Sea Segment 1	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Ice/Sea Segment 2	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0
Ice/Sea Segment 3	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	2	0.0	1	0.0	1	0.0
Ice/Sea Segment 4	1	0.0	2	0.0	1	0.0	1	0.0	1	0.0	4	0.0	1	0.0	1	0.0	2	0.0	7	0.1	2	0.0	2	0.0
Ice/Sea Segment 5	4	0.0	12	0.1	4	0.0	4	0.0	5	0.1	15	0.2	5	0.1	5	0.0	7	0.1	21	0.2	7	0.1	7	0.1
Ice/Sea Segment 6	4	0.0	13	0.1	4	0.0	4	0.0	7	0.1	21	0.2	7	0.1	6	0.1	12	0.1	33	0.4	11	0.1	9	0.1
Ice/Sea Segment 7	13	0.1	37	0.5	13	0.1	8	0.1	17	0.2	45	0.6	17	0.2	10	0.1	22	0.3	56	0.8	22	0.3	13	0.1
Ice/Sea Segment 8	18	0.2	47	0.6	18	0.2	4	0.0	22	0.3	56	0.8	22	0.2	7	0.1	28	0.3	66	1.1	28	0.3	11	0.1
Ice/Sea Segment 9	40	0.5	81	1.6	37	0.5	28	0.3	42	0.5	83	1.8	38	0.5	30	0.4	45	0.6	85	1.9	40	0.5	32	0.4
Ice/Sea Segment 10	3	0.0	10	0.1	2	0.0	3	0.0	7	0.1	21	0.2	5	0.1	5	0.1	11	0.1	31	0.4	9	0.1	8	0.1
Ice/Sea Segment 11	2	0.0	7	0.1	n	0.0	2	0.0	4	0.0	11	0.1	1	0.0	3	0.0	6	0.1	18	0.2	3	0.0	5	0.1
Ice/Sea Segment 12	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	4	0.0	n	0.0	1	0.0
Ice/Sea Segment 13	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	4	0.0	1	0.0	1	0.0
Ice/Sea Segment 14	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Ice/Sea Segment 15	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Ice/Sea Segment 16	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Ice/Sea Segment 17	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Ice/Sea Seg. 1[1]	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Ice/Sea Seg. 2[1]	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Ice/Sea Seg. 3[1]	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Ice/Sea Seg. 4[1]	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0
Peard Bay[2]	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Elson Lagoon[3]	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Simpson Lagoon[3]	1	0.0	4	0.0	1	0.0	1	0.0	2	0.0	6	0.1	2	0.0	1	0.0	3	0.0	9	0.1	3	0.0	2	0.0
Gwydyr Bay[3]	3	0.0	9	0.1	3	0.0	2	0.0	4	0.0	11	0.1	3	0.0	2	0.0	5	0.0	14	0.2	4	0.0	3	0.0
Jago Lagoon[3]	1	0.0	2	0.0	n	0.0	n	0.0	2	0.0	5	0.1	2	0.0	1	0.0	3	0.0	9	0.1	2	0.0	2	0.0
Beaufort Lagoon[3]	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	2	0.0	n	0.0	n	0.0
Subsis. Res. Area A	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Subsis. Res. Area B	1	0.0	4	0.0	1	0.0	1	0.0	2	0.0	7	0.1	2	0.0	2	0.0	4	0.0	13	0.1	4	0.0	4	0.0
Subsis. Res. Area C	59	0.9	94	2.9	56	0.8	38	0.5	63	1.0	96	3.2	61	0.9	41	0.5	68	1.1	97	3.7	65	1.1	45	0.6
Subsis. Res. Area D	60	0.9	95	3.0	53	0.8	46	0.6	62	1.0	96	3.1	55	0.8	47	0.8	63	1.0	96	3.3	56	0.8	48	0.6
Fall Feeding Area[4]	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	2	0.0	1	0.0	1	0.0	1	0.0	3	0.0	1	0.0	1	0.0
Summer Feed. Area 1[5]	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0
Summer Feed. Area 2[5]	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Southern SLS Area	n	0.0	n	0.0	n	0.0	3	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0
Northern SLS Area	3	0.0	8	0.1	3	0.0	n	0.0	4	0.0	11	0.1	4	0.0	4	0.0	5	0.1	16	0.2	5	0.1	5	0.1
Northern SLS[1]	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	2	0.0	1	0.0	1	0.0	1	0.0	3	0.0	1	0.0	1	0.0
Boundary Segment 2	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	3	0.0	1	0.0	1	0.0
Boundary Segment 3	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	2	0.0	1	0.0	n	0.0

Note: ** = Greater than 99.5%; n = Less than 0.5%; SLS = spring lead system.
Boundary segments with less than 0.5 percent probability of one or more contacts within 30 days are not shown.
Environmental Resources are vulnerable year-round unless otherwise noted;
Vulnerable: 1) May-June 2) June-October 3) July-September 4) September-October 5) June-September

Table B-51.

Combined probabilities (expressed as percent chance) of one or more spills greater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting a certain environmental resource over the assumed production life of the lease area, OCS Lease Sale 144, Beaufort Sea.

Within 180 days								
Environmental Resource	Base Case		High Case		Barter I. Deferral Alternative		Nuiqsut Deferral Alternative	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
Land	45	0.6	86	2.0	42	0.5	30	0.4
Ice/Sea Segment 1	1	0.0	5	0.0	1	0.0	1	0.0
Ice/Sea Segment 2	1	0.0	3	0.0	1	0.0	1	0.0
Ice/Sea Segment 3	2	0.0	7	0.1	2	0.0	2	0.0
Ice/Sea Segment 4	7	0.1	20	0.2	7	0.1	6	0.1
Ice/Sea Segment 5	14	0.2	39	0.5	14	0.2	12	0.1
Ice/Sea Segment 6	23	0.3	58	0.9	23	0.3	17	0.2
Ice/Sea Segment 7	35	0.4	76	1.4	35	0.4	21	0.2
Ice/Sea Segment 8	44	0.6	84	1.9	42	0.5	21	0.2
Ice/Sea Segment 9	50	0.7	90	2.3	45	0.6	37	0.5
Ice/Sea Segment 10	27	0.3	63	1.0	22	0.2	19	0.2
Ice/Sea Segment 11	14	0.1	38	0.5	8	0.1	10	0.1
Ice/Sea Segment 12	6	0.1	17	0.2	4	0.0	4	0.0
Ice/Sea Segment 13	2	0.0	7	0.1	1	0.0	2	0.0
Ice/Sea Segment 14	n	0.0	1	0.0	n	0.0	n	0.0
Ice/Sea Segment 15	n	0.0	n	0.0	n	0.0	n	0.0
Ice/Sea Segment 16	n	0.0	n	0.0	n	0.0	n	0.0
Ice/Sea Segment 17	2	0.0	6	0.1	2	0.0	2	0.0
Ice/Sea Seg. 1 SLS*	n	0.0	1	0.0	n	0.0	n	0.0
Ice/Sea Seg. 2 SLS*	n	0.0	1	0.0	n	0.0	n	0.0
Ice/Sea Seg. 3 SLS*	n	0.0	1	0.0	n	0.0	n	0.0
Ice/Sea Seg. 4 SLS*	2	0.0	6	0.1	2	0.0	2	0.0
Peard Bay*	n	0.0	n	0.0	n	0.0	n	0.0
Elson Lagoon*	n	0.0	n	0.0	n	0.0	n	0.0
Simpson Lagoon*	6	0.1	19	0.2	6	0.1	3	0.0
Gwydyr Bay*	8	0.1	23	0.3	7	0.1	5	0.0
Jago Lagoon*	6	0.1	17	0.2	5	0.1	4	0.0
Beaufort Lagoon*	1	0.0	3	0.0	1	0.0	1	0.0
Subsis. Res. Area A	n	0.0	1	0.0	n	0.0	n	0.0
Subsis. Res. Area B	9	0.1	26	0.3	9	0.1	7	0.1
Subsis. Res. Area C	73	1.3	99	4.3	71	1.2	51	0.7
Subsis. Res. Area D	66	1.1	97	3.5	59	0.9	49	0.7
Fall Feeding Area*	1	0.0	3	0.0	1	0.0	1	0.0
Summer Feed. Area 1*	3	0.0	9	0.1	1	0.0	3	0.0
Summer Feed. Area 2*	n	0.0	1	0.0	n	0.0	n	0.0
Southern SLS Area	n	0.0	n	0.0	n	0.0	n	0.0
Northern SLS Area	11	0.1	32	0.4	11	0.1	9	0.1
Northern SLS*	3	0.0	10	0.1	3	0.0	3	0.0
Boundary Segment 2	1	0.0	3	0.0	1	0.0	1	0.0
Boundary Segment 3	1	0.0	2	0.0	1	0.0	n	0.0

Note: * Vulnerable less than year-round.
** = Greater than 99.5%; n = Less than 0.5%.
Boundary segments with less than 0.5 percent probability of one or more contacts within 180 days are not shown.

Table B-52.

Probabilities (expressed as percent chance) of one or more spills greater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting land segments over the assumed production life of thelease area, OCS Lease Sale 144, Beaufort Sea.

Land Segment	Within 3 days								Within 10 days								Within 30 days							
	Base Case		High Case		Barter I. Deferral Alternative		Nuiqsut Deferral Alternative		Base Case		High Case		Barter I. Deferral Alternative		Nuiqsut Deferral Alternative		Base Case		High Case		Barter I. Deferral Alternative		Nuiqsut Deferral Alternative	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
21	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0
23	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0
24	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0
25	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0
26	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0	n	0.0
27	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	3	0.0	1	0.0	1	0.0	1	0.0	5	0.0	1	0.0	1	0.0
28	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	3	0.0	1	0.0	1	0.0
29	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	2	0.0	1	0.0	n	0.0	1	0.0	4	0.0	1	0.0	1	0.0
30	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0	n	0.0	1	0.0	2	0.0	1	0.0	n	0.0
31	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	2	0.0	1	0.0	n	0.0
32	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	2	0.0	1	0.0	n	0.0	1	0.0	2	0.0	1	0.0	n	0.0
33	1	0.0	4	0.0	1	0.0	1	0.0	2	0.0	6	0.1	2	0.0	1	0.0	2	0.0	7	0.1	2	0.0	1	0.0
34	2	0.0	7	0.1	2	0.0	1	0.0	3	0.0	10	0.1	3	0.0	1	0.0	4	0.0	13	0.1	4	0.0	1	0.0
35	1	0.0	2	0.0	n	0.0	n	0.0	2	0.0	5	0.1	2	0.0	1	0.0	3	0.0	9	0.1	3	0.0	1	0.0
36	1	0.0	2	0.0	1	0.0	n	0.0	2	0.0	6	0.1	2	0.0	1	0.0	2	0.0	8	0.1	2	0.0	1	0.0
37	2	0.0	6	0.1	2	0.0	1	0.0	3	0.0	9	0.1	2	0.0	2	0.0	4	0.0	11	0.1	3	0.0	2	0.0
38	1	0.0	2	0.0	1	0.0	n	0.0	2	0.0	5	0.0	1	0.0	1	0.0	2	0.0	7	0.1	2	0.0	1	0.0
39	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	3	0.0	1	0.0	1	0.0
40	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	3	0.0	1	0.0	1	0.0	2	0.0	5	0.1	1	0.0	1	0.0
41	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	4	0.0	1	0.0	1	0.0	2	0.0	6	0.1	2	0.0	1	0.0
42	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	n	0.0	2	0.0	n	0.0	n	0.0
43	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0	1	0.0	2	0.0	n	0.0	n	0.0
44	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0
45	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	n	0.0	1	0.0	n	0.0	n	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than 0.5 percent probability of one or more contacts within 30 days are not shown.

Table B-53.

Probabilities (expressed as percent chance) of one or more spills greater than or equal to 1,000 barrels, and the estimated number of spills (mean), occurring and contacting land segments over the assumed production life of the lease area, OCS Lease Sale 144, Beaufort Sea.

	Within 180 days							
Land Segment	Base Case		High Case		Barter I. Deferral Alternative		Nuiqsut Deferral Alternative	
	Prob	Mean	Prob	Mean	Prob	Mean	Prob	Mean
19	n	0.0	1	0.0	n	0.0	n	0.0
20	n	0.0	1	0.0	n	0.0	n	0.0
21	n	0.0	1	0.0	n	0.0	n	0.0
22	n	0.0	1	0.0	n	0.0	n	0.0
23	1	0.0	4	0.0	1	0.0	1	0.0
24	1	0.0	2	0.0	1	0.0	1	0.0
25	n	0.0	1	0.0	n	0.0	n	0.0
26	1	0.0	2	0.0	1	0.0	n	0.0
27	3	0.0	8	0.1	3	0.0	2	0.0
28	3	0.0	9	0.1	3	0.0	2	0.0
29	4	0.0	13	0.1	4	0.0	2	0.0
30	1	0.0	4	0.0	1	0.0	1	0.0
31	1	0.0	2	0.0	1	0.0	n	0.0
32	1	0.0	4	0.0	1	0.0	1	0.0
33	3	0.0	11	0.1	3	0.0	2	0.0
34	7	0.1	22	0.3	7	0.1	3	0.0
35	6	0.1	18	0.2	5	0.1	3	0.0
36	5	0.1	16	0.2	5	0.1	3	0.0
37	5	0.1	15	0.2	4	0.1	3	0.0
38	3	0.0	9	0.1	3	0.0	2	0.0
39	2	0.0	7	0.1	2	0.0	1	0.0
40	2	0.0	7	0.1	2	0.0	1	0.0
41	3	0.0	10	0.1	3	0.0	2	0.0
42	1	0.0	4	0.0	1	0.0	1	0.0
43	1	0.0	3	0.0	1	0.0	1	0.0
44	n	0.0	2	0.0	n	0.0	n	0.0
45	n	0.0	1	0.0	n	0.0	n	0.0
46	n	0.0	1	0.0	n	0.0	n	0.0
47	n	0.0	1	0.0	n	0.0	n	0.0
58	n	0.0	1	0.0	n	0.0	n	0.0

Note: n = less than 0.5 percent; ** = greater than 99.5 percent. Segments with less than 0.5 percent probability of one or more contacts within 30 days are not shown.

Table B-54.

State of Alaska Estimated North Slope Remaining Reserves as of January 1, 1994

Fields	Reserves
Developed	
Endicott	262
Kuparuk River	1,142
Lisburne	83
Milne Point	81
Point McIntyre	356
Prudhoe Bay	3,618
Prudhoe Bay Other	25
Total Developed	5,567
Undeveloped	
Beaufort Sea	180
Point Thompson/Flaxman Island	200
West Sak	149
Niakuk/Alapah	55
Total Undeveloped	584
Total Developed and Undeveloped	6,151

Source: State of Alaska, Department of Natural Resources, Division of Oil and Gas, 1994.

Table B-55.[1]
North Slope and Trans Alaska Pipeline Petroleum Spills of <1,000 barrels, 1989-1994

a. North Slope[2] Spills -- <50 bbls

Year	Total Petroleum (Products + Crude Oil)				Products (Includes Gasoline, Diesel, and Hydraulic and Lubrication Oils)				Crude Oil			
	Number of Spills	Gallons	Barrels	Barrels/ spill	Number of Spills	Gallons	Barrels	Barrels/ Spill	Number of Spills	Gallons	Barrels	Barrels/ Spill
1994	319	5,420	129.05	0.40	251	4,090	97.38	0.39	68	1,330	31.67	0.47
1993	445	9,313	221.74	0.50	362	5,064	120.57	0.33	83	4,249	101.17	1.22
1992	515	12,593	299.83	0.58	409	10,220	243.33	0.59	106	2,373	56.50	0.53
1991	738	18,046	429.67	0.58	557	15,023	357.69	0.64	181	3,023	71.98	0.40
1990	669	14,589	347.36	0.52	491	11,576	275.62	0.56	178	3,013	71.74	0.40
1989	759	28,659	682.36	0.90	537	21,605	514.41	0.96	222	7,054	167.95	0.76
Total	3,445	88,620	2,110.01	0.61	2,607	67,578	1,609.01	0.62	838	21,042	501.00	0.60
Average Spill Rates 1989-1993												
	574				434				140			

b. North Slope[2] Spills -- 50 to ≤1,000 bbls

Year	Total Petroleum (Products + Crude)				Products (Includes Gasoline, Diesel, and Hydraulic and Lubrication Oils)				Crude Oil			
	No. of Spills	Gallons	Barrels	Barrels/ Spill	No. of Spills	Gallons	Barrels	Barrels/ Spill	No. of Spills	Gallons	Barrels	Barrels/ Spill
1994	3	19,540	465.24	155.08	0	0	0.00	0.00	3	19,540	465.24	155.08
1993	8	90,415	2,152.74	269.09	1	9,100	216.67	216.67	7	81,315	1,936.07	276.58
1992	2	10,400	247.62	123.81	2	10,400	247.62	123.81	0	0	0.00	0.00
1991	1	2,650	63.10	63.10	1	2,650	63.10	63.10	0	0	0.00	0.00
1990	1	25,200	600.00	600.00	0	0	0.00	0.00	1	25,200	600.00	600.00
1989	5	83,430	1,986.43	397.29	1	5,100	121.43	121.43	4	78,330	1,865.00	466.25
Total	20	231,635	5,515.13	275.76	5	27,250	648.82	129.76	15	204,385	4,866.31	324.42
Average Spill Rates 1989-1993												
	3				1				2			

c. Trans-Alaska Pipeline[3] Spills <50 bbls

Year	Total Petroleum (Products + Crude Oil)				Products (Includes Gasoline, Diesel, and Hydraulic and Lubrication Oils)				Crude Oil			
	Number of Spills	Gallons	Barrels	Barrels/ Spill	Number of Spills	Gallons	Barrels	Barrels/ Spill	Number of Spills	Gallons	Barrels	Barrels/ Spill
1994	273	5,773	137.45	0.50	248	4,724	112.47	0.45	25	1,049	24.98	1.00
1993	213	2,574	61.29	0.29	184	2,319	55.22	0.30	29	255	6.07	0.21
1992	173	4,260	101.43	0.59	155	3,584	85.33	0.55	18	676	16.10	0.89
1991	172	1,264	30.10	0.18	160	1,148	27.34	0.17	12	116	2.76	0.23
1990	101	5,401	128.60	1.27	87	5,330	126.91	1.46	14	71	1.69	0.12
1989	63	2,466	58.71	0.93	59	2,224	52.95	0.90	4	242	5.76	1.44
Total	995	21,738	517.58	0.52	893	19,329	460.22	0.52	102	2,409	57.36	0.56
Average Spill Rates 1989-1993												
	166				149				17			

d. Trans-Alaska Pipeline[3] Spills -- 50 to ≤1,000 bbls

Year	Total Petroleum (Products + Crude Oil)				Products (Includes Gasoline, Diesel, and Hydraulic and Lubrication Oils)				Crude Oil			
	Number of Spills	Gallons	Barrels	Barrels/ Spill	Number of Spills	Gallons	Barrels	Barrels/ Spill	Number of Spills	Gallons	Barrels	Barrels/ Spill
1994	1	4,000	95.24	95.24	1	4,000	95.24	95.24	0	0		
1993	0	0	0.00	0.00	0	0	0.00	0.00	0	0		
1992	1	2,700	64.29	64.29	1	2,700	64.29	64.29	0	0		
1991	1	2,800	66.67	66.67	1	2,800	66.67	66.67	0	0		
1990	0	0	0.00	0.00	0	0	0.00	0.00	0	0		
1989	1	5,000	119.05	119.05	1	5,000	119.05	119.05	0	0		
Total	4	14,500	345.24	86.31	4	14,500	345.24	86.31	0	0		
Average Spill Rates 1989-1993												
	1				1							

Source: State of Alaska, State Pipeline Coordinators Office, Department of Environmental Conservation, Letter: 95-02-gv, February 16, 1995

1 The information contained in the table is provided to Alaska Department of Environmental Conservation by private industry according to the Sate of Alaska Regulation 18 AAC.75 and is based on initial spill reports. There are no spills >1,000 bbls in the database used to compile these tables.

2 North Slope Spills include the spills from all oil production facilities and areas on the north slope of Alaska except Alyeska pump stations 1 and 2.

3. Trans Alaska Pipeline Spills include pump stations 1 through 12 and the entire pipeline and the 3 mile wide corridor associated with it.

Table B-56.

North Slope and Trans Alaska Pipeline Petroleum Small Spill (<1,000 barrels) Rates, 1989-1994

a. North Slope[2] Spill Rates -- <50 bbls

		Total Petroleum (Products + Crude Oil)		Products (Includes Gasoline, Diesel, and Hydraulic and lubrication Oils)		Crude Oil	
Year	Production (MMbbl)	Number of Spills	Spills/ Bbbl	Number of Spills	Spills/ Bbbl	Number of Spills	Spills/ Bbbl
1993	557.036	445	798.87	362	649.87	83	149.00
1992	612.119	515	841.34	409	668.17	106	173.17
1991	641.009	738	1,151.31	557	868.94	181	282.37
1990	636.164	669	1,051.62	491	771.81	178	279.80
1989	668.611	759	1,135.19	537	803.16	222	332.03
Total	3,114.939	3,126.00	1,003.55	??	ERR	770.00	247.20
Average Spill Rates 1989-1993							
			1,003.55		813.50		247.20

b. North Slope[2] Spill Rates -- 50 to ≤1,000 bbls

		Total Petroleum (Products + Crude Oil)		Products (Includes Gasoline, Diesel, and Hydraulic and lubrication Oils)		Crude Oil	
Year	Production (MMbbl)	Number of Spills	Spills/ Bbbl	Number of Spills	Spills/ Bbbl	Number of Spills	Spills/ Bbbl
1993	557.036	8	14.36	1	1.80	7	12.57
1992	612.119	2	3.27	2	3.27	0	0.00
1991	641.009	1	1.56	1	1.56	0	0.00
1990	636.164	1	1.57	0	0.00	1	1.57
1989	668.611	5	7.48	1	1.50	4	5.98
Total	3,114.939	20		5		15	
Average Spill Rates 1989-1993							
	5,060.723		0.00		0.00		0.00

c. Trans Alaska Pipeline[3] Spill Rates -- <50 bbls

Year	Production	Total Petroleum (Products + Crude Oil)		Products (Includes Gasoline, Diesel, and Hydraulic and lubrication Oils)		Crude Oil	
		Number of Spills	Spills/ Bbbl	Number of Spills	Spills/ Bbbl	Number of Spills	Spills/ Bbbl
1993	557.036	213	382.38	184	330.32	29	52.06
1992	612.119	173	282.62	155	282.62	18	29.41
1991	641.009	172	268.33	160	249.61	12	18.72
1990	636.164	101	158.76	87	136.76	14	22.01
1989	668.611	63	94.23	59	88.24	4	5.98
Total	3,114.939	722		645		77	
Average Spill Rates 1989-1993							
	5,060.723	1,058.00	209.06	951.00	187.92	107.00	21.14

d. Trans Alaska Pipeline[3] Spill Rates -- 50 to ≤1,000 bbls

Year	Production	Total Petroleum (Products + Crude Oil)		Products (Includes Gasoline, Diesel, and Hydraulic and lubrication Oils)		Crude Oil	
		Number of Spills	Spills/ Bbbl	Number of Spills	Spills/ Bbbl	Number of Spills	Spills/ Bbbl
1993	557.036	0	0.00	0	0.00	0	
1992	612.119	1	1.63	1	613.50	0	
1991	641.009	1	1.56	1	641.03	0	
1990	636.164	0	0.00	0	0.00	0	
1989	668.611	1	1.50	1	666.67	0	
Total	3,114.939	3		3		0	0
Average Spill Rates 1989-1993							
	5,060.723		0.00		??		0

Table B-57
Small Spills < 1,000 Barrels

a. Estimated Exploration Small Spills ≥1 and < 1,000

Case	Number of Wells	Spill Size (bbl)	Spill Rate (Spills/ Wells)	Estimated Number of Spills	Average Size (bbl)	Total Volume (bbl)
Low	6	≥1 and < 1,000	11/100[1]	1	9[1]	9
Base Case	22	≥1 and < 1,000	11/100[1]	2	9[1]	18
High Case	65	≥1 and < 1,000	11/100[1]	7	9[1]	63
Barter Island Deferral Alt.	20	≥1 and < 1,000	11/100[1]	2	9[1]	18
Nuiqsut Deferral Alt	14	≥1 and < 1,000	11/100[1]	2	9[1]	18

b. Estimated Production Small Spills ≥1 and < 50

Case	Resource Volume (Bbbl)	Spill Size (bbl)	Spill Rate (Spills/ Bbbl)	Estimated Number of Spills	Average Size (bbl)	Total Volume (bbl)
Base Case	1.2	≥1 and < 50	234/Bbbl[2]	281	5[2]	1,405
High Case	3.9	≥1 and < 50	234/Bbbl[2]	913	5[2]	4,565
Barter Island Deferral Alt.	1.08	≥1 and < 50	234/Bbbl[2]	253	5[2]	1,265
Nuiqsut Deferral Alt	0.72	≥1 and < 50	234/Bbbl[2]	168	5[2]	840

c. Estimated Production Small Spills ≥50 and < 1,000

Case	Resource Volume (Bbbl)	Spill Size (bbl)	Spill Rate (Spills/ Bbbl)	Estimated Number of Spills	Average Size (bbl)	Total Volume (bbl)
Base Case	1.2	≥50 and < 1,000	10/Bbbl[3]	12	160[3]	1,920
High Case	3.9	≥50 and < 1,000	10/Bbbl[3]	39	160[3]	6,240
Barter Island Deferral Alt.	1.08	≥50 and < 1,000	10/Bbbl[3]	11	160[3]	1,760
Nuiqsut Deferral Alt	0.72	≥50 and < 1,000	10/Bbbl[3]	7	160[3]	1,120

d. Estimated Total Spills ≥1 and < 1,000

Case	Resource Volume (bbl)	Spill Size (bbl)	Total Estimated Number of Spills	Total Volume (bbl)
Low	< 0.13	≥1 and < 1,000	1	9
Base Case	1.2	≥1 and < 1,000	295	3,343
High Case	3.9	≥1 and < 1,000	959	10,868
Barter Island Deferral Alt.	1.08	≥1 and < 1,000	266	3,043
Nuiqsut Deferral Alt.	0.72	≥1 and < 1,000	177	1,978

Source: USDOI, MMS, Alaska OCS Region, 1995.

[1] Calculated with oil-spill data from 1982-1991 from the Alaska OCS Region.
[2] Calculated with oil-spill data from 1970-1992 from Anderson (1994) and production data from 1970-1992 from Francois (1993).
[3] Calculated with oil-spill data from 1964-1970 from Tracey (1988), 1971-1990 oil-spill data from Cotton (1991), 1964-1992 oil-spill data from Anderson (1994), and production data from 1964 to 1992 from Francois (1993).

Table B-58.

Small Spills <1,000 Barrels for the Cumulative Case

a. Estimated Cumulative-Case Exploration Small Spills ≥1 and <1,000

Area	Number of Wells	Spill Size (bbl)	Spill Rate (Spills/ Wells)	Estimated Number of Spills	Average Size (bbl)	Total Volume (bbl)
Federal						
Sale 144 (Base Case)	22	≥1 and <1,000	11/100[2]	2	9[2]	18
Leased and Undeveloped	7[1]	≥1 and <1,000	11/100[2]	1	9[2]	9
Total—Federal	29			3		27
State—Offshore						
Developed	2[1]	≥1 and <1,000	11/100[2]	0	9[2]	0
Undeveloped	1[1]	≥1 and <1,000	11/100[2]	0	9[2]	0
Total—State	3			0		0
Total—Federal & State	**32**			**3**		**27**

Source: USDOI, MMS, Alaska OCS Region, 1994.

1 For the Sale 144 base case, 14 wells were estimated to be drilled to delineate discovered fields with recoverable resources estimated to be 1.2 Bbbl. For the Federal leased and undeveloped areas and State developed and undeveloped areas the number of future exploration/delineation wells estimated to be drilled is based on 7 wells/1.2 Bbbl—assuming most of exploration/delineation wells in these areas already have been drilled.

2 Calculated with oil-spill data from 1982-1991 from the Alaska OCS Region.

b. Estimated Cumulative-Case Production Small Spills ≥1 and <50

Area	**Resource Volume (Bbbl)**	**Spill Size (bbl)**	**Spill Rate (Spills/ Wells)**	**Estimated Number of Spills**	**Average Size (bbl)**	**Total Volume (bbl)**
Federal						
Sale 144 (Base Case)	**1.2**	**≥1 and <50**	**234/Bbbl[1]**	**281**	**5[1]**	**1,405**
Leased and Undeveloped	**0.20**	**≥1 and <50**	**234/Bbbl[1]**	**47**	**5[1]**	**235**
Total—Federal	**1.40**			**328**		**1,640**
State—Offshore						
Developed	**0.262**	**≥1 and <50**	**234/Bbbl[1]**	**61**	**5[1]**	**305**
Undeveloped	**0.180**	**≥1 and <50**	**234/Bbbl[1]**	**42**	**5[1]**	**210**
Total—State	**0.442**			**103**		**515**
Total—Federal & State	**1.842**			**431**		**2,155**

Source: USDOI, MMS, Alaska OCS Region, 1995.

1 Calculated with oil-spill data from 1970-1992 from Anderson (1994) and production data from 1970-1992 from Francois (1993).

c. Estimated Cumulative-Case Production Small Spills ≥50 and <1,000

Area	Resource Volume (Bbbl)	Spill Size (bbl)	Spill Rate (Spills/ Wells)	Estimated Number of Spills	Average Size (bbl)	Total Volume (bbl)
Federal						
Sale 144 (Base Case)	1.2	≥50 and <1,000	10/Bbbl[1]	12	160[1]	1,920
Leased and Undeveloped	0.20	≥50 and <1,000	10/Bbbl[1]	2	160[1]	320
Total—Federal	1.40			14		2,240
State—Offshore						
Developed	0.262	≥50 and <1,000	10/Bbbl[1]	3	160[1]	480
Undeveloped	0.180	≥50 and <1,000	10/Bbbl[1]	2	160[1]	320
Total—State	0.442			5		800
Total—Federal & State	**1.842**			**19**		**3,040**

Source: USDOI, MMS, Alaska OCS Region, 1995.

[1] Calculated with 1964-1970 oil-spill data from Tracey (1988), 1971-1990 oil-spill data from Cotton (1991), 1964-1992 oil-spill data from Anderson (1994), and 1964-1992 production data from Francois (1993).

d. Total Estimated Cumulative-Case Spills ≥1 and <1,000 and Their Assumed Distribution

Area	Resource Volume (Bbbl)	Spill Size (bbl)	Total Estimated Number of Spills	Total Volume (bbl)
Federal				
Sale 144 (Base Case)	1.2	≥1 and <1,000	295	3,343
Leased and Undeveloped	0.20	≥1 and <1,000	50	564
Total—Federal	1.40		345	3,907
State—Offshore				
Developed	0.262	≥1 and <1,000	64	785
Undeveloped	0.180	≥1 and <1,000	44	530
Total—State	0.442		108	1,315
Total—Federal & State	**1.842**		**453**	**5,222**

Source: USDOI, MMS, Alaska OCS Region, 1995.

Table B-59
Sale 144 Base- and High-Case and Deferral-Alternative Estimates of Onshore Spills <1,000 Barrels Associated with Operation of the North Slope Facilities and Trans-Alaska Pipeline

		Products (Includes Gasoline, Diesel Oil, and Hydraulic and Lubrication Oils)				Crude Oil				Total Petroleum (Products + Crude Oil)	
	Total[1] Est. Cum. Prod. (Bbbl)	Spill[2] Rate (Spills/ Bbbl)	No. of Spills	Mean Volume[3] /Spill (bbl)	Volume (Bbbl)	Spill[2] Rate (Spills/ Bbbl)	No. of Spills	Mean Volume[3] /Spill (bbl)	Volume (Bbbl)	Total Number of Spills	Total Volume Spilled (bbl)
North Slope Spills <50 barrels											
Base Case	**1.200**	**814**	**977**	**0.62**	**605.74**	**247**	**296**	**0.60**	**177.60**	**1,273**	**783.34**
High Case	3.90	814	3,175	0.62	1,968.50	247	963	0.60	577.80	4,138	2,546.30
Barter Island Def. Alt.	1.08	814	879	0.62	544.98	247	267	0.60	160.20	1,146	705.18
Nuiqsut Def. Alt.	0.72	814	586	0.62	363.32	247	178	0.60	106.80	764	470.12
North Slope Spills 50 to <1,000 barrels											
Base Case	**1.200**	**1.61**	**2**	**129.76**	**259.52**	**4.82**	**6**	**324.42**	**1,946.52**	**8**	**2,206.04**
High Case	3.90	1.61	6	129.76	778.56	4.82	19	324.42	6163.98	25	6,942.54
Barter Island Def. Alt.	1.08	1.61	2	129.76	259.52	4.82	5	324.42	1,622.10	7	1,881.62
Nuiqsut Def. Alt.	0.72	1.61	1	129.76	129.76	4.82	3	324.42	973.26	4	1,103.02
Total North Slope Spills <1,000 barrels											
Base Case	**1.200**		**979**		**865.26**		**302**		**2,124.12**	**1,281**	**2,989.38**
High Case	3.90		3,181		2,747.06		982		6,741.78	4,163	9,488.84
Barter Island Def. Alt.	1.08		881		804.50		272		1,782.30	1,153	2,586.80
Nuiqsut Def. Alt.	0.72		587		493.08		181		1,080.06	768	1,573.14
Trans-Alaska Pipeline Spills <50 barrels											
Base Case	**1.200**	**207.07**	**248**	**0.52**	**128.96**	**24.72**	**30**	**0.56**	**16.80**	**278**	**145.76**
High Case	3.90	207.07	806	0.52	419.12	24.72	96	0.56	53.76	902	472.88
Barter Island Def. Alt.	1.08	207.07	224	0.52	125.44	24.72	27	0.56	15.12	251	140.56
Nuiqsut Def. Alt.	0.72	207.07	149	0.52	77.48	24.72	18	0.56	10.08	167	87.56
Trans-Alaska Pipeline Spills 50 to <1,000 barrels											
Base Case	**1.200**	**0.96**	**1**	**86.31**	**86.31**	**-**	**-**	**-**	**-**	**1**	**86.31**
High Case	3.90	0.96	4	86.31	345.24	-	-	-	-	4	345.24
Barter Island Def. Alt.	1.08	0.96	1	86.31	86.31	-	-	-	-	1	86.31
Nuiqsut Def. Alt.	0.72	0.96	1	86.31	86.31	-	-	-	-	1	86.31
Total Trans-Alaska Pipeline Spills <1,000 barrels											
Base Case	**1.200**		**249**		**215.27**		**30**		**16.80**	**279**	**232.07**
High Case	3.90		810		764.36		96		53.76	906	818.12
Barter Island Def. Alt.	1.08		225		211.75		27		15.12	252	226.87
Nuiqsut Def. Alt.	0.72		150		163.79		18		10.08	168	173.87
Total North Slope and Trans-Alaska Pipeline Spills <50 barrels											
Base Case	**1.200**		**1,225**		**734.70**		**326**		**194.40**	**1,551**	**929.10**
High Case	3.90		3,981		2,387.62		1,059		631.56	5,040	3,019.18
Barter Island Def. Alt.	1.08		1,103		670.42		294		175.32	1,397	845.74
Nuiqsut Def. Alt.	0.72		735		440.80		196		116.88	931	557.68
Total North Slope and Trans-Alaska Pipeline Spills 50 to <1,000 barrels											
Base Case	**1.200**		**3**		**345.83**		**6**		**1,946.52**	**9**	**2,292.35**
High Case	3.90		10		1,112.80		19		6,163.98	29	7,287.78
Barter Island Def. Alt.	1.08		3		345.83		5		1,622.10	8	1,967.78
Nuiqsut Def. Alt.	0.72		2		216.07		3		937.26	5	1,189.33
Total North Slope and Trans-Alaska Pipeline Spills <1,000 barrels											
Base Case	**1.200**		**1,228**		**1,080.53**		**332**		**2,140.92**	**1,560**	**3,221.45**
High Case	3.90		3,991		3,511.42		1,078		6,795.54	5,069	10,306.96
Barter Island Def. Alt.	1.08		1,106		1,016.25		299		1,797.42	1,045	2,813.67
Nuiqsut Def. Alt.	0.72		737		656.87		199		1,090.14	936	1,747.01

Source: USDOI, MMS, 1995.

1 Total Estimated Cumulative Production, Table B-54.

2 Table B-56.

3 Table B-55.

Table B-60.
Cumulative-Case (Offshore Platforms and Pipelines) Estimates of Onshore Spills <1,000 Barrels Associated with Operation of the North Slope Facilities and Trans-Alaska Pipeline

		Products (Includes Gasoline, Diesel Oil, and Hydraulic and Lubrication Oils)				Crude Oil				Total Petroleum (Products + Crude Oil)	
	Total[1] Est. Cum. Prod. (Bbbl)	Spill[2] Rate (Spills/Bbbl)	No. of Spills	Mean Volume[3] /Spill (bbl)	Volume (Bbbl)	Spill[2] Rate (Spills/Bbbl)	No. of Spills	Mean Volume[3] /Spill (bbl)	Volume (Bbbl)	Total Number of Spills	Total Volume Spilled (bbl)
North Slope Spills <50 barrels											
Federal Sale 144 (Base Case)	1.200	814	977	0.62	605.74	247	296	0.60	177.60	1,273	783.34
Fed. Leased & Undeveloped	0.20	814	163	0.62	101.06	247	49	0.60	29.40	212	130.46
State Developed	5.567	814	4,532	0.62	2,809.84	247	1,375	0.60	825.00	5,907	3,634.84
State Undeveloped	0.584	814	475	0.62	294.50	247	144	0.60	86.40	619	380.90
Total	8.291		6,147		3,811.14		1,864		1,118.40	8,011	4,929.54
North Slope Spills 50 to <1,000 barrels											
Federal Sale 144 (Base Case)	1.200	1.61	2	129.76	259.52	4.82	6	324.42	1,946.52	8	2,206.04
Fed. Leased & Undeveloped	0.20	1.61	0	129.76	0.0	4.82	1	324.42	324.42	1	324.42
State Developed	5.567	1.61	9	129.76	1,167.84	4.82	27	324.42	8,759.34	36	9,927.18
State Undeveloped	0.584	1.61	1	129.76	129.76	4.82	3	324.42	973.26	4	1,103.02
Total	7.551		12		1,557.12		37		12,003.54	49	13,560.66
Total North Slope Spills <1,000 barrels											
			6,159		5,368.26		1,901		13,121.94	8,060	18,490.20
Trans-Alaska Pipeline Spills <50 barrels											
Federal Sale 144 (Base Case)	1.200	207.07	248	0.52	128.96	24.72	30	0.56	16.80	278	145.76
Fed. Leased & Undeveloped	0.20	207.07	41	0.52	21.32	24.72	5	0.56	2.80	46	24.12
State Developed	5.567	207.07	1,153	0.52	599.56	24.72	138	0.56	77.28	1,291	676.84
State Undeveloped	0.584	207.07	121	0.52	62.92	24.72	14	0.56	7.84	135	70.76
Total	7.551		1,563		812.76		187		104.72	1,750	917.48
Trans-Alaska Pipeline Spills 50 to <1,000 barrels											
Federal Sale 144 (Base Case)	1.200	0.96	1	86.31	86.31	-	-	-	-	1	86.31
Fed. Leased & Undeveloped	0.20	0.96	0	86.31	0.0	-	-	-	-	0	0.0
State Developed	5.567	0.96	5	86.31	431.55	-	-	-	-	5	431.55
State Undeveloped	0.584	0.96	1	86.31	86.31	-	-	-	-	1	86.31
Total	7.551		7		604.17	-	-	-	-	7	604.17
Trans-Alaska Pipeline Spills <1,000 barrels											
			1,570		1,416.93		187		104.72	1,757	1,521.65
Total North Slope and Trans-Alaska Pipeline Spills <50 barrels											
			7,710		4,623.90		2,051		1,223.12	9,761	5,847.02
Total North Slope and Trans-Alaska Pipeline Spills 50 to <1,000 barrels											
			19		2,161.29		37		12,003.54	56	14,164.83
Total North Slope and Trans-Alaska Pipeline Spills <1,000 barrels											
			7,729		6,785.19		2,088		13,226.66	9,817	20,011.85

Source: USODI, MMS, 1995.

[1] Total Estimated Cumulative Production, Appendix B, Table B-54

[2] Appendix B, Table B-56.

[3] Appendix B, Table B-55

APPENDIX C

ENERGY ALTERNATIVES TO THE PROPOSED ACTION

ENERGY ALTERNATIVES TO THE PROPOSED ACTION

A. ENERGY ALTERNATIVES CONSIDERED: For the EIS prepared in response to the Comprehensive Program 1992-1997, an extensive list of possible alternatives to OCS oil and natural gas was considered. This list is reproduced in Table C-1 below. Many of these alternatives are very expensive, environmentally unattractive, or both. On the basis of cost and environmental attractiveness, the list of alternatives whose environmental effects would be considered in depth was reduced to the shorter list reproduced in Table C-2. A complete discussion of the rationale behind these lists can be found in *Comparative Environmental Analysis of Energy Alternatives to OCS Oil and Gas* in USDOI, MMS, 1992, the EIS for the Comprehensive Program 1992-1997, Volume III. This document is incorporated by reference.

TABLE C-1
Possible Energy Alternatives to OCS Oil and Gas

Oil and Gas Supply Substitutes	
-U.S. Onshore Conventional Oil	-U.S. Onshore Conventional Gas
-Domestic Enhanced Oil Recovery	-Tight Sands Gas
-Tar Sands	-Coalbed Methane
-Imported Oil	-Devonian Shale
-Oil from Shale	-Imported Gas
Fuel Substitutions	
-Nuclear (electric)	-Solar Ponds
-Coal	-Wood (natural or plantation)
-Coal Synfuels (liquids or gas)	-Methanol (from natural gas or coal)
-Geothermal	-Ethanol (from corn, sugar cane, or biomass)
-Hydro (electric)	-Agricultural Biomass
-Wind (electric)	-Municipal Waste
-Tidal Power	-Hydrogen
-Ocean Thermal (electric)	-Peat
-Photovoltaic	-Waste Heat
-Solar Radiation Concentrators	
Conservation	
-Improved Building Shells	
-More Efficient Conversion Technologies (e.g., CAFE, Appliance Efficiency)	
-Reduced Amounts of Goods and Services	

TABLE C-2 Energy Alternatives Considered for Environmental Analysis
Energy Alternatives to OCS Oil:
• Supply Substitution - Increased onshore domestic oil production - Increased import of oil • Fuel substitution in transportation - Imported methano--from foreign natural gas - Gasohol--ethanol from corn - Compressed natural gas--from domestic natural gas - Electric cars • Conservation measures - Transportation--increased fuel economy/diesel engines/public transportation - Industrial--reduced consumption of plastics
Energy Alternatives to OCS Natural Gas:
• Supply substitution - Increased onshore domestic gas production - Increased liquid natural gas (LNG) imports • Fuel substitution in electricity generation - Coal - Nuclear - Residual fuel oil • Renewable sources of electricity generation - Wind - Solar Thermal - Photovoltaic - Hydropower • Conservation measures - Conservation in residential gas appliances

New technology might change this most likely list over time; however, there is little basis for anticipating which alternatives might become more attractive in the future. Thus, the present section only analyzes the environmental effects associated with those alternatives listed in Table C-2.

The following sections consider the nature and environmental effects of alternatives to the oil and natural gas that may be produced from leases sold in Sale 144. Tables C-3 and C-4 show the equivalent quantities of alternative energy sources that may be required should this lease be cancelled.

B. EFFECTS ASSOCIATED WITH REPLACEMENTS FOR OIL PRODUCED FROM SALE 144:

1. Oil-Supply Substitutes:

a. Increased Oil Imports: The major environmental effects associated with the expanded importation of oil include: (1) the generation of greenhouse gases and regulated air pollutants from both transportation and dockside activities, emissions of pollutants (NO_x, SO_x, and VOC's) implicated in the formation of acid rain, and tropospheric and stratospheric ozone formation; (2) degradation of water quality from oil spills occurring from either accidental or intentional discharges or tanker casualties; (3) possible destruction of flora and fauna and recreational and scenic land and water areas from oil spills; and (4) the public aversion to the risk of increased oil spills.

b. Increased Onshore Domestic Crude Oil Production: The greatest potential for significantly increasing the domestic crude-oil supply lies in successful application of enhanced oil recovery (EOR) processes to known reservoirs and by additional drilling in existing fields (infill drilling). The EOR processes fall into the categories of chemical flooding, miscible flooding, and thermal recovery methods. A key feature common to all three methods is the need to inject liquids or gases to mobilize and displace otherwise unrecoverable oil. The EOR activities usually do not impose significant additional negative effects in areas where primary and secondary recovery already has occurred.

The major environmental effects associated with expanded domestic onshore oil production using EOR techniques include: (1) potential degradation of local ambient-air quality from atmospheric emissions of dust, engine exhaust, off-well gases, gas-flaring products, particulates, SO_2, CO, NO_x, H_2S, and hydrocarbons and the consequent formation of acid rain and tropospheric ozone and depletion of stratospheric ozone; (2) potential degradation of local and national air quality due to emissions of greenhouses gases, especially CO_2 used in miscible flooding; (3) possible degradation of both surface-water and groundwater quality from spills or leaks of process chemicals during handling, mixing, or injection and increased potential for chemical contamination of drinking water by injected fluids left in the reservoir; (4) expanded land use through more intensive field development (i.e., more wells, roads, injection lines, and facilities); and (5) health risks to workers from the handling of the toxic chemicals used in thermal and chemical recovery processes.

2. Fuel Substitution in Transportation: The transportation sector consumes over 40 percent of petroleum products sold in the United States. Any reduction in demand for petroleum by the transportation sector would have a significant impact on overall demand. Demand for petroleum by the transportation sector might be reduced in two ways: first by substituting a less polluting alternative for the oil, and second by conserving fuel through improvements in private and public vehicle efficiency.

Viable alternative transportation fuels include imported methanol, ethanol distilled using domestic corn, compressed natural gas, and electricity:

The major environmental impacts associated with expanded use of imported methanol as an alternative to gasoline include: the deterioration of air quality from the emissions of various regulated pollutants during tanker transportation; possible water and land degradation from spills, leaks, and port expansion; and handling related health and safety issues.

Expanded production of ethanol for use as a blending component in gasoline would result in severe adverse environmental impacts. Bioconversion plants generate more regulated air pollutants per unit of energy output than any other fuel production process mentioned in this analysis. The production of ethanol produces no net increase in greenhouse gases. Nevertheless, the emissions of NO_x would have negative impacts on stratospheric ozone. Both water runoff from corn production and spills and leaks of wastewater from ethanol conversion plants contribute to water quality degradation. Increased corn production for additional ethanol would have widespread, adverse impacts on the land in terms of soil erosion, loss of wildlife habitat, and the depletion of soil quality. The nontoxic solid wastes produced during ethanol conversion degrade the environment by occupying large areas of land and by introducing materials that leach into groundwater and surface water supplies.

Domestically produced natural gas can be compressed and used as a substitute for gasoline in passenger vehicles. The environmental impacts of natural gas for passenger car use are the same as natural gas for other uses from a production and transportation perspective. These impacts are summarized in the discussion of domestic onshore production.

The environmental impacts associated with electricity as a gasoline substitute are dependent upon the primary energy source used to produce the electricity. Some of these impacts are considered in the subsequent natural gas section.

3. *Conservation Measures:*

a. Increased Fuel Economy in the Transportation Sector: Conservation of oil in the transportation sector can take many forms. One option is increasing fuel efficiency in conventional gasoline-powered vehicles by implementing new technologies that allow a vehicle to operate more efficiently with no loss in performance or size. Other measures include driving smaller and lighter cars, driving at slower speeds, replacing gasoline engines with diesel engines, and using public transportation more frequently. All of these measures are believed to have positive net impacts on the environment.

b. Reduced Consumption of Plastics: Within the industrial sector, oil's main future use will be as a chemical feedstock. A major end use category for petrochemicals is plastics. Because petroleum hydrocarbons are the major feedstock for plastics, the reduced consumption of plastics is an energy alternative to OCS oil production.

To reduce consumption of petroleum by reducing plastic feedstock consumption, an alternative must be found for the end use product made from plastic resin. In most cases, the easiest alternative is to make the final product from a different material. One example would be less use of plastic in an automobile through the substitution of steel, but this substitution could lead to greater energy consumption. Additional steel would require additional coal with all of its attendant environmental impacts. Additionally, if metal is substituted into an automobile, the extra weight will make it less fuel-efficient, raising its gasoline use. This increased demand for gasoline would increase environmental impacts from oil production and transportation whether the crude oil was OCS-produced or imported oil. As seen from this example, reduced use of plastic products in the vehicle may not reduce oil use. This effect will most likely be true for many alternatives to plastic products. Although impacts associated with plastic production will be decreased if an alternative is implemented, there will always be other impacts associated with the substitute's production and use.

C. EFFECTS ASSOCIATED WITH REPLACEMENTS FOR NATURAL GAS PRODUCED FROM SALE 144:

Commercial natural gas production is not expected from tracts leased in Sale 144. Nevertheless, it is possible that natural gas may be produced from these tracts at some time in the future. In the unlikely event that commercial natural gas production does occur from these tracts, this section discusses possible alternatives to that gas and the environmental effects associated with each alternative.

1. *Gas Supply Substitution:*

a. Increased Onshore Domestic Natural Gas Production: Over the next 10 years, tight sands gas and coalbed methane reserves have the potential to contribute substantially to the U.S. supply of natural gas. Methane gas from coal seams has an excellent chance for development and is already successfully marketed from several areas. Total reserves in the United States are estimated to range between 80 and 400 Tcf. Thirteen western tight gas basins have been identified and are estimated to contain in excess of 400 Tcf of nonassociated gas in place.

The environmental impacts that result from producing unconventional reserves of natural gas from tight sands and coalbed formations will entail a slightly increased risk to the environment over conventional gas production. As with conventional production, there will be emissions of noise and regulated pollutants from diesel and gas-fueled support equipment, compressor engines, and fugitive leaks from accessory equipment. Emissions of SO_x, NO_x, and VOC's could potentially exacerbate acid rain levels and increase tropospheric ozone formation. Additionally, the emissions of NO_x could have negative impacts on stratospheric ozone. There will also be emissions of greenhouse gases, especially methane and CO_2, but these quantities will be less than those generated from conventional production activities. The primary wastes of onshore gas production are "produced water" that exists naturally in oil and gas formations and drilling fluids. The major environmental water quality concern associated with tight sands gas and coalbed methane recovery have to do with the use of hydraulic fracturing where the potential exists for contamination or disruption of aquifers from injection of toxic fracturing fluids. Conventional land preparatory activities adversely affect ecosystems, soil, wildlife, and possibly wetlands depending on where the wells are located. The major societal impacts are risks to workers from handling the toxic chemicals added to the fracturing fluid.

b. Increased LNG Imports: The production and liquefaction of natural gas has environmental impacts, but these impacts, except for the global warming impact, will be felt in the countries where the natural gas is produced and subsequently liquified. Effects considered here begin at the point where the tanker transporting the imported liquified natural gas (LNG) enters U.S. waters.

The only major environmental impact associated with expanded LNG use would occur if an LNG carrying tank punctures or leaks during unloading or use. Because LNG readily vaporizes but does not disperse quickly and remains near ground level, accidental ignition of the vapor clouds would have tremendous explosive power. Regulated pollutant emissions during transport and unloading are not a significant problem due to special combustion systems built into LNG ships, the nature of natural gas, and the special unloading process used for this fuel.

2. *Fuel Substitution for Gas in Electricity Generation:*

a. Coal: The major environmental impacts of expanded coal use include: deterioration of ambient air quality from emissions of regulated pollutants, aldehydes, and toxins from surface mining activities; noise from mining activities; the elimination of vegetation and displacement or destruction of wildlife habitat associated with surface mining; deterioration of water quality and possible elimination of aquatic life from acid mine drainage and mine water runoff which may contain toxic trace substances; the problem of disposal of solid wastes produced during mining; the visual intrusions on the land from surface mining residuals; and occupa- tional hazards and risks to workers from exposure to physical danger, noise, solvents, coal dust, and potential mutagens and carcinogens, such as polycyclic aromatic hydrocarbons.

b. Nuclear: The major environmental impacts associated with an expanded use of nuclear energy include: potential releases of small amounts of radiation during mining, processing, and the use of radioactive materials; surface water and groundwater deterioration from the disposal of low-level radioactive wastes and considerable public anxiety about radiation.

c. Residual Fuel Oil: Residual fuel oil is a heavy petroleum product remaining after the more valuable petroleum products have been distilled from crude oil. The United States both produces and imports residual fuel oil. On the margin, the additional residual fuel needed to replace OCS gas would be imported. Consequently, the environmental impacts of importing and then distributing residual fuel oil within the United States are considerable to be similar to those arising from imported crude oil.

3. Renewable Sources of Electricity Generation: In general, renewable energy resources are often considered to be environmentally benign by comparison with most "conventional" energy resources like fossil fuels, which are not renewable. The term renewable refers to energy flows which are continuously generated and are of a physical nature rather than of a chemical nature as are fossil fuels. Although these energy flows are continuously generated, they are not always available; i.e., the sun contin- uously generates radiant energy, but due to the rotation of the earth, cloud cover, etc., the energy is not always available. Most of these renewable energy sources have been utilized in the past, though past applications were often rudimentary and on a small scale. Currently, however, some of these sources are being developed commercially on a large-scale to deliver energy in the form of electricity or heat.

The total environmental impacts of the renewable energy source will depend on the technologies used, the scale of operation, and the geographical distribution of the systems. Because the energy sources are physical in nature rather than chemical, their environmental impacts primarily will be physical.

a. Wind: Wind turbines are used to convert wind into useful mechanical or electrical energy. Almost all turbines re erected in clusters called "wind farms." Expanding generation of electricity with wind power would generate the following major environmental impacts: disturbance of sizable land areas as thousands of giant windmills disrupt existing uses and impact wildlife, the possibility of erosion and changes in drainage patterns in certain areas, visual impacts, considerable noise, and interference with television reception. In addition, the establishment of large windmills will produce an indirect environmental impact by increasing the demand for steel, and thus iron and coal with all their attendant problems.

b. Solar Thermal: Solar thermal electric plants concentrate the radiant energy from the sun to create steam which is used to generate electricity. The active systems which are considered to be both economical and efficient include central receivers, parabolic dishes and solar troughs. The central receiver system utilizes an array of sun-tracking mirrors (heliostats) which reflect solar radiation onto a receiver mounted on top of a central tower. Parabolic dishes and troughs are distributed-collector systems which track the sun. The basic difference between the central receiver and the distributed collector systems is that in the former, the solar energy radiating on a large area is transmitted to a central point as radiation, while in the latter, the energy is carried as heat in a fluid.

The major environmental impacts associated with increased use of solar energy production include: use of large land areas for sitings of reflectors or heliostats, some water quality degradation due to the discharge of waste rinse solutions, loss of wildlife habitat, intense reflections from heliostats, visual disturbances, and the emissions associated with the fabrication of materials used to construct the systems.

c. Photovoltaic: Photovoltaic energy systems use chemical processes to convert the sun's radiant energy directly into electricity. The major environmental impacts associated with the expanded use of photovoltaics as a source of electricity include: the deterioration of air quality from emissions of toxic air pollutants released during production of the photovoltaic cells and from leaks at the plant; the problem of disposing of toxic and nontoxic solid wastes produced during the production of the cells; and the potential for adverse land impacts from photovoltaic plant construction and decommissioning.

d. Hydropower: Hydroelectric power projects use the energy of flowing water to generate electricity. Usually hydro projects require a dam to create a reservoir of water except in those instances where a naturally occurring waterfall provides the energy to drive the generators. The water from the reservoir flows through generator turbines which produce the electricity. At present, hydropower is a major source of energy for electricity generation worldwide.

Since hydropower exploits the energy in an existing body of water, the environmental consequences of cpm- structing and operating a hydro facility result principally from modifying free-flowing waters. The severity of the impacts will vary from site to site depending on the type of project and specific fish species and terrain that are affected.

The major environmental impacts associated with increased hydroelectric power generation include: micro- climatic changes surrounding the reservoir; aquatic habitat, and water quality degradation due to water losses downstream and fluctuations in water levels and releases of toxins caused indirectly from thermal stratification; adverse impacts on flora and fauna and disruption of wildlife habitats from flooding and hydropower construc- tion activities; erosion of stream beds, estuaries, deltas, and seashores from increased river velocity; potential losses or gains to recreation and tourism; visual intrusions on the landscape from excavation of dam building materials; and societal impacts such as population relocation, the potential expansion of agriculture, and control of flooding.

4. Conservation: Consumers could realize significant reductions in natural gas use through the use of more efficient gas appliances. These savings could accrue to the residential and commercial sectors through the adoption of more efficient furnaces and better insulated water heaters. Firms in the industrial sector could lower their natural gas consumption by installing more efficient gas using equipment, improving insulation, and using energy saving process improvements.

Reductions in natural gas consumption through conservation would lead to reduced negative environmental effects associated with the production and transportation of natural gas. The only negative environmental effects associated with conservation might be some minor impacts related to increased production of insulating materials and other effects associated with production of more efficient equipment to replace obsolete equipment that had not yet worn out.

D. ENERGY EQUIVALENTS:

Table C-3 Energy Anticipated to Be Produced from the Proposed OCS Sale 144—Beaufort Sea	
Anticipated Production	
Total Crude Oil Production	12.00×10^8 (bbl)
Total Natural Gas Production	0.00 (cf)
Energy Equivalent	
Crude Oil BTU Equivalent @ 5.80×10^6 BTU/bbl[1]	69.60×10^{14} (BTU)
Natural Gas BTU Equivalent @ 1.03×10^3 BTU/cf[2]	0.00 (BTU)
Total Oil and Gas BTU Equivalent[3]	69.60×10^{14} (BTU)

Table C-4 Equivalent Amounts of Energy Needed from Other Sources to Replace Anticipated Oil Production from the Proposed OCS Sale 144—Beaufort Sea	
Alternative Energy Source	Amount of Resource Needed to Provide an Equivalent Amount of BTU's
Onshore Domestic Oil Production	12.00×10^8 (bbl)
Imported Oil	12.00×10^8 (bbl)
Methanol @ 2.71×10^6 BTU/bbl[3]	25.68×10^8 (bbl)[4]
Ethanol @ 3.55×10^6 BTU/bbl[5]	19.62×10^8 (bbl)[6]
Compressed Natural Gas @ 5.63×10^3 cf/BOE[7]	67.56×10^{11} (cf)[8]
Electric Cars (not directly convertible to BTU)	

Table C-5 Energy Potentially Available from Other Sources to Replace Any Possible Gas Production from the Proposed OCS Sale 144—Beaufort Sea
Alternative Energy Source Equivalents
Onshore Domestic Gas @ 1.03×10^3 BTU/cf
Liquid Natural Gas Imports @ 1.03×10^3 BTU/cf
Coal @ 2.17×10^7 BTU/T[9]
Nuclear @ 6.51×10^8 BTU/T of ore[10]
Residual Fuel Oil @ 6.29×10^6 BTU/bbl[11]
Wind (not directly convertible to BTU's)
Solar Thermal (not directly convertible to BTU's)
Photovoltaic (not directly convertible to BTU's)
Hydropower (not directly convertible to BTU's)

[1] and [2] USDOE, Energy Information Administration (EIA), *Monthly Energy Review*, p. 152-3. August 1993.
[3] Oak Ridge National Lab. (ORNL), *Transportation Energy Data Book*: Ed. 9, prepared for the USDOE. April 1987.
[4] 2.00×108^8 bbl oil (5.80×10^6 BTU/1 bbl oil) x (bbl methanol/2.71×10^6 BTU).
[5] ORNL, *Transportation Energy Data Book*.
[6] 2.00×10^8 bbl oil x (5.80×10^6 BTU/1 bbl oil) x (1 bbl ethanol/3.55×10^6 BTU).
[7] (5.80×10^6 BTU/1 bbl oil) x (1 cf gas/1.03×10^3 BTU).
[8] (5.63×10^3 cf/1 BOE) x 2.00×10^8 bbl.
[9] EIA, *Monthly Energy Review*, p. 153.
[10] Science and Public Policy Program, 1975, pp. 6-9; cited in USDOI, MMS, Alaska OCS Region, 1990 (Beaufort Sea Sale 124 FEIS).
[11] EIA, *Monthly Energy Review*, p. 151.

APPENDIX D

MMS ALASKA OCS REGION

ENVIRONMENTAL STUDIES PROGRAM

MMS, ALASKA OCS REGION
ENVIRONMENTAL STUDIES PROGRAM

The Alaska Environmental Studies Program (ESP) was initiated by the U.S. Department of the Interior (USDOI) in 1974 in response to the Federal Government's decision to propose areas of Alaska for offshore gas and oil development. Federal management of the Outer Continental Shelf (OCS) is guided by several legislative acts. Regulations implementing the OCS Lands Act (OCSLA) of 1953, as amended in 1978 (OCSLAA), designated the Bureau of Land Management (BLM) as the administrative agency responsible for leasing and the U.S. Geological Survey (USGS) as responsible for supervising classification, evaluation, development, and production of mineral resources on submerged Federal lands. The offices under BLM and USGS responsible for offshore leasing were reorganized as the Minerals Management Service (MMS) in 1982. One of the goals of the OCSLA was to provide for the protection of the environment concomitant with mineral-resource development. The OCSLA requires the Secretary of the Interior to conduct environmental studies to obtain information pertinent to sound leasing decisions as well as to monitor the human, marine, and coastal environments (OCSLAA, 1978 [P.L. 95-372, Sec. 20]). Also, the National Environmental Policy Act (NEPA) of 1969 requires that all Federal Agencies use a systematic, interdisciplinary approach that will ensure the integrated use of the natural and social sciences in any planning and decisionmaking that may have effects on the environment. Federal laws impose additional requirements on the offshore leasing process, including the Coastal Zone Management Act; Federal Water Pollution Control Act Amendments; Marine Mammal Protection Act (MMPA); Endangered Species Act; and Marine Protection, Research, and Sanctuaries Act.

The ESP is unique among the various components of the offshore leasing program. The purpose of the ESP is to define information needs and implement studies to assist in predicting, assessing, and managing potential effects on the human, marine, and coastal environments of the OCS and coastal areas that may be affected by gas and oil development. Lease-management decisions are enhanced when current, pertinent, and timely information is available. To attain program goals, data on specific environmental, social, and economic concerns arising from offshore leasing are required. The ESP then monitors any effects during and after oil exploration and development. It is the largest, single-agency, mission-oriented, marine-studies program in the Federal Government. More than $500 million have been spent on the ESP nationally, with more than $250 million of this amount funding Alaskan studies on 15 planning areas in the Arctic, Bering Sea, and Gulf of Alaska Subregions.

Early in the development of the program, the focus was on obtaining baseline information on the vast biological resources and physical characteristics of the Alaskan environment for prelease decisionmaking. These studies included biological surveys of marine species, basic oceanography and meteorology, and geologic and sea-ice phenomena. As a broader base of information was established, it became possible to focus on more topical studies in smaller areas to answer specific questions and fill identified information needs. In addition, a number of generic studies were initiated on the potential effects of oil contamination on biological resources and on the probable transport and dispersion of oil that might be spilled in the marine environment. These latter analyses are used to predict areas likely to be at greatest risk from possible pollution incidents. The use of computer -modeling techniques has been implemented to aid in the assessment of potential oil-spill and other pollutant risks to the environment and to key species such as fur seals, sea otters, and endangered whales. Modeling also has been used in the ecosystem studies, especially where extrapolation to other areas seemed warranted.

As more disciplinary data were collected and analyzed, the importance of taking an integrated, interdisciplinary look at complete ecosystems in sensitive areas became apparent. During this time, the leasing program was maturing. As a number of sales were held and exploration activities began, postlease studies to monitor the possible effects of gas and oil activities on the environment and resources of these areas were initiated. The program has begun to provide information for the development of the 5-year leasing schedule, continues to provide information for prelease- and lease-related decisions, and develops monitoring information necessary for postlease management.

As studies information has been amassed, improved focus has required greater integration of various scientific disciplines. The MMS has initiated synthesis meetings, information update meetings (IUM's), and information transfer meetings (ITM's) to gather maximum expertise and assess the status of existing information, and to plan the best possible approach to a study within the constraints of time and resources. As more pertinent infor- mation is collected by the MMS and other Federal and State Agencies, studies are funded to search and evaluate existing literature and data prior to initiation of field efforts. This prevents duplication of effort and saves valuable resources by focusing later study efforts on the areas of greatest information need and highest usefulness to MMS decision needs.

As noted by the National Research Council (1994), the MMS Alaska ESP is "extensive, substantive and high quality." However, the Alaska ESP has been challenged to meet its mission in an increasingly conservative fiscal environment. For example, the Alaska ESP's funding has declined approximately 80 percent since 1986. Thus, Mission, Partnerships, Quality Science, and Responsiveness have become themes of increasing importance to the MMS Alaska ESP. The MMS remains committed to attaining quality environmental and socioeconomic information. Always a strong point, public input in planning the ESP has remained a cornerstone of the program's success.

INTRODUCTION AND STRATEGY OVERVIEW: From the initiation of the Alaskan program, environmental studies have been categorized into several broadly defined subjects. Baseline information on the distribution, abundance, and migratory patterns of marine species; potential disturbances to the marine environment; and oceanographic and meteorological conditions were integrated into the design of multi- disciplinary studies. Major categories of study have included the disciplines of environmental geology, physical oceanography, biology, protected species, fate and effects, and social and economic sciences.

The integration and synthesis of multiagency, multidisciplinary studies results in a regional overview that is an important element of the overall environmental assessment and studies-planning process in Alaska. The wealth of information collected during this long-term program is synthesized and updated continually to be meaningful to decisionmakers. Since 1978, MMS sponsored synthesis meetings to bring investigators and managers together to review the status of knowledge in a given area, such as the Beaufort Sea, and to discuss the impli- cations of proposed gas and oil development. Because multiple sales now have been held in many areas of Alaska, the basic synthesis task has been performed for most regions on the OCS surrounding Alaska.

However, new information still must be relayed to decisionmakers in a timely manner; and the question of cumulative effects from other new human uses of the OCS and from successive State and Federal sales must be considered. An ITM usually is scheduled for each region to allow integration of multidisciplinary data from the social and natural sciences into the assessment process. Results of these efforts are published as regional reports and provide input to environmental impact statements (EIS's). These publications and lists of current and completed projects are available for all of the major Alaskan lease-sale planning areas in the Arctic, Bering Sea, and Gulf of Alaska. The studies program maintains a computerized bibliography of reports based on MMS-funded research.

The ESP also supports publication of study results in peer-reviewed literature. Hundreds of papers based on Alaska OCS studies have been published in scientific journals and books, and several hundred more in published conference proceedings. This improves both the quality of study reports and the distribution and availability of study results to a wide audience.

Recently, the U.S. and seven other Arctic nations voluntarily agreed to cooperate on an Arctic Environmental Protection Strategy (AEPS). The AEPS prescribes internationally coordinated actions to monitor and control oil pollution and five other types of pollutants through the Arctic Monitoring and Assessment Program (AMAP). Because AEPS and AMAP are nonbinding agreements, there is no legislative authority for their implementation and no direct budget; however, MMS will try to support the essence and specifications of these strategies.

PRELEASE CONSIDERATIONS: The Alaskan ESP includes three broad regions—the Arctic, the Bering Sea, and the Gulf of Alaska. Seventeen sales have been held—seven in the Arctic (Sales BF, 71, 87, 97, 109, 124, and 126), six in the Gulf of Alaska (Sales 39, 55, RS1, RS2, CI, and 60), and four in the Bering Sea (Sales 57, 70, 83, and 92).

The current 5-year leasing schedule (1992-1997) remains the major consideration for the design and management of the studies program. The ideal environmental studies program in a frontier area provides a minimum 4-year period preceding a sale to obtain information needed for an assessment of potential offshore effects. However, in a frontier region such as the Alaskan Arctic—with large planning areas, potential environmental hazards associated with offshore activities, and still-developing technology required for hydro- carbon extraction—maximum lead time is necessary to conduct adequate environmental assessments. The planning areas listed in the schedule are shown in

Figures 1, 2, and 3. The studies and schedules recommended in this study plan may require modification to reflect the addition or deletion of sales and the modification of timing for a particular sale depending on what sales are in the 5-year CP.

Arctic Leasing Activities: The offshore Arctic Subregion extends across the OCS off Alaska from the Bering Strait to the Canadian border. Below are the Arctic planning areas and the status of their respective completed and proposed lease sales. (Future lease sales on the current 5-year leasing schedule are shown in bold type.)

Beaufort Sea	Chukchi Sea	Hope Basin
Sale BF - December 1979	Sale 109 - May 1988	**Sale 159 - 1998**
Sale 71 - October 1982	Sale 126 - August 1991	
Sale 87 - August 1984	**Sale 148 - 1998**	
Sale 97 - March 1988		
Sale 124 - June 1991		
Sale 144 - late 1996		

Two sales included in the current 5-year leasing schedule—Chukchi Sea Sale 148 and Hope Basin Sale 159—have been deferred for possible leasing in the future.

Bering Sea Leasing Activities: The Bering Sea Subregion consists of five planning areas. The Bering Sea planning areas are listed below along with the status of their respective sales.

Norton Basin	Navarin Basin
Sale 57 - March 15, 1983	Sale 83 - April 17, 1984
Sale 100 - Canceled	Sale 107 - Deferred
Sale 120 - Canceled	Sale 130 - Canceled

St. George Basin	North Aleutian Basin
Sale 45 - Canceled	Sale 51 - Canceled
Sale 70 - April 12, 1983	Sale 75 - Canceled
Sale 89 - Canceled	Sale 92 - October 11, 1988
Sale 101 - Canceled	(moratorium)
Sale 153 - late 1997	Sale 117 - Canceled

The current 5-year leasing schedule includes only one lease sale in the Bering Sea. However, due to lack of industry interest, MMS is not proceeding with St. George Basin Sale 153.

Gulf of Alaska Leasing Activities: The Gulf of Alaska encompasses several planning areas. Early lease sales and supporting study efforts focused on the northeastern Gulf of Alaska, Cook Inlet, Shelikof Strait, and Kodiak. Recent study efforts have been concentrated in the Cook Inlet Planning Area because of proposed lease sales and industry interest. Below are the Gulf of Alaska planning areas and the status of their respective lease sales.

Gulf of Alaska	Cook Inlet
Sale 39 - April 13, 1976	Sale CI - October 27, 1977
Sale 55 - October 21, 1980	Sale 60 - September 29, 1981
Sale RS1 - June 30, 1981	Sale RS2 - August 5, 1982
Sale 88 - Canceled	Sale 88 - Canceled
Sale 114 - Canceled	Sale 114 - Canceled
Sale 158 - mid-1997	**Sale 149 - mid-1996**

Kodiak	Shumagin
Sale 46 - Canceled	Sale 86 - Canceled
Sale 61 - Canceled	Sale 129 - Canceled
Sale 99 - Canceled	

Environmental Studies in Relation to the Prelease Process: The MMS offshore prelease program is a primary determinant of studies-information needs. There are many steps in the leasing process that require environmental information. Prelease steps include:

- Information Base Review (IBR)
- Request for Interest and Comments
- Call for Information and Nominations and Notice of Intent to Prepare an Environmental Impact Statement
- Proposed Action and Alternatives Memorandum
- Draft EIS
- Proposed Notice of Sale
- Final EIS
- Consistency Determination
- Final Notice of Sale

POSTLEASE CONSIDERATIONS: Prior to FY 1982, most studies of the Alaskan offshore were planned, conducted, and concluded before a sale was held to provide decision information for the EIS. How- ever, it is apparent that not all informational needs can be obtained prior to a sale. Since gas and oil production would normally occur 8 to 15 years after leasing, postlease studies may continue to address environmental concerns and acquire additional information for development-and-production-phase environmental analyses. Future study plans may become more closely related to development schedules and monitoring and evaluation needs rather than leasing schedules. In the past, lease-schedule changes have disrupted the orderly progression of the studies program and resulted in an information lag for various offshore leasing events because of the time needed to plan and conduct studies. Because the Alaskan offshore leasing program ranges from a northern temperate climate to the Arctic, a systematic, orderly studies approach is a necessity.

There are many steps in the postlease process that require environmental information. Postlease steps that require environmental data and assessment are:

- Exploration plans
- Drilling permits
- Transportation plans
- Development and production plans
- Pipeline permits
- Lease termination or expiration (platform abandonment)

At each step of the offshore-lease-management process, a variety of potential resource-use conflicts may be encountered. Consequently, basic management questions serve to further define the information needs that environmental studies must address. To focus the studies, several questions about multiple-use conflict have been formulated. Two questions are fundamental: (1) what is the expected reduction in benefits to humans from natural resources due to major multiple-use conflicts of the proposal; and (2) can this loss be minimized by mitigating measures? Use conflicts occur between offshore oil activities and subsistence living, commercial fishing, recreation, social infrastructure, ecological relationships, air and water quality, archaeological and historical resources, shipping conflicts, and environmental hazards to technology.

To date, there has been no OCS production development or production offshore Alaska. However, exploration, artificial-island construction and abandonment, and unitization agreements (include suspension of leases) have occurred.

Arctic Exploration Activities: Since the mid-1940's, the Arctic has been an area of great geologic interest and significant gas and oil discoveries, culminating in the development of the coastal Prudhoe Bay field and adjacent Kuparuk, Lisburne, Endicott, Niakuk, and Milne Point fields. There were four oil discoveries in the central and eastern portions of the Beaufort Sea that have since been unitized. In the central Beaufort Sea north of Prudhoe Bay are the exploratory wells located near Seal Island, OCS-0181 No. 1 (part of the Northstar Unit), and the Sandpiper wells, OCS-0370 and OCS-0371 (Sandpiper Unit), west of the Seal Islands. In the eastern Beaufort Sea, the Hammerhead No. 1 and No. 2 wells, OCS-0849, form the Hammerhead Unit, whereas two Kuvlum wells, OCS-0866 and OCS-0865, form the Kuvlum Unit. Below are the Arctic Planning Areas and lease sales that have resulted or may still result in exploration activities.

Beaufort Sea	Chukchi Sea
Sale BF - December 1979	Sale 109 - May 1988
Sale 71 - October 1982	Sale 126 - August 1991
Sale 87 - August 1984	
Sale 97 - March 1988	
Sale 124 - June 1991	

Bering Sea Exploration Activities: Below are the Bering Sea planning areas and lease sales that have resulted or may still result in exploration activities.

Norton Basin	Navarin Basin
Sale 57 - March 15, 1983	Sale 83 - April 17, 1984
St. George Basin	North Aleutian Basin
Sale 70 - April 12, 1983	Sale 92 - October 11, 1988 (moratorium)

After initial lease sales and exploration, there were no discoveries in the St. George and Navarin Basins, and all leases have been relinquished. The current 5-year leasing schedule includes only one lease sale in the Bering Sea; however, due to lack of industry interest, MMS is not proceeding with St. George Basin Sale 153. Exploratory drilling, aside from one Continental Offshore Stratigraphic test (COST) well, has not occurred in the North Aleutian Basin due to Congressional moratoriums. At present, there is no drilling activity in the Bering Sea; and no geologic and geophysical permits have been issued for the area since FY 1988.

Gulf of Alaska Exploration Activities: The Gulf of Alaska encompasses several planning areas. Early lease sales and supporting study efforts focused on the northeastern Gulf of Alaska, Cook Inlet, Shelikof Strait, and Kodiak. Recent study efforts have been concentrated in the Cook Inlet Planning Area because of proposed lease sales and industry interest.

There have been no commercial discoveries on any portion of the Gulf of Alaska Subregion to date, and there are no active leases. However, production and new commercial discoveries in Upper Cook Inlet continue on State lands. Below are the Gulf of Alaska planning areas and sales that have resulted in exploration activities.

Gulf of Alaska	Cook Inlet
Sale 39 - April 13, 1976	Sale CI - October 27, 1977
Sale 55 - October 21, 1980	Sale 60 - September 29, 1981

EXAMPLES OF SPECIFIC DECISIONS AFFECTED: Previous OCS experiences with leasing and exploration, and gas and oil development and transportation in State coastal areas, provide specific examples of how ESP data affect OCS decisions.

- The ice cover in the Beaufort and Chukchi Seas is present locally from 8 to 12 months each year. These conditions pose complications for gas and oil development. The studies program has investigated hazards such as bottom gouging by ice ridges, ice-ridge and lead formations, ice motion, and, to a lesser degree, marine-permafrost behavior. By FY 1986, long-term studies of geologic processes and hazards of the Beaufort and Chukchi continental shelves and coastal regions were completed. The information from these studies is used to define potential areas of exploration difficulty for permit review.

- One study focus has been the evaluation of effects of on-ice seismic exploration on ringed seal behavior and distribution. Other studies have investigated the sensitivity of bowhead, gray, humpback, and belukha whales to noise and disturbance. The results of these studies have been used in devising and evaluating potential mitigating measures.

- In recent years, much public and governmental attention in Alaska has been given to the potential effects of gas and oil activities on the status and behavior of the bowhead whale. Studies have concentrated on observations of bowhead-migration routes, potential feeding areas, and behavior. A major role of whale-study components has been to support seasonal drilling and geophysical-survey monitoring-program needs. In a unique information transfer, MMS investigators pass data on the status of the whale migration and whale behavior directly to MMS and National Marine Fisheries Service regulatory authorities. These daily status reports have been used by MMS authorities to make decisions regarding timing and location of offshore operations, such as geophysical exploration and exploration drilling.

- Simulated oil-spill trajectories and weathering models of Alaskan oils under subarctic conditions, both developed by MMS prior to the *Exxon Valdez* oil spill in spring 1989, were used during the spill. The models successfully predicted spill trajectories between Prince William Sound and Kodiak and also the persistence and emulsification of the oil. This information was provided in real time to fishermen's groups on Kodiak and to the Alaska Regional Response Team.

The ESP information is used in numerous specific decisions, including selection of areas for leasing consideration, decisions to lease, EIS development and postlease assessment, exploration monitoring, mitigation, permit evaluations, and others.

IDENTIFICATION OF INFORMATION NEEDS: A draft Alaska Environmental Studies Strategic Plan was distributed to approximately 150 Federal, State, local, environmental, Native, industry, international, and other organizations in early 1995. Comments received from respondents were taken into consideration in identifying needed studies. Previous program reviews were also considered. The proposed studies are listed in the Alaska OCS Region Timeline for Studies.

Some of the proposed studies incorporate recommendations from the National Research Council (NRC) in a recent review of the Alaska ESP. The review is entitled "Environmental Information for Outer Continental Shelf Oil and Gas Decisions in Alaska" (NRC, 1994). The NRC report was prepared in response to a request from the U.S. House of Representatives that MMS seek NRC advice about the adequacy of environmental information for Chukchi and Beaufort Sea lease sales. The NRC committee concluded that the environmental information currently available for the Chukchi and Beaufort OCS areas is generally adequate for leasing and exploration decisions, except with regard to effects on the human environment (Executive Summary, page 3, NRC, 1994).

Consideration also was given to a series of reviews of the national ESP by the NRC within the National Academy of Sciences. The reviews are entitled "Assessment of the U.S. Outer Continental Shelf Environmental Studies Program." Volume I focuses on Physical Oceanography] (NRC, 1990); Volume II focuses on Ecology (NRC, 1992a); Volume III focuses on Social and Economic Sciences (NRC, 1992b); and Volume IV summar- izes Lessons and Opportunities (NRC, 1993).

The IBR process also identifies ESP information needs through solicitation of public comment and suggestions on how to enhance our information base. For example, the IBR process for Sale 144 (Beaufort Sea) included one IBR workshop and one ITM. Approximately 1,000 invitations for one or both meetings were sent to State and Federal Agencies; borough, city, and village leaders; oil and fishing industry personnel; environmental groups; scientists; contractors; and others. For the ITM, approximately 200 people, including about 30 MMS personnel, attended various sessions. Attendees were encouraged by session chairs to comment on the information available, either through oral participation in the question-and-answer periods during the ITM, or afterwards in writing.

Several of the proposed studies incorporate recommendations from Cook Inlet communities and the Cook Inlet Regional Citizens Advisory Council (CIRCAC); and a few of the proposed studies also were highlighted in previous ESP study plans.

The following sections summarize the goals of the proposed studies, discipline by discipline.

PHYSICAL OCEANOGRAPHY: The ESP has developed a shoreline-oiling model called COZOIL (Coastal and Surf Zone Oil-Spill Transport Model). The shoreline-oiling model is a first- generation model with known faults that must be corrected to provide useful information. In addition, the model database needs to be updated with the massive amounts of shoreline data accumulated by researchers during the *Exxon Valdez* spill; and the model needs to be validated against shoreline-oiling data from the spill.

The MMS oil-spill-trajectory models, which are a primary analytical tool for NEPA assessment are continually being evaluated and then improvements recommended. An interim hindcast simulation of Arctic OCS circulation in 1983 is the basis for the Arctic oil-spill-risk analysis for proposed sales in the current 5-year CP. However, known interannual variability in factors driving Arctic Ocean circulation, the need to incorporate recent improvements in Chukchi and Beaufort Sea oceanographic understanding, and the need to include known mesoscale effects of the coastline topography on winds in spill modeling limit the usefulness of this interim model. Hence, a study entitled "Update of Circulation and Oil-Spill-Trajectory Model for Cook Inlet, Beaufort Sea, and Chukchi Sea" is proposed. The study will improve the 3-dimensional, variable-scale circulation models along the lines recommended by the National Academy of Sciences (NRC, 1990). For example, the improvements will involve higher-resolution bathymetry, and the use of sea-ice, oceanographic, and meteorological data from recent MMS, U.S. Navy, National Science Foundation, and international research programs.

FATE AND EFFECTS: Concern was expressed about the fate and persistence of low, chronic levels of trace-metal and hydrocarbon contamination in Cook Inlet and Shelikof Strait. A study entitled "Sediment Quality in Depositional Areas of Shelikof Strait and Outermost Lower Cook Inlet" addresses this issue.

In the Chukchi Sea, water- and sediment-quality issues relate to local and regional cumulative effects of contamination from Russian discharges, Project Chariot, coastal mining activities, coastal freshwater discharges from mineralized terrains, and coastal fuel spills. Hence, a study entitled "Coastal Chukchi Sea Monitoring Program" is proposed and will be coordinated with ongoing domestic and international oceanographic-monitoring studies being conducted in the Arctic.

The ESP has sponsored development of an oil-weathering model for use in environmental assessment and spill response in open water and ice cover. The model has been very successful, including correction prediction of the weathering of oil during the *Exxon Valdez* spill; but the model needs to be updated to take into account the improvements in computer software and hardware and improvements in scientific understanding of oil weathering and spreading made over the decade and a half since the model was developed. The study entitled "Revision of the Alaska OCS Oil-Weathering Model" provides this update.

BIOLOGY: Intertidal communities were the largest single category of habitat affected by the Prince William Sound oil spill. An ongoing study entitled "Kachemak Bay Experimental and Monitoring Studies" will obtain information throughout the year on intertidal-community structure, recruitment, and succession. The information will help to assess damages and predict rates of recovery from possible future oil spills.

Coastal areas are generally important feeding areas for migratory fishes, seabirds, and marine mammals; and the Hope Basin coastal area is especially important. It is characterized by complex linkages between physical and biological processes, hence the proposed study entitled "Hope Basin Physical Processes and Ecological Characterization." This will be only the second study conducted by ESP that is specific to the Hope Basin.

Previous exploration and production of North Slope oil has required the construction of roads and causeways that have affected the distribution of several coastal fishes and possibly the population of broad whitefish. Many questions remain about the effects of causeways on coastal anadromous and amphidromous fishes. The ongoing study entitled "North Slope Amphidromy Assessment" examines the use of stable isotope data to help resolve the remaining questions.

Fisheries are a vital part of the Alaskan economy, and flatfish like sole and halibut are a major segment of the market. The nursery grounds for juvenile flatfish are not well known and are difficult to identify. An initial goal of an ongoing study entitled "Defining Habitats for Juvenile Flatfishes in Southcentral Alaska" is to characterize Kodiak-area nursery grounds according to physical and biological parameters, so that flatfish nursery grounds in other Alaskan regions can be identified by physical characteristics.

Seabird colonies are major components of Alaskan marine ecosystems and may be especially vulnerable to OCS activity. Hence, we have had a long-term study entitled "Monitoring and Evaluating Effects of Seabird Colonies in Potential Oil and Gas Development Areas" that will be continued by the NBS. A recently com- pleted study entitled the "Barren Island Seabirds Study" examined seabird recovery rates in seabird colonies damaged by the *Exxon Valdez* spill. A study that is specific to Cook Inlet, entitled "Cook Inlet Seabird Colony Study" has been proposed for NBS implementation. Another study entitled "Survey of Cook Inlet Shorebird Habitats during Spring and Fall Migrations," also proposed for NBS implementation, is expected to determine important Cook Inlet shorebird-staging areas and habitat use and to synthesize available regional shorebird information.

PROTECTED SPECIES: Marine mammal tissues have been collected over a period of several years as part of a study entitled "Alaskan Marine Mammal Tissues Archival Project." The archival project has created a tissue bank that will allow for determination of changes in baseline contaminant loads. The archival project, adopted as a model for the NMFS national tissue archive to provide analyses of high importance to subsistence hunters, is proposed for continuation.

The bowhead whale, protected under the Endangered Species Act, is of great importance to Alaskan Natives for cultural and subsistence purposes. Issues relating to the potential short-term and cumulative effects of OCS activities on bowhead whale behavior continue to be key environmental issues in Arctic leasing.

Aerial surveys have been conducted for many years to monitor the progress of the bowhead whale fall migra- tion. The surveys have emphasized regional shifts in the migratory corridor. The database has become a very important means of evaluating cumulative effects on the bowhead-migration axis. Hence, the study entitled "Monitoring the Distribution of Arctic Whales" is proposed for continuation. Satellite telemetry, in an ongoing study entitled "Application of Satellite-Linked Tags for Bowhead Whales," has been shown capable of supple- menting whale aerial-monitoring studies. Hence, a follow-up study, "Tagging and Satellite Tracking of Bowhead Whales" is proposed.

The ringed seal is a key Arctic marine mammal that is important for subsistence. Seal populations were monitored for several years in OCS exploration and potential development areas but have not been resurveyed recently. Therefore, a new study entitled "Monitoring Key Marine Mammals: Arctic" is proposed. A recently funded NBS study entitled "Sensitive Nonendangered Mammals and Marine Birds in the Beaufort and Chukchi Sea" will help to collect, collate, and analyze information needed to evaluate the region-wide effects of oil development in Arctic waters. The latter study is proposed for continuation. A new study to model the potential effects of Arctic oil spills on polar bears is also proposed. The study "Simulation Modeling of the Effects of Arctic Oilspills on the Population Dynamics of Polar Bears" would model both the potential for bears to intersect a hypothetical oil spill and the anticipated time requirements for the bear population to recover from any large spill-induced mortalities.

Three new studies are proposed to address specific information needs for marine mammal species found in the Gulf of Alaska. One study entitled "Monitoring Birds, Mammals, and Endangered Species along Potential Routes for Transporting Arctic-Produced Oil through the Gulf of Alaska" would monitor endangered species, sea otters, and other marine mammals encountered along normal tanker routes out of Valdez, Alaska. A second study, "Migrational Movements and Winter Habitat Utilization of Cook Inlet Belukha Whales," would investi- gate this whale species that is important to local subsistence hunters and may be reproductively discrete from other belukha populations. The MMS would join with NMFS to conduct joint aerial surveys of belukha whales in outer Cook Inlet during the winter. Sea otters are a protected species and one of the marine mammals most sensitive to oil spills. The mortalities of sea otters during the 1989 Prince William Sound oil spill demonstrated their vulnerability and the high regard placed upon sea otters by the general public. A study entitled "Gulf of Alaska Information Update: Sea Otters" is proposed to compare the abundance and distribution of sea otters in the Gulf of Alaska.

SOCIAL AND ECONOMIC SCIENCES: The economic and social fabric of the State of Alaska has been changed by the oil industry and continues to change as the oil industry downsizes. Substantial information has accumulated during the long-running Alaska ESP program component on social and economic studies. Two new proposed studies entitled "Publication of a Book on the Socioeconomic Effects of Oil and Gas Industry Activity on the Alaska OCS" and "Economic and Social Effects of Diminishing Oil and Gas Industry Activity on Alaskan Communities" will document the "boom-and-bust" characteristics of these changes.

Although the NRC (1994) concluded that the ESP in Alaska is generally extensive, substantive, and high-quality, information about effects on the human environment was considered a major information need for Alaskan leasing and exploration decisions. The NRC recommended documenting more carefully the changes in the human environment that result from all phases of Federal actions on the OCS. In order to do this, addi- tional data was needed which provides a consistent set of reliable data that can be used to detect and describe significant social, cultural, and economic changes. Subsequently applicable data have been collected through the study "Social Indicators Study of Alaskan Coastal Villages," (OCS Study MMS 92-0031, 92-0032, 92-0052, 93-0035, 93-0070, 93-0071 released recently) which will be completed in summer, 1995. Also results of the recently completed study "An Investigation of the Sociocultural Consequences of Outer Continental Shelf Development in Alaska" are directly applicable to the NRC recommendations (OCS Study MMS 95-010 to 95-015).

The NRC review noted that assessment should examine sociocultural issues, and in particular should quantify potential impacts on the subsistence sector of the economy. A recently completed study entitled "Subsistence Harvest Data: Gulf of Alaska" and "An Investigation of the Sociocultural Consequences of OCS Development in Alaska" have examined this issue, including the acquisition of subsistence skills by Alaskan Native children.

Also, the NRC review mentioned the importance of documenting long-term, gradual sociocultural changes from all phases of OCS activities. The NRC also recommended the careful quantification and analysis—and inclusion of scientific conclusions—in social and cultural assessments. This need is further addressed through two ongoing studies—"Rural Alaska Model, Census, and GIS Database Updates and Training" and "Sociocultural Consequences of Alaska OCS Activities: Data Analysis/Integration." Although not related to OCS develop- ment, an incident for which long-term changes could be documented is the March 1989 Prince William Sound oil spill. This issue is being addressed through the proposed new study entitled "*Exxon Valdez* Oil Spill Cleanup: A Synthesis of Existing Community-Based Social Information, 1989-1995."

OTHER: A cooperative program established between MMS and the University of Alaska-Fairbanks has the potential to leverage additional scientific results and logistical capabilities at levels comparable to MMS contri- butions. This program, which is proposed for continuation, is "Minerals Management Service/University of Alaska-Fairbanks/State of Alaska Coastal Marine Institute Management."

Recently the Alaska ESP assumed responsibility for equipment management in support of most Alaska studies. An example is deployment of a research launch, that provides a specialized, mobile platform for a variety of biological and oceanographic studies throughout the coastal waters of Alaska. These services are provided by "Management and Logistics of Oceanographic Equipment."

As stated in the section on "Available Information," the size and scope of the overall ESP necessitates mechanisms to integrate and synthesize the study results and to communicate and transfer the information to agency managers and the public. Hence, continuation of the ongoing study entitled "Conference Management and Reports on MMS Results" is proposed in order to coordinate synthesis meetings, ITM's, small conferences on issues of concern, and publication of the proceedings and significant results. A new, additional objective of the study on conferences and reports will be to summarize and synthesize ESP socioeconomic reports. This study is also a key component for the Alaska OCS Region's Area Evaluation and Decision Process.

AVAILABLE INFORMATION

ENVIRONMENTAL GEOLOGY

Arctic: The Arctic offshore region is composed of the Beaufort and Chukchi seas, including Kotzebue Sound. The Beaufort and Chukchi seas are environmentally different from all other offshore regions of the United States in that they are usually ice-covered. This ice cover, which is almost total for 8 to 11 months each year, freezes to approximately 2 meters (m) average thickness in one season. These conditions pose complications for gas and oil development. The ESP has investigated hazards such as bottom gouging by ice ridges; ice-ridge and lead formations; ice motion; and, to a lesser degree, marine- permafrost behavior. By FY 1986, long-term studies of geologic processes and hazards of the Beaufort and Chukchi Sea continental shelves and coastal regions were completed.

The Arctic ice pack is moved westward along the Alaskan coast by the clockwise Beaufort eddy and shears against the stationary landfast ice, forming extensive shear-pressure-ridge systems. Ice ridges may exceed 10 m in height and may have subsurface ice keels that are several tens of meters deep and may scour the sea- floor of the continental shelf, forming deep gouges. Ice gouges of indeterminate age have been found as far out as the edge of the continental shelf, though they are more numerous and frequent in shallower waters, especially along the ice-ridging zone (13-20 m) near headlands and subsurface topographical highs. Areas of landfast ice, containing multi- and first-year ice fragments and hummocks, form extensive rubble fields. Ice-movement forces on offshore structures in the Beaufort and Chukchi seas can exceed the ice forces on Cook Inlet platforms by a factor of 100.

The ice-covered season is somewhat shorter in the central and southern Chukchi Sea than in the Beaufort Sea, but ice conditions and ice hazards are severe in both areas. The width of landfast ice along the Chukchi Sea coast between Barrow and Cape Lisburne is much less than in the Beaufort Sea; thus, sea-ice interactions with landfast ice are encountered much closer to the coast in the Chukchi Sea than in the Beaufort Sea. Several persistent areas of open water (polynyas) exist along the Chukchi Sea coastline during the winter, in contrast to the almost totally ice-covered Beaufort Sea.

Bering Sea: The Bering Sea has a mean depth of 1,636 m and a surface area of 2,300,000 square kilometers (km^2). It extends approximately 1,500 km, from the Aleutian Islands to the Bering Strait, and is bounded on the west by eastern Siberia and the Kamchatka Peninsula and on the east by western Alaska. The continental slope is incised by some of the largest submarine canyons in the world. Apparently, most of the modern sediments are transported into the basin floor from two canyons along the Aleutian Islands and from the Bering Canyon south of the Pribilof Islands. Little modern sediment is transported to the abyssal plain from canyons northwest of the Pribilof Islands.

Gulf of Alaska: The Gulf of Alaska borders the southern coast of Alaska, which extends hundreds of kilometers from the southeastern panhandle to the Alaska Peninsula. Geographically, the Gulf of Alaska Subregion includes the Cook Inlet (Shelikof Strait), Kodiak Island, and Shumagin Shelf OCS Planning Areas. The Alaska coastline contains a variety of geomorphological features, including rugged mountains. The highest peaks are in the eastern gulf, where Mount St. Elias rises 5,500 m. Active volcanism is present in the Alaska and Aleutian Ranges. The better known volcanoes are Mount Augustine in lower Cook Inlet and Mount Katmai and Mount Redoubt on the Alaska Peninsula.

The only significant flatlands in the Gulf of Alaska Subregion are found on the Copper River Delta and the eastern side of Cook Inlet, and between Dry Bay and Yakutat. The segment of coastline from Cross Sound in southeastern Alaska westward to Prince William Sound is typified by unprotected beaches and has only three embayments of any consequence—Lituya, Yakutat, and Icy Bays. Prince William Sound is essentially an inland sea (an island and fjord complex) that is relatively sheltered from the open gulf. The gulf side of the coastline of the Kenai Peninsula, the Kodiak Archipelago, and the Alaska Peninsula is mainly bedrock indented by numerous fjords and embayments. The southern coastline of the Alaska Peninsula is steep and rugged. Because the peninsula is topographically asymmetrical, the drainage divide between streams flowing into the gulf and those entering the Bering Sea is generally less than 16 km from the gulf coast. Bays and islands are numerous along the peninsula.

The Gulf of Alaska continental shelf is narrow in comparison to those of the Bering and Chukchi Seas; it is 100 km wide in the vicinity of the Fairweather Ground off Yakutat, then narrows in the vicinity of the Kodiak Archipelago before progressively decreasing in width toward the west. The shelf is dissected by several large marine valleys and troughs. Some of these offshore features appear to be glacial in origin. The major bathy- metric highs are Fairweather Ground, Portlock and Albatross Banks, numerous islands in the western part of the gulf off Kodiak Island, and emergent features such as Middleton Island.

PHYSICAL OCEANOGRAPHY: The possibility of oil spills is one of the principal items evaluated as part of an environmental assessment. The studies program has continued to simulate hypothetical oil-spill transport in open and ice-covered waters by means of a circulation model. Currently, a new circulation and trajectory-simulation model is being prepared for MMS to account for the specific features of the Alaska OCS. Simula- tions are key to sale-specific-EIS preparation. Related physical oceanographic studies have investigated currents, tides, sea-ice motion, and meteorological forcing. Data from these studies are used in validating and computing probabilities of oil-spill contact for different environmental resource and coastal areas. Models and users' manuals are complete for oil weathering in open and ice-filled waters and for transport and mass-balance of oil onto and along beaches. Another model has quantified losses of commercially important fisheries from oil spills.

Arctic: Ice and water trajectories of potential oil spills on the Beaufort Sea continental shelf would be greatly influenced by the circulation patterns of the Arctic Ocean. Surface-ocean currents beyond the shelf edge flow westward between Mackenzie Bay and Point Barrow under the influence of the clockwise Beaufort Gyre. An easterly flowing current from the Chukchi Sea has been observed along the 50-m isobath. Nearshore, local summer winds may reverse the general wind-driven westward drift and set the surface current easterly. Oceanographic and meteorological processes influence the extent of ice-free open water in summer and the dispersion of any spilled oil. Pack ice can be encountered along the nearshore Beaufort coastline, even during the summer "open water" and should be expected at all times in leases farther offshore. Storms are frequent during summer and occasionally generate storm surges and wave heights that can be destructive to nearshore facilities.

Chukchi Sea circulation is influenced by ocean currents flowing predominantly northward from the Bering Sea into the Arctic Ocean. Bifurcation of the northerly flowing current occurs in the central Chukchi Sea and is presently being studied to determine its characteristics and influence on Arctic circulation. At times, a reversal of flow in the Bering Strait occurs and a southerly flow of ice and water takes place; but the volume of Arctic-water outflow during these periods is low. The northward coastal currents, together with a westward drift along the southern margin of the Arctic-ice pack, combine to establish a broad, counterclockwise circulation in the Chukchi Sea. Wave heights and storm surges are more severe hazards in the Chukchi Sea than in the Beaufort Sea, primarily due to the longer reaches of open water in summer and fall. Kotzebue Sound, which is more protected from open-ocean conditions, does not have the severe sea-ice hazards evident elsewhere in the Arctic. Both oil-spill-trajectory modeling and ice-movement statistics suggest that oil spills in the Chukchi would tend to move westward.

Bering Sea: The Bering Sea is an area of large meteorological variability. Atmospheric conditions can be extreme—comparable only to the "Roaring Forties" of the Norwegian Sea and the "Furious Fifties" of the Antarctic. Seasonal contrasts are also extreme: during winter, over half the sea surface is covered with ice; during summer, sea-surface temperatures may become almost temperate, exceeding 16 °C in the isolated eastern sector of Norton Sound.

The strong westward flow of the Gulf of Alaska stream provides most of the inflow into the Bering Sea through deep passes between the Aleutian Islands. In the eastern part of the Bering Sea, three hydrographic fronts (roughly corresponding with the 50-, 100-, and 250-m isobaths) separate the water overlying the shelf into distinguishable domains with distinctive seasonal oceanographic properties. Shelf circulation is generally sluggish and characterized by the presence of nonstationary eddies. Mean circulation is northward toward the Bering Strait.

Advances and retreats of the ice edge are correlated with fluctuations in sea and air temperatures, surface winds, and regional meteorological events. Generally, the southern limit of the ice edge extends from northern Bristol Bay to the vicinity of St. George Island in the Pribilofs. In extreme years, ice may extend as far south as the Aleutian Islands. Ice formation usually begins in mid-October in the northern Bering Sea and progresses southward. The retreat of the ice edge begins in April; by mid- to late June, the Bering Sea is generally ice-free.

Initial meteorological and oceanographic studies in the Bering Sea were oriented toward expanding background data for atmospheric measurements (chiefly pressure, winds, and temperatures), hydrography, and ocean-circulation patterns. These data were used to supplement existing information and to allow for a basic description of the physical environment. Features unique to the Bering Sea were clarified, including the three zones or fronts on the southeastern shelf, the circulation pattern of Norton Sound, and the seasonal charac- teristics and transport of sea ice. Remote-sensing imagery was used to monitor sea-ice formation, transport, and ablation. Information available was first compiled and published, and then updated in two three-volume sets of marine-climatology atlases, "Climatic Atlas of the Outer Continental Shelf Waters and Coastal Regions of Alaska" (Brower, Searby, and Wise, 1977; Brower et al., 1988).

Recent studies emphasis relative to the Bering Sea physical environment has focused on particular area needs such as circulation near the Yukon River Delta, wave heights in the central Bering Sea, and the influence of semipermanent eddies on along- and cross-shelf circulation. Emphasis has also included expanding probabilistic predictive-modeling capabilities for (1) circulation and potential oil-spill trajectories, and (2) coastal transport of hypothetical oil spills. Additional information on ice-edge processes has been garnered by the NSF-funded Marginal Ice Zone Experiment program.

Gulf of Alaska: The maritime climate of the Gulf of Alaska is characterized by heavy precipitation, cool summers, and relatively warm winters. Precipitation ranges from about 50 centimeters (cm) to more than 500 cm annually. Regionally, precipitation shows a general eastward increase and also increases with elevation. The mean annual precipitation in the Gulf of Alaska is about 150 cm, a portion of which occurs as snowfall. Highest snowfalls occur in the coastal mountains. The annual average temperature is about 2.2 °C. Mean temperatures range from a low of 6.7 °C to a high of about 15.5 °C.

Because the temperature is relatively mild in the outer Gulf of Alaska, sea ice does not form in winter. How- ever, the more severe climatic conditions and shallow water depths in Cook Inlet promote sea-ice formation. During winter months, sea ice is usually found north of the forelands and along the western side of the inlet.

Major storms are common in the Gulf of Alaska and are most frequent and intense in winter. Major storm tracks lie along and south of the Aleutian Islands and the Alaska Peninsula. Storms generally move eastward and stagnate near southeastern Alaska. In late summer and fall, most storms move into the Bering Sea. Very high coastal winds occur as a result of atmospheric-pressure differentials between interior Alaska and the Gulf of Alaska. Higher interior pressure promotes periodic local, offshore winds that are orographically funneled, attaining velocities up to 150 km per hour and extending up to 30 km offshore.

Oceanographic circulation in the Gulf of Alaska is dominated by the Alaska Current, which flows counter- clockwise adjacent to and offshore of the continental-shelf break (200 m). The Alaska Current has been described as a boundary between the warm, high-salinity water of the North Pacific and the cooler, low-salinity water of the continental shelf. The current has a surface layer of low salinity and a subsurface-temperature maximum. Associated with this current are warm surface water and a permanent halocline at about the 150-m depth. The Alaska Current is less than 75 km wide, with a mean current speed of about 60 cm per second. Field data have shown the presence of a narrow coastal jet 20 to 30 km wide, with a typical baroclinic speed of 15 to 40 cm per second, that appears to be present all along the Gulf of Alaska coast. Mean currents over the continental shelf are weak in comparison to the Alaska Current and the coastal jet. The shelf flow is alongshore toward the west; however, there is also considerable cross-shelf flow.

Tides in the Gulf of Alaska are predominantly mixed and semidiurnal. Tidal amplitudes vary considerably, typically 3 to 5 m; however, tidal amplitudes as high as 10 m are attained at the head of Cook Inlet.

FATE AND EFFECTS: A vital portion of the studies program has been centered on determination of the fate and weathering of spilled oil and the effects that oil spills may have on marine habitats and biota. Studies have investigated the effects of hydrocarbons on king and Tanner crabs and on salmonids. The MMS and National Oceanic and Atmospheric Administration participated in the Baffin Island Oil Spill test program in the Canadian Arctic and investigated the weathering of spilled oil in open water and sea ice. The MMS also provided funds to support initial studies of fate and effects of the *Exxon Valdez* spill in Prince William Sound in spring 1989. The weathering studies of Alaskan oils and weathering models developed by MMS were used in response to the spill. Chemical oceanographic studies gathered baseline information on sedimentary processes, suspended- particulate matter, heavy-metal content, carbon budgets, dissolved hydrocarbons, and sedimentary chemistry in the Bering Sea in the early years of the ESP.

In recent years, the Alaska OCS Region initiated efforts to develop additional targeted monitoring programs. In September 1983, the Beaufort Sea Monitoring Workshop (Houghton, Segar, and Zeh, 1984) was conducted, the results of which have been used by the MMS ESP staff for the direct contracting of a Beaufort Sea Hydrocarbon and Trace Metal Monitoring Program. The goal of this program has been to test hypotheses regarding long-term change in sediments and lower trophic levels. A similar monitoring workshop (Houghton et al., 1987) was conducted for the Bering Sea, but recommendations were placed on hold pending oil development in the Bering Sea.

BIOLOGY: The ESP has investigated the life history, food habits, and abundance and distribution of seabirds, fish, and invertebrates, as well as aspects of their interaction with gas and oil activities. Studies have addressed commercial and subsistence fisheries and marine birds. Fisheries studies were targeted at important Bering Sea commercial fisheries species such as salmon and red king, blue king, Tanner, and Korean hair crabs. Work has been conducted on simulation modeling of fisheries with the intent to quantify potential damage to commercial fisheries if accidental oil spills were to occur. Nearshore fisheries studies have been conducted in the Bering, Beaufort, and Chukchi Seas. Major studies of seabirds have been completed, including population studies in the Bering Sea and reproductive ecology and trophics of marine birds of the Gulf of Alaska. Seabird monitoring studies have also been conducted in areas of the Beaufort and Chukchi Seas and shorebird research in the southern Chukchi Sea.

Major ecosystem studies have been performed for several areas in the Alaskan OCS. Areas identified as important habitats for major Alaskan species, potential gas- and oil-development sites, and important subsistence-harvest areas have led to studies in Simpson Lagoon, the eastern Beaufort Sea, Peard Bay, Kasegaluk Lagoon, Yukon River Delta, Unimak Pass, and the North Aleutian Basin.

Arctic: The variety and distribution of animals along the Arctic coast reflect the combined effects of ice movements, watermass and seafloor characteristics, and availability of suitable food. The presence or absence of ice profoundly affects fish, bird, and marine mammal movement and behavior in this region. Many of these species congregate near the edge of the pack ice and move in response to ice motion. For example, polynyas in the Chukchi Sea provide open water along the coastline during the winter and migration periods.

Arctic nearshore waters also are important to most waterfowl in the Arctic; two-thirds of the bird population of the Canadian Arctic islands, including large numbers of black brant, oldsquaw, gulls, and shorebirds, pass through this region. Eider ducks, shorebirds, and gulls nest in high densities on some of the barrier islands. En route south, up to 45 percent of the estimated total Pacific flyway population of black brant stage in Kasegaluk Lagoon. Seabird colonies of puffins, murres, kittiwakes, and gulls are found at Capes Lisburne and Thompson and in Kotzebue Sound. Cape Lisburne supports the northernmost major bird colony—currently estimated at 265,000 birds—on the western coast of North America.

Fish species include Arctic char, whitefish, cisco, cod, smelt, flatfish, and sculpin. An extensive Arctic Fisheries Database (1993) on these fishes has been compiled from the various OCSEAP and MMS studies and placed on a compact disk. Salmon runs in the Chukchi Sea support a modest commercial fishery centered in the Kotzebue area.

Bering Sea: The inflow of nutrient-rich Pacific Ocean deep waters and nutrient replenishment as a result of winter processes in the Bering Sea are conducive to high productivity and standing stocks in spring and summer. Overall, the Bering Sea has the largest eelgrass beds (vital to black brant geese and other species), possibly the largest clam population, large populations of groundfish, the largest sockeye salmon run, one of the highest densities of birds, and one of the largest marine mammal populations in the world.

The Bering Sea has a highly productive benthic system dominated by boreal Pacific species whose distribution is correlated strongly with sediment type. The benthos in most of the Chirikov Basin (north of St. Lawrence Island) is dominated by amphipods, an important prey item of gray whales. Organic-carbon enrichment of the southeastern Bering shelf is indicated by dense populations of deposit-feeding bivalve mollusks, a general increase of other infauna, and high densities and biomass of epifauna.

Bivalve mollusks—one of the most commonly consumed prey items in the Bering Sea—are a resource for which crabs, sea stars, bottomfishes, and marine mammals compete. In the northern part of the Bering Sea, where low water temperatures prevail, sea stars,tanner crab, walruses, and bearded seals are dominant bottom predators.

The feeding ecology and energetic requirements of juvenile king and tanner crabs, and the distribution of larval and juvenile red king crabs, have been examined. A completed study of crabs in the nearshore waters of the Pribilof Islands delineates the seasonal distribution and abundance of juvenile and adult king and Korean hair crabs.

The Bering Sea supports more than 300 finfish species, 8 of which are of commercial interest. The greatest number of bottomfish in the Bering Sea are sculpin, blenny, eelpout, snailfish, cod, and flatfish. Commercial fisheries in the region are dominated by the pollock fishery, the largest single-species fishery in the world. Other important fisheries include the harvest of yellowfin sole, Pacific halibut, Pacific herring, sablefish, and Pacific cod. World-renowned sockeye salmon runs into Bristol Bay drainages support a commercial fishery of international importance. In addition, eastern Bering Sea fisheries for king and Tanner crab are among the most important of Alaska's fisheries.

Baseline studies of fish have included work on distributions of ichthyoplankton and the distribution, abundance, migrations, spawning activities, and environmental relations for key species such as halibut, herring, walleye pollock, yellowfin sole, and salmon. Surveys of the seasonal migration and feeding habits of juvenile salmonids were initiated in the nearshore waters adjacent to the North Aleutian Shelf area. An ecosystem study surveyed the dominant forage and anadromous fishes in the same area. Another investigation involved considerable refinement of a fisheries food-web model for king crab, sockeye salmon, and yellowfin sole populations in Bristol Bay. In the Yukon River Delta, a study was initiated on the distribution, seasonal abundance, and foods of juvenile salmon. The ecosystem dynamics of fish in the eastern Bering Sea have been evaluated using simulation modeling.

Seabird populations in the eastern Bering Sea comprise one of the richest and most important avian fauna in the world. The total number of seabirds probably exceeds 26 million. Nearly the entire world population of red-legged kittiwakes nests on the Pribilof Islands. Most of the known breeding whiskered auklet population resides in the Aleutian Island area. Nonbreeding shearwaters pass through the Bering Sea by the millions. All of these species depend on the exceptionally high productivity of Bering Sea waters to maintain their dense populations. In addition, millions of birds use the coastal areas. The Yukon-Kuskokwim River Delta, a notable example, hosts some 24 million waterfowl and shorebirds. Izembek Lagoon and other lagoons along the northern side of the Alaska Peninsula also are concentration areas for coastal birds.

Population censuses were completed at all major Bering Sea seabird colonies by the Fish and Wildlife Service with funds from the OCS program. As a result of these baseline studies, the feeding ecology, breeding, pelagic distribution, and reproductive biology of marine birds of the eastern Bering Sea are much better understood. Also examined were waterfowl and their habitats in Bristol Bay, the Unimak Pass area, the Yukon River Delta, Norton Sound, and major islands in the Bering Sea. An MMS-sponsored conference was held to determine the best methods for monitoring multiple seabird species at multiple colonies in the Bering Sea and in other Alaskan OCS areas. The MMS-sponsored seabird monitoring has been ongoing since 1984.

In addition to studies on specific physical and/or biological processes or vulnerable species, multidisciplinary studies of regional ecosystems were performed to learn about the biological and physical processes that support ecosystem functions and important species' habitats. During FY's 1985 through 1988, ecosystem studies were continued in the Yukon River Delta and the North Aleutian Shelf lease-sale areas (including Izembek Lagoon). The Yukon River Delta and North Aleutian Shelf ecosystem studies were coordinated with, and involved, studies of important subsistence or commercial fish species. These studies were followed by studies focused on understanding the ecology of Pacific salmon, Pacific herring, and king crab. The focus of the ecosystem studies was on areas and processes of probable biological sensitivity to possible oil spills. A workshop to consider monitoring needs in the Bering Sea was held in January 1987. These and other targeted study efforts of seals, seabirds, and waterfowl are expected to provide the basic framework by which the Alaska OCS Region will meet environmental monitoring needs.

Gulf of Alaska: The Gulf of Alaska supports some of the largest populations of birds and marine mammals in the world. The largest seabird colonies are located on the Semidi Islands, Barren Islands, Forrester Island, and St. Lazaria Island, and are dominated by populations of storm petrels, tufted puffins, common murres, and/or auklets. A large population of black-legged kittiwakes is located on Middleton Island. Other important colonies or colony areas include the Kodiak Archipelago and adjacent Alaska Peninsula, the Chiswell Islands, and Chisik Island. Additionally, millions of shearwaters from the southern hemisphere visit western gulf waters during spring and summer and feed intensively in the pelagic zone. Migrant shorebirds are abundant in spring and fall at coastal estuaries between Kayak Island and Prince William Sound and in Cook Inlet. At times, western sandpipers and dunlins may number in the millions. The sandpipers probably comprise the world population of the species, while the visiting dunlins represent the entire western Alaska breeding population.

Several regions in the Gulf of Alaska are noted for a high commercial catch of finfish and shellfish. These fisheries are very important to the Alaskan economy. Present fishing efforts are concentrated on shellfish, salmon, halibut, sablefish, walleye pollock, Pacific cod, and, to a lesser extent, Pacific herring.

The Pacific herring fishery is modest; but in specific localities such as northern Prince William Sound, Kamishak Bay, Chinitna Bay, Uganik Bay, and Chiniak Bay, commercial catches are high and the fishery is economically attractive. There also is a rapidly growing groundfishery. The principal species are walleye pollock and Pacific cod in the western gulf; sablefish in the Yakutat area; and walleye pollock, sablefish, and flounder in the southeastern gulf.

PROTECTED SPECIES: The Alaskan offshore provides habitat to several marine mammals and endangered species, most notably the bowhead whale. Since 1981, the MMS, Alaska OCS Region, has performed monitoring studies initiated as part of aerial surveys and behavioral studies of whales. Much of the research on the bowhead whale has recently been summarized and published in the peer-reviewed, hardcover *Bowhead Whale Book* (Burns, Montague, and Cowles, 1993). Other recent studies on endangered species include emphasis on surveys of distribution and abundance of endangered whales, feeding ecology of gray whales (formerly endangered), experimental research on gray and humpback whale behavior in response to gas and oil activities, and peregrine falcon nest surveys in western Alaska.

Arctic: Marine mammals of the area include bowhead, gray, and belukha whales; bearded, ringed, spotted, and ribbon seals; walruses; and polar bears. Endangered whales present in Arctic Ocean offshore-sale areas have included bowhead, with occasional sightings of fin and humpback whales in the Chukchi Sea. Bowhead whales migrate through all Arctic Planning Areas. In the spring and fall, bowhead whales move between their overwintering areas in the northern Bering Sea and their summer-feeding areas in the Canadian Beaufort Sea. The spring and fall migratory routes are different. In the spring, bowheads generally follow the area sur- rounding nearshore leads through the Chukchi Sea and offshore leads through the Beaufort Sea; in the fall, they move closer to shore in the Beaufort Sea and farther west in the Chukchi Sea. During fall months, information on the migration status is transmitted by the MMS Bowhead Whale Aerial Survey directly from the field to regulatory authorities. Also in the fall, some nearshore areas between Barrow and Pitt Point and between Kaktovik and Demarcation Bay are believed to serve as secondary feeding locations because groups of bowheads are frequently sighted there and are presumed to be feeding. Gray whales, until recently an endangered species, also are seasonal visitors to Arctic waters. The Chukchi and northern Bering Seas are the primary feeding grounds for the world's gray whale population. From June through October, groups are scattered throughout the Chukchi Sea; a few have been observed well into the eastern Beaufort Sea.

Spectacled eiders occupy Arctic coastal and offshore habitats during spring migration and postbreeding/fall-migration periods, when they move west and south to their as-yet-poorly defined wintering areas, probably in the Bering Sea region. Satellite-tag-monitoring studies are gradually revealing the location of these areas. Steller's eiders also may be found in these areas during migration.

Bering Sea: Nineteen species of cetaceans and eight species of pinnipeds have been recorded in the eastern Bering Sea. Some of these (fin, minke, humpback, and gray whales) migrate seasonally, feeding in the northern Bering Sea during summer and then migrating south into the Pacific Ocean before the first ice is formed. Other species, such as bowhead and belukha whales, winter along the ice edge and migrate north into the Arctic as the sea-ice edge recedes in the summer. Several pinniped species (ringed, bearded, and spotted seals) and walruses are commonly associated with a sea-ice habitat.

Most of the world population of northern fur seals breed annually on the Pribilof Islands, which has in the past supported a major fur-harvesting industry by resident Aleuts on St. Paul Island. Steller (northern) sea lions occur throughout the eastern Bering Sea and Bristol Bay and are routinely seen on the pack-ice edge during spring, when the pack is south of Nunivak Island. The population of Steller sea lions has declined in recent years, with numbers in the eastern Aleutians declining by more than 95 percent since the 1970's. This species has been listed as "threatened" under the Endangered Species Act (ESA) since 1989 and is under review for possible designation as "endangered."

Sea otters are found along the Aleutian Islands and on the northern side of the Alaska Peninsula. Yupik and Inupiat communities of the Yukon Delta, Norton Sound, and St. Lawrence Island harvest as part of their subsistence activities bearded, ringed, and spotted seals; walruses; polar bears; and bowhead and belukha whales. Bowhead whales are harvested primarily by St. Lawrence Islanders and belukha whales in the Yukon Delta and Norton Sound region.

The distribution and relative density of endangered whales have been surveyed throughout the eastern Bering Sea. Evaluations of the acoustic responses of migrating gray whales and of feeding humpback whales to noise associated with gas and oil exploration and development have been completed. Other studies on whales have involved the attachment of radio and/or satellite tags onto bowhead, gray, humpback, and fin whales; the feeding ecology of gray whales; and bibliographic studies.

Nonendangered marine mammal studies have focused on life-history information; the effects of oil on fur seals and sea otters; the relationship of marine mammal species to ice conditions; the morbidity of walruses and spotted seals; and the behavioral responses of ringed seals, sea otters, and belukha whales to noise associated with gas and oil exploration and development. The distribution of many species of marine mammals has been routinely recorded during aerial and vessel surveys of endangered species. A study to model the effect of oil spills on the population dynamics of northern fur seals also was conducted.

Gulf of Alaska: Harbor seals have declined in the Gulf of Alaska from over 20,000 in the 1960's to less than 8,000 in 1992. Steller sea lions are abundant in the gulf, with major haulout sites at Forrester, Marmot, and Sugarloaf Islands and at Seal Rocks. The breeding colonies of Steller sea lions in the eastern Aleutians and the Gulf of Alaska are declining for uncertain reasons and are listed as "depleted" under the MMPA and "threat-ened" under the ESA. Sea otters, virtually extirpated as a result of commercial fur hunting between 1742 and 1911, now occupy long stretches of the rocky shorelines and kelp beds of Prince William Sound, Kamishak Bay, Afognak Island, and the southern Alaska Peninsula. It is probable that the sea otter-population range is expanding into areas with abundant food supply and suitable habitat. There is a subpopulation of about 500 belukha whales in Cook Inlet and smaller numbers near Kodiak and Yakutat and in Prince William Sound. Large numbers of Dall porpoise and harbor porpoise are found throughout the northern Gulf of Alaska and Cook Inlet. Six species of endangered whales (sei, fin, blue, humpback, Pacific right, and sperm) and gray whales (formerly endangered) occur in the Kodiak Archipelago or the adjacent ocean waters on a seasonal basis or at irregular intervals.

SOCIAL AND ECONOMIC SCIENCES: Studies in this discipline were initiated in the mid-1970's at the urging of the State of Alaska and with recognition by the USDOI that the societies of rural Alaska were especially vulnerable to the influences of industrial development. Also, social and economic studies are mandated by Section 20 of the OCSLAA, which includes monitoring of the human environment. Very little data existed to allow MMS social scientists to confidently predict social effects from offshore exploration and development. Because of the nature of subsistence dependence in the communities of coastal Alaska and the essentially nonurban character of the Native culture, the study of the effects of offshore petroleum development goes beyond conventional economic considerations. To meet these needs, several core-study topics were undertaken for nearly every lease-sale area in the State. These included petroleum-technology assessments, statewide and local economic and demographic forecasts, commercial-fishing effects, regional socioeconomic and sociocultural systems studies, and transportation-system effects.

As the understanding of social systems and the predictions of the potential effects caused by exploration and development have evolved, social and economic studies are now more focused and issue-oriented, emphasizing the critical points between OCS activities and the social systems with which such development interacts. Special topical studies that are focused on analyzing the effects of economic development on specific aspects of a social or cultural system include forecasts of rural structural economic change and the relationship between market and subsistence economies. Studies that acquire time-series data designed to correspond to very specific MMS requirements are conducted. A series of monitoring studies are now also a component. In addition to the time- series data studies—a form of monitoring, information about social indicators as measures of local community and regional well-being has been gathered. Sociocultural monitoring studies begun in FY 1985 have tracked community cultural change, social health, and values. These monitoring studies also contribute to current assessments of OCS effects in the EIS's for ongoing sales in that they provide empirical data upon which the assessments are based.

Arctic: The Alaskan Arctic Ocean offshore region is comprised of the Beaufort and Chukchi Seas, including Kotzebue Sound. Most of the areas of potential OCS development lie offshore of a broad, flat coastal plain. The North Slope Borough (NSB), whose jurisdiction encompasses this coastal plain as well as much of the Brooks Range and its northern foothills, includes eight communities—six of which may be considered coastal— and the oil-related industrial enclaves in and around Prudhoe Bay. Since the 1960's, the North Slope's social, economic, and cultural life has changed, largely in response to the Alaska Native Claims Settlement Act, gas and oil development, and the internal-restructuring process that resulted from these developments. Growth of the NSB, the Inuit Circumpolar Conference, the Alaska Eskimo Whaling Commission, and other local insti- tutions reflects the increasing social complexity of the region. The interplay of Federal, State, and local concerns in coastal zone planning and environmental protection also have been important during this period of rapid change. Studies of the region are set in this context of rapid change, high resource levels, and potentially high environmental and social costs. Protection of the Inupiat culture, whaling traditions and privileges, subsistence-resource-harvest areas, and locally based decisionmaking all are recurrent themes around which data have been collected.

To the south of the NSB on its western end is the adjoining Northwest Arctic Borough, which surrounds the eastern portion of Kotzebue Sound. The Inupiaq compose the majority of the population in this region. These communities have not had the enormous increase in cash wealth that their neighbors to the north have had, but they have undergone a substantial amount of change in making the transition from a subsistence economy to a cash economy with all the cultural, institutional, and educational changes occurring at the same time. Recently, the Red Dog mine has started to provide an influx of cash into some villages as a result of local hiring. Studies on this region have focused on these changes.

Bering Sea: The Alaska Peninsula and Aleutian Chain are potential staging areas for all of the OCS lease-sale areas within the Bering Sea Subregion. All supplies and cargo for the area that arrive by ship or barge must transit a limited number of passes in the Aleutian Islands that also are major migratory pathways for endangered whales. Major fisheries occur within the Bering Sea, with the few communities on the Aleutian and Pribilof Islands serving as important fishing ports. The area is sparsely inhabited, with most area residents residing in a few military installations, commercial fishing ports, and Native settlements. However, because of valuable commercial and natural resources, the plans for offshore development in this area have been intensely debated. Potential effects on small communities along the Aleutian Islands could be extensive.

The social environment of the Bering Sea Subregion may be characterized by mixed subsistence economies in many remote villages and a few small regional centers. All of the people of the region depend to varying degrees on subsistence, commercial fishing, and the harvesting of sea mammals. Existing infrastructure for any petroleum-development and transportation systems is marginal at best. Commercial fishing is the only major industry in the region; next to government, it is the major source of employment.

Individual sets of regional socioeconomic and sociocultural, economic and/or demographic, transportation, and, as appropriate, commercial fishing studies were undertaken to support each of the St. George Basin, North Aleutian Shelf, Navarin Basin, and Norton Basin lease sales. Since then, other studies on subjects such as subsistence and harvest disruption, social indicators, community economics, and petroleum-technology assessments, as well as case studies of individual communities, have been conducted in support of specific lease sales.

Gulf of Alaska: The Gulf of Alaska is both culturally and economically diverse. In addition to a large, generally more urban, Caucasian population spread across the gulf coast, many Alaskan Native culture groups are represented—the Aleuts and Koniags of the Aleutians, the Alaska Peninsula, and Kodiak; the Kenaitze Indians and other Athabaskan-speaking groups of the Cook Inlet area; the Chugach Eskimos along the northern gulf; and the Tlingit and Haida Indians of the southeastern panhandle.

Fishing is the predominant industry throughout the Gulf of Alaska, including Anchorage in extreme Upper Cook Inlet—the financial and service center of the State. Notable exceptions are the Kenai/Nikishka area in Upper Cook Inlet, with an economy based primarily on the Cook Inlet oil industry; Valdez, the terminus of the Trans- Alaska Pipeline; and the southeastern panhandle, which is also dependent on the tourism, timber, mining, and fishing industries.

Finally, the entire area—with the exception of Anchorage—is sustained on a mixed economy of cash and subsistence. While there is a great deal of variation throughout the Gulf of Alaska, almost all communities depend to some degree on subsistence-resource harvests for sustenance. This is particularly true in the smaller, predominantly Alaskan Native communities.

Regional socioeconomic and/or sociocultural studies, economic and demographic analyses, and commercial- fishing and transportation-effects studies have been undertaken to support Gulf of Alaska and Cook Inlet lease sales.

BEAUFORT SEA ENVIRONMENTAL STUDIES LIST: A list of studies conducted in the Beaufort Sea Planning Area under the MMS Environmental Studies Program is included as the last item in this appendix. The reader is advised that environmental assessments made in this EIS are likely to use a broader data base than the studies listed; for example, additional studies conducted by other MMS offshore leasing offices and other Federal, State, university, or international agencies.

OTHER: The size and scope of the overall ESP necessitates mechanisms to integrate study results from multiple disciplines to make them more useful to managers and decisionmakers. Small conferences/workshops on various topics are held to assist the Alaska OCS Region in assessing the potential effects of gas and oil leasing. Previous topics have included monitoring seabird populations (USDOI, MMS, 1985), forage fish of the southeastern Bering Sea (Allen and Ware, 1987), sea-ice forces and mechanics (USDOI, MMS, 1988b), mercury in the marine environment (USDOI, MMS, 1989), a synthesis of information on causeways in the Beaufort Sea (USDOI, MMS, 1990b), Arctic fisheries (Meyer and Johnson, 1990), the status of Federal Arctic Research Information (Geiselman and Mitchell, 1991), and a workshop to assist MMS in designing baseline/ monitoring studies in Norton Sound in support of the OCS offshore mining program (USDOI, MMS, 1990c).

The results of environmental studies have been summarized, integrated, and published in hardcover books—the *Gulf of Alaska Book* (Hood and Zimmerman, 1987) and the two-volume *Eastern Bering Sea Shelf: Oceanography and Resources* (Hood and Calder, 1981)—and in multiple synthesis meeting reports for specific planning areas. The most recent synthesis reports for individual planning areas are Jarvela (1984) for the Navarin Basin, Hameedi (1982) for the St. George Basin, Thorsteinson (1984) for the North Aleutian Basin, Truett (1985) for Norton Basin, Becker (1987) for the Beaufort Sea, and Truett (1984) for the Chukchi Sea. Data made available subsequent to synthesis meetings are made available through IUM's and ITM's (e.g., Becker, 1988; Hale, 1987; Jarvela and Thorsteinson, 1989; USDOI, MMS, 1988a, 1990a, 1993).

Data management is an integral part of the ESP. Physical and biological field data are normally digitized into standardized formats for submission to a national archive. These data are quality-controlled for accuracy and consistency by a data-processing contractor. Once stored, data from multiple projects can be merged for subsequent retrieval by subject or area (e.g., Arctic Fisheries Database, 1993). The ESP staff have been integrally involved in the development of the MMS Technical Information Management System (TIMS), which will help coordinate information archival agencywide.

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ALASKA OCS REGION STUDIES LIST
BEAUFORT SEA

Highlighted studies involved research specific to the Beaufort Sea planning area; others involved multiple planning areas or are of generic application to the planning area. Study funding was provided in years shown for each.

A. ENVIRONMENTAL

Identification, Documentation and Delineation of Coastal Migratory Bird Habitats in Alaska. Alaska Dept. of Fish and Game and Point Reyes Bird Observatory, P. Arneson and G. Divoky, Research Unit No. 3, 1976-79. $689,709.

Distribution, Composition, and Variability of Western Beaufort and Northern Chukchi Sea Benthos. Oregon State University, A. Carey, Research Unit No. 6, 1976-77, 1979-82. $1,202,616.

Assessment of Potential Interaction of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf of Alaska. University of Louisville, R. Atlas, Research Unit No. 29, 1975-77, 1979-80, 1982. $1,405,335.

Analysis of Marine Mammal Remote Sensing Data. Johns Hopkins University, C. Ray and D. Wartzok, Research Unit No. 34, 1976. $18,372.

Trace Hydrocarbon Analysis in Previously Studied Matrices and Methods Development for (a) Trace HC Analysis in Sea Ice and at the Sea Ice/Water Interface and (b) Analysis of Individual High Molecular Weight Aromatic HCs. National Bureau of Standards, S. Chesler, Research Unit No. 43, 1976-78. $615,036.

Environmental Assessment of Alaskan Waters - Trace Element Methodology - Inorganic Elements. National Bureau of Standards, P. LaFleur, Research Unit No. 47, 1976. $116,356.

Coastal Morphology, Sedimentation, and Oil Spill Vulnerability. Research Planning Institute Inc., M. Hayes, Research Unit No. 59, 1975-81. $1,182,914.

Migration, Distribution, and Abundance of Bowhead and Beluga Whales. NOAA/ NMFS/Northwest and Alaska Fisheries Center, C. Fiscus and H. Braham, Research Unit No. 69, 1976-78. $320,603.

Effects of Oiling on Marine Mammals. Scripps Institution of Oceanography, G. Kooyman, Research Unit No. 71, 1976, 1980. $142,150.

Lethal and Sublethal Effects of Acute and Long-term Exposures of Petroleum Hydrocarbons on Alaskan Marine Organisms. NOAA/NMFS/Auke Bay Laboratory, S. Rice and J. Karinen, Research Unit No. 72, 1975-82. $2,740,334.

Sublethal Effects of Petroleum Hydrocarbons and Trace Metals, Including Biotransformation, as Reflected by Morphological, Chemical, Physiological, and Behavioral Indices. NOAA/NMFS/Northwest and Alaska Fisheries Center, D. Malins, Research Unit No. 73, 1976-82. $3,221,367.

Identification of Major Processes in Biotransformations of Petroleum Hydrocarbons and Trace Metals. NOAA/NMFS/Northwest and Alaska Fisheries Center, D. Malins, Research Unit No. 74, 1976. Funding included with RU 73.

Oil Pollutant Effects on Subarctic and Arctic Biota: Assessment of Available Literature. NOAA/NMFS/Northwest and Alaska Fisheries Center, M. Stansby, D. Malins, and F. Piskur, Research Unit No. 75, 1976. $50,523.

Western Beaufort and Northern Chukchi Shelf Surface Currents. United States Coast Guard, G. Hufford, Research Unit No. 81, 1975-77. $81,593.

Interaction of Oil With Sea Ice in the Arctic Ocean. University of Washington, S. Martin, Research Unit No. 87, 1976-77, 1979-82. $660,071.

Sea Ice Ridging and Pile-Up. U.S. Army Cold Regions Research and Engineering Laboratory, W. Weeks, Research Unit No. 88, 1976-83. $3,224,430.

Current, CTD, and Pressure Measurements in Possible Dispersal Regions of the Chukchi and Beaufort Seas. University of Washington, K. Aagaard, Research Unit Nos. 91/151, 1975-77, 1979-83. $1,723,264.

(a) Evolution, Pathobiology, and Breeding Ecology of Herring Gulls in the Northeast Gulf of Alaska and (b) Effects of Petroleum Exposure on the Breeding and Ecology of Gulls and Kittiwakes. Johns Hopkins University, F. Bang and S. Patten, Research Unit No. 96, 1975-76. $74,120.

Dynamics of Nearshore Sea Ice. University of Washington, R. Colony, Research Unit No. 98, 1978. $451,533.
Delineation and Engineering Characteristics of Permafrost Beneath the Arctic Seas. U.S. Army Cold Regions Research and Engineering Laboratory, P. Sellman and E. Chamberlain, Research Unit No. 105, 1975-83. $1,672,677.

Seasonality and Variability of Stream Flow Important to Alaskan Nearshore Coastal Areas. University of Alaska, R. Carlson, Research Unit No. 111, 1975. $81,144.

Salinity, Temperature and Depth Measurements of the Beaufort Sea Shelf. University of Washington, K. Aagaard, Research Unit No. 151, 1975-76. $302,016.

Natural Distribution of Trace Heavy Metals on the Alaskan Shelf. University of Alaska, D. Burrell, Research Unit No. 162, 1975-78. $1,374,924.

Shorebird Dependence on Arctic Littoral Habitats. University of California, R. Risebrough and P. Connors, Research Unit No. 172, 1975-77, 1979-80, 1982. $537,784.

Baseline Study of Microbial Activity and Crude Oil-Microbial Interactions in the Beaufort Sea, Gulf of Alaska and Norton Sound. Oregon State University, R. Morita and R. Griffiths, Research Unit No. 190, 1975-80. $1,105,863.

Morbidity and Mortality of Key Marine Mammal Species. University of Alaska, F. Fay, Research Unit No. 194, 1975, 1977-80. $617,714.

Distribution, Abundance, and Feeding Ecology of Birds Associated with Sea Ice. Point Reyes Bird Observatory, G. West and G. Divoky, Research Unit No. 196, 1975-77, 1979-80, 1982. $656,813.

Offshore Permafrost Studies. U.S. Geological Survey, D. Hopkins, Research Unit No. 204, 1975-83. $1,023,464.

Geologic Environment of the Chukchi and Beaufort Sea Shelf and Coastal Regions. U.S. Geological Survey, P. Barnes and E. Reimnitz, Research Unit No. 205, 1975-86. $2,934,878.

Avifaunal Utilization of the Offshore Islands Near Prudhoe Bay, Alaska. University of Alaska, D. Schamel, Research Unit No. 215, 1975. $6,279.

Natural History and Ecology of Bearded and Ringed Seals. Alaska Department of Fish and Game, T. Eley and J. Burns, Research Unit No. 230, 1976-80. $750,990.

Trophic Relationships Among Ice-inhabiting Phocid Seals and Functionally Related Marine Mammals in the Arctic. Alaska Department of Fish and Game, L. Lowry, K. Frost, B. Kelly, and J. Burns, Research Unit No. 232, 1976-84. $2,294,423.

Beaufort Sea Estuarine Fishery Study. Alaska Department of Fish and Game, T. Bendock, Research Unit No. 233, 1975-77. $368,146.

Climatic Effects on Fast-Ice Extent and its Seasonal Decay Along the Beaufort Sea and Chukchi Sea Coasts. University of Colorado, R. Barry, Research Unit No. 244, 1975-77. $249,713.

Relationships of Marine Mammal Distributions, Densities, and Activities to Sea Ice Conditions. Alaska Department of Fish and Game and the University of Alaska, J. Burns, F. Fay, and L. Shapiro, Research Unit No. 248, 1975-77. $469,205.

(a) Mechanical Properties of Sea Ice and (b) Sea Ice Deformation in the Nearshore Zone. University of Alaska, L. Shapiro and W. Harrison, Research Unit Nos. 250/265, 1975-80. $662,587.

Subsea Permafrost: Probing, Thermal Regime and Data Analysis. University of Alaska, T. Osterkamp and W. Harrison, Research Unit No. 253, 1975-83. $1,232,409.

Determination of Morphology of Beaufort, Chukchi, and Bering Sea Nearshore Ice By Means of Satellite and Aerial Remote Sensing. University of Alaska, W. Stringer, Research Unit No. 257, 1975-78. $356,519.

Experimental Measurements of Sea-Ice Failure Stresses Near Grounded Structures. University of Alaska, W. Sackinger and R. Nelson, Research Unit No. 259, 1975-77. $171,329.

Baseline Study of Historic Ice Conditions in Bering Strait, Chukchi Sea and Beaufort Sea. University of Alaska, W. Hunt and C. Naske, Research Unit No. 261, 1975-77. $156,006.

Operation of an Alaskan Facility for Application of Remote Sensing Data to OCS Studies. University of Alaska, W. Stringer, Research Unit No. 267, 1975-78, 1980-84. $1,456,273.

Arctic Offshore Permafrost Studies. Michigan Technical University and the University of Alaska, J. Rogers, Research Unit Nos. 271/610, 1982. $892,286.

Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf. University of Alaska, D. Shaw, Research Unit No. 275, 1975-79. $1,856,280.

Microbial Release of Soluble Trace Metals From Oil-Impacted Sediments. University of Alaska, R. Barsdate, Research Unit No. 278, 1975-76. $37,516.

Preparation of Illustrated Keys to Skeletal Remains and Otoliths of Forage Fishes. University of Alaska, J. Morrow, Research Unit No. 285/318, 1976. $67,364.

Transport of Pollutants in the Vicinity of Prudhoe Bay. Environmental Protection Agency, R. Callaway, Research Unit No. 335, 1975-76. $76,399.

Seasonal Pelagic Distribution and Abundance of Marine Birds. U.S. Fish and Wildlife Service, J. Bartonek, C. Lensink, and P. Gould, Research Unit No. 337, 1975-79. $1,434,830.

Catalog of Seabird Colonies in Alaska. U.S. Fish and Wildlife Service, J. Bartonek, C. Lensink, and A. Sowls, Research Unit No. 338, 1977. $46,389.

An Annotated Bibliography of Literature on Alaska Water Birds. U.S. Fish and Wildlife Service, C. Lensink and J. Bartonek, Research Unit No. 339, 1976. $66,292.

Marine Climatology of the Gulf of Alaska, Bering Sea, and Beaufort Sea. NOAA/National Climatic Center and University of Alaska/AEIDC, W. Brower and J. Wise, Research Unit No. 347, 1976-78. $338,899.

Literature Search on Density and Distribution of Fishes of the Beaufort Sea. University of Alaska, J. Morrow, Research Unit No. 348, 1976. $30,620.

Seismicity of the Beaufort Sea, Bering Sea, and Gulf of Alaska. NOAA/National Geophysical and Solar-Terrestrial Data Center, H. Meyers, Research Unit No. 352, 1976-77. $48,308.

(a) Reconnaissance Characterization and (b) Environmental Assessment of Selected Habitats in Arctic Littoral Systems. Western Washington State University, C. Broad, Research Unit No. 356, 1975-81. $2,369,584.

Plankton Studies in the Beaufort, Chukchi, and Bering Seas. University of Washington, R. Horner, Research Unit No. 359, 1975-80. $1,006,816.

Radiometric Spectral Response of Oil Films. NOAA/ERL/Applied Physics Cold Laboratory, P. Kuhn, Research Unit No. 399, 1975-76. $44,423.

A Study of Beaufort Sea Coastal Erosion. Arctic Research Inc., R. Lewellen, Research No. 407, 1976. $27,558.

Prototype Beaufort Sea Technology Scenario. E. Clarke, Research Unit No. 422, 1976. $?. Not in ESDS. Suspect a small amount, as it was for a presentation.

Zooplankton and Micronekton Studies: Southeastern Bering Sea, Chukchi Sea and Beaufort Sea. University of Alaska, R. Cooney, Research Unit No. 426, 1975-77. $544,156.

Feasibility of Intertidal Zone Mapping by Multispectral Techniques. Environmental Research Institute of Michigan, C. Wezernak, Research Unit No. 428, 1976-77. $135,555.

Seismic and Tectonic Hazards in the Hope Basin and Beaufort Shelf. U.S. Geological Survey, A. Grantz, Research Unit No. 432, 1976-77. $111,251.

Modeling the Alaskan Continental Shelf Waters. Rand Corporation, J. Leendertse and D. Liu, Research Unit No. 435, 1978-85. $3,493,400.

Accumulation of Organic Constituents and Heavy Metals from Petroleum-impacted Sediments By Marine Detritivores of the Alaska OCS. Battelle Pacific Northwest Laboratories, J. Anderson, Research Unit No. 454, 1978-79. $655,276.

Beaufort Sea Barrier Island-Lagoon Ecological Process Studies. LGL Ecological Research Associates, B. Gallaway and J. Truett, Research Unit No. 467, 1976-81. $3,754,001.

The Fate and Weathering of Petroleum Spilled in the Marine Environment: A Literature Review and Synopsis. Science Applications Inc., J. Payne and R. Jordon, Research Unit No. 468, 1979. $?. Not in ESDS. May be combined with lab study.

Shoreline History of the Chukchi and Beaufort Seas as an Aid to Predicting Offshore Permafrost Conditions. U.S. Geological Survey, D. Hopkins, Research Unit No. 473, 1976-77, 1979-80. $1,069,871.

Characterization of Organic Matter in Sediments from the Gulf of Alaska, Bering and Beaufort Seas. University of California-Los Angeles, I. Kaplan, Research Unit No. 480, 1976-81. $769,747.

Evaluation of Earthquake Activity and Seismotectonic Studies of Northern and Western Alaska. University of Alaska, N. Biswas and L. Gedney, Research Unit No. 483, 1977-78, 1980-81. $1,880,380.

Index of Original Surface Weather Records. NOAA/National Climatic Data Center, W. Brower, Research Unit No. 496, 1977. $?. Not in ESDS.

Modeling Algorithms for the Weathering of Oil in the Marine Environment. NOAA/ Environmental Data Service, J. Mattson, Research Unit No. 499, 1977-78. $127,103.

Activity-directed Fractionation of Petroleum Samples. Battelle/Columbus and Pacific Northwest Laboratories, J. Warner, Research Unit No. 500, 1977-78. $276,300.

Natural Distribution and Environmental Background of Trace Heavy Metals in Alaskan Shelf and Estuarine Areas. Battelle Pacific Northwest Laboratories, D. Robertson, Research Unit No. 506, 1979. $74,701.

A Geographic-based Information Management System for Permafrost Predictions in the Beaufort and Chukchi Seas. University of Colorado, M. Vigdorchik, Research Unit No. 516, 1981. $99,587.

Nearshore Meteorologic Regimes in the Arctic. Occidental College, T. Kozo, Research Unit No. 519, 1977, 1979-84. $1,225,564.

Characterization of the Nearshore Hydrodynamics of Arctic Barrier Island-Lagoon Systems. University of Alaska, J. Matthews, Research Unit No. 526, 1977-81. $1,782,232.

Aspects of Size Distributions, Clay Mineralogy, and Geochemistry of Sediments of the Beaufort Sea and Adjacent Deltas, North Arctic Alaska. University of Alaska, A. Naidu, Research Unit No. 529, 1977-81. $691,220.

Geology and Geomorphology of the Barrier Island-Lagoon System Along the Beaufort Sea Coastal Plain. University of Alaska, P. Cannon, Research Unit No. 530, 1980. $218,522.

Numerical Modeling and Associated Current Measurements in the Beaufort Sea and Chukchi Sea. Kinnetics Laboratory Inc., J. Mungall, Research Unit No. 531, 1977-82. $826,781.

Nutrient Dynamics and Trophic System Energetics in Nearshore Beaufort Sea Waters. University of Alaska, D. Schell, Research Unit No. 537, 1977-81. $1,174,937.

Oil Spill Vulnerability of the Beaufort Coast. University of South Carolina, D. Nummendahl, Research Unit No. 540, 1980. $? Not in ESDS.

Quality Assurance Program for Trace Petroleum Component Analysis. NOAA/ National Analytical Facility, W. MacLeod, Research Unit No. 557, 1978-88, 1990. $1,907,704.

Oil Pooling Under Sea Ice. U.S. Army Cold Regions Research and Engineering Laboratory, A. Kovacs, Research Unit No. 562, 1978-80. $257,532.

Taxonomic Identification and Archival of Biological Specimens. California Academy of Sciences, W. Eschmeyer, Research Unit No. 563, 1978-90. Funding? Believed to be included in OCSEAP data management budget. Not in ESDS.

Transport and Behavior of Oil Spilled In and Under Sea Ice (Task I). Flow Research Co., M. Coon and R. Pritchard, Research Unit No. 567, 1978, 1980-83. $1,131,218.

Transport and Behavior of Oil Spilled In and Under Sea Ice (Tasks II and III). ARCTEC Inc., L. Schultz and P. DeSlauries, Research Unit No. 568, 1978-81. $643,316.

Multivariate Analysis of Petroleum Weathering in the Marine Environment. Science Applications Inc., J. Payne, Research Unit No. 597, 1980-82. $1,762,081.

Habitat Requirements and Expected Distribution of Alaska Coral. VTN Oregon Inc., R. Cimberg, Research Unit No. 601, 1980. $51,769.

Baffin Island Oil Spill Project. Environmental Protection Service (Canada), P. Blackall, Research Unit No. 606, 1980-84. $1,036,853.

Biodegradation of Aromatic Compounds by High Latitude Phytoplankton. University of Texas, C. Van Baalen, Research Unit No. 607, 1981. $58,830.

Beaufort and Chukchi Seacoast Permafrost Studies. Michigan Technological University and University of Alaska, J. Rogers and J. Morack, Research Unit No. 610, 1983. $?. Funding combined with another RU the PIs conducted.

Biological Investigations of Beluga Whales in the Coastal Waters of Northern Alaska. Alaska Department of Fish and Game, J. Burns, Research Unit No. 612, 1981-83. $629,328.

Investigations of Marine Mammals in the Coastal Zone of Western Alaska During Summer and Autumn. Alaska Department of Fish and Game, K. Frost, L. Lowry, and J. Burns, Research Unit No. 613, 1981. $320,509.

Baffin Island Oil Spill Project: Hydrocarbon Bioaccumulation and Histo- pathological and Biochemical Responses of Molluscs. Battelle New England Marine Research Laboratory, J. Neff, Research Unit No. 615, 1981. $194,278.

The Nature and Biological Effects of Weathered Petroleum. NOAA/NMFS/Northwest and Alaska Fisheries Center, D. Malins, Research Unit No. 619, 1982-83. $342,130.

Storm Surge Modeling. University of Alaska, Z. Kowalik, Research Unit No. 627, 1982-84. $225,481.

Belukha Whale Responses to Industrial Noise in Nushagak Bay, Alaska, 1983. Hubbs-Sea World Marine Research Institute, W. Evans, Research Unit No. 629, 1982-83. $277,926.

Geophysical and Biological Reconnaissance of Rock Habitats in Western Camden Bay. University of Alaska, D. Schell and K. Dunton, Research Unit No. 630, 1982. $28,088.

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Application and Construction of Satellite Tags for Large Whales. Univ. of Guelph, J. Goodyear, P. O. No. 12886, 1990. $18,623.

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Oil Spill Probability Projection. Futures Group, Contract No. 29055, 1980. $193,348.

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Study of the Effects of Oil on Marine Mammals. Univ. of Guleph, J. Geraci, Contract No. 29169, 1979. $2,018,457.

Generic Mud Plume Modeling Study. U.S. Army Corps of Engineers, Contract No. 30012, 1983. $10,800.

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Assessment of Satellite Tracked Surface Buoys in Simulating the Movement of Spilled Oil in the Marine Environment. Applied Science Associates, M. Reed, Contract No. 30340, 1986. $86,925.

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C. RELEVANT ALASKA REGION SYNTHESIS AND PROGRAMMATIC DOCUMENTS

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APPENDIX E

EMPLOYMENT AND POPULATION FORECASTS:

METHODOLOGY

AND

SUPPORTING TABLES FOR SECTIONS III.C.1 & IV.B.8

METHODOLOGY FOR EMPLOYMENT AND POPULATION FORECASTS

The employment and population forecasts prepared for the Sale 144 EIS were calculated using the MMS Manpower Model and the Rural Alaska Model (RAM). Using the Exploration and Development Report for Sale 144, the number of wells, platforms, shore bases, and kilometers of pipeline were input to the Manpower Model.

The Manpower Model predicts the number of onshore and offshore short- and long-term skilled and unskilled workers. These data are input to the RAM. Among other variables, the RAM predicts the number of OCS enclave workers and the number of direct OCS resident workers as well as the number of Native and non-Native residents.

The term "a job" or the term "an employee" as used in the analysis of effects on the economy is defined as one full-time equivalent worker working for 1 year. A "resident employee" is defined as a resident of the North Slope Borough.

Table E-1
Summary of Employment and Population Projections Without OCS Activity

	EMPLOYMENT					POPULATION			
Year	Non-OCS	OCS	Total	Enclave OCS	Total Employment	Resident	Resident Native	Resident Non-Native	Total
1998	4,842	0	4,842	0	4,842	3,675	2,909	766	6,056
1999	4,645	0	4,645	0	4,645	3,736	2,979	757	5,994
2000	4,635	0	4,635	0	4,635	3,795	3,044	751	6,051
2001	4,494	0	4,494	0	4,494	3,862	3,111	751	6,023
2002	3,726	0	3,726	0	3,726	3,932	3,184	748	5,593
2003	3,693	0	3,693	0	3,693	3,980	3,252	728	5,641
2004	3,324	0	3,324	0	3,324	4,042	3,318	724	5,467
2005	3,307	0	3,307	0	3,307	4,104	3,391	713	5,530
2006	3,305	0	3,305	0	3,305	4,179	3,467	712	5,604
2007	2,692	0	2,692	0	2,692	4,263	3,549	714	5,286
2008	2,669	0	2,669	0	2,669	4,334	3,635	699	5,358
2009	2,667	0	2,667	0	2,667	4,420	3,722	698	5,443
2010	2,671	0	2,671	0	2,671	4,517	3,817	700	5,541
2011	2,678	0	2,678	0	2,678	4,627	3,922	705	5,650
2012	2,688	0	2,688	0	2,688	4,745	4,035	710	5,769
2013	2,699	0	2,699	0	2,699	4,848	4,130	718	5,871
2014	2,709	0	2,709	0	2,709	4,928	4,204	724	5,951
2015	2,715	0	2,715	0	2,715	4,988	4,260	728	6,012
2016	2,718	0	2,718	0	2,718	5,036	4,307	729	6,060
2017	2,719	0	2,719	0	2,718	5,035	4,305	730	6,058
2018	2,712	0	2,712	0	2,712	5,019	4,293	726	6,042
2019	2,702	0	2,702	0	2,702	5,006	4,286	720	6,029
2020	2,691	0	2,691	0	2,691	5,001	4,288	713	6,024
2021	2,682	0	2,682	0	2,682	4,997	4,290	707	6,021
2022	2,672	0	2,672	0	2,672	4,996	4,294	702	6,019
2023	2,664	0	2,664	0	2,664	4,997	4,301	696	6,020
2024	2,659	0	2,659	0	2,664	5,000	4,307	693	6,024
2025	2,657	0	2,657	0	2,657	5,008	4,316	692	6,032
2026	2,657	0	2,657	0	2,657	5,020	4,328	692	6,043
2027	2,658	0	2,658	0	2,658	5,036	4,344	692	6,060
2028	2,660	0	2,660	0	2,660	5,061	4,367	694	6,084
2029	2,664	0	2,664	0	2,664	5,087	4,391	696	6,111
2030	2,668	0	2,668	0	2,668	5,116	4,417	699	6,140

Source: MMS Manpower Model and Rural Alaska Model, 1995.

Table E-2
Summary of Employment and Population Projections for the Proposal (Alternative I) and the Barter Island Deferral (Alternative III)

	EMPLOYMENT			POPULATION			
Year	Non-OCS	OCS	Total	Resident	Resident Native	Resident Non-Native	Total
1998	4,842	441	5,283	3,675	2,909	766	6,332
1999	4,645	457	5,102	3,748	2,979	769	6,287
2000	4,635	687	5,322	3,815	3,048	767	6,331
2001	4,494	797	5,291	3,888	3,119	769	6,260
2002	3,726	1,565	5,291	3,959	3,193	766	6,624
2003	3,693	2,253	5,946	4,040	3,263	777	7,132
2004	3,324	2,729	6,053	4,444	3,345	799	7,281
2005	3,307	3,075	6,382	4,246	3,435	811	7,571
2006	3,305	3,464	6,769	4,358	3,528	830	7,910
2007	2,692	3,553	6,245	4,475	3,625	850	7,656
2008	2,669	2,898	5,567	4,571	3,724	847	7,306
2009	2,667	2,842	5,509	4,648	3,816	832	7,359
2010	2,671	2,617	5,288	4,735	3,905	830	7,305
2011	2,678	2,521	5,199	4,832	4,006	826	7,346
2012	2,688	2,527	5,215	4,946	4,120	826	7,470
2013	2,699	2,500	5,199	5,072	4,240	832	7,580
2014	2,709	2,501	5,210	5,203	4,363	840	7,710
2015	2,715	2,384	5,099	5,338	4,490	848	7,766
2016	2,718	2,300	5,018	5,470	4,617	853	7,842
2017	2,719	2,175	4,894	5,598	4,740	858	7,881
2018	2,712	2,033	4,745	5,736	4,874	862	7,922
2019	2,702	1,912	4,614	5,879	5,014	865	7,978
2020	2,691	1,694	4,385	6,028	5,159	869	7,975
2021	2,682	1,553	4,235	6,173	5,305	871	8,012
2022	2,672	1,423	4,095	6,330	5,455	875	8,087
2023	2,664	1,322	3,986	6,447	5,566	881	8,127
2024	2,659	1,217	3,876	6,528	5,642	886	8,133
2025	2,657	1,066	3,723	6,584	5,694	890	8,112
2026	2,657	973	3,630	6,618	5,727	891	8,060
2027	2,658	836	3,494	6,632	5,743	889	7,986
2028	2,660	721	3,381	6,632	5,745	887	7,698
2029	2,664	697	3,361	6,605	5,731	874	7,671
2030	2,668	276	2,944	6,563	5,694	869	7,586

Source: MMS Manpower Model and Rural Alaska Model, 1995.

Table E-3
Summary of Employment and Population Projections for the Nuiqsut Deferral (Alternative IV)

	EMPLOYMENT			POPULATION			
Year	Non-OCS	OCS	Total	Resident	Resident Native	Resident Non-Native	Total
1998	4,842	425	5,267	3,675	2,909	766	6,332
1999	4,645	299	4,944	3,748	2,979	757	6,185
2000	4,635	521	5,156	3,812	3,048	751	6,391
2001	4,494	530	5,024	3,888	3,118	751	6,371
2002	3,726	1,351	5,077	3,963	3,193	748	6,488
2003	3,693	1,448	5,141	4,038	3,265	728	6,599
2004	3,324	1,840	5,164	4,121	3,344	724	6,690
2005	3,307	2,260	5,567	4,209	3,427	713	7,023
2006	3,305	2,480	5,785	4,320	3,520	712	7,250
2007	2,692	1,948	4,640	4,432	3,616	714	6,582
2008	2,669	1,912	4,581	4,509	3,714	699	6,643
2009	2,667	1,814	4,481	4,589	3,798	698	6,660
2010	2,671	1,716	4,387	4,681	3,891	700	6,693
2011	2,678	1,709	4,387	4,784	3,993	705	6,797
2012	2,688	1,720	4,408	4,904	4,109	710	6,925
2013	2,699	1,681	4,380	5,033	4,230	718	7,028
2014	2,709	1,683	4,392	5,164	4,354	724	7,159
2015	2,715	1,690	4,405	5,299	4,481	728	7,298
2016	2,718	1,503	4,221	5,435	4,609	729	7,304
2017	2,719	1,474	4,193	5,563	4,733	730	7,413
2018	2,712	1,454	4,166	5,702	4,867	726	7,532
2019	2,702	1,447	4,149	5,850	5,008	720	7,664
2020	2,691	1,226	3,917	6,005	5,154	713	7,661
2021	2,682	1,197	3,879	6,162	5,308	707	7,794
2022	2,672	1,175	3,847	6,285	5,424	702	7,891
2023	2,664	965	3,629	6,373	5,505	696	7,829
2024	2,659	970	3,629	6,433	5,564	693	7,892
2025	2,657	968	3,625	6,472	5,600	692	7,927
2026	2,657	947	3,604	6,497	5,622	692	7,938
2027	2,658	814	3,472	6,497	5,636	692	7,867
2028	2,660	699	3,359	6,519	5,645	694	7,804
2029	2,664	680	3,344	6,510	5,640	696	7,790
2030	2,668	275	2,943	6,498	5,630	699	7,521

Source: MMS Manpower Model and Rural Alaska Model, 1996.

Table E-4
Summary of Employment and Population Projections for the High Case (Alternative I)

	EMPLOYMENT			POPULATION			
					Resident	Resident	
Year	Non-OCS	OCS	Total	Resident	Native	Non-Native	Total
1998	4,482	419	5,261	3,675	2,909	766	6,328
1999	4,645	495	5,140	3,748	2,979	769	6,313
2000	4,635	984	5,619	3,816	3,048	768	6,690
2001	4,494	1,309	5,803	3,904	3,121	783	6,887
2002	3,726	2,158	5,884	3,996	3,201	795	7,026
2003	3,693	3,233	6,926	4,079	3,278	801	7,788
2004	3,324	4,250	7,544	4,495	3,361	834	8,308
2005	3,307	5,051	8,358	4,311	3,450	861	8,897
2006	3,305	5,897	9,202	4,439	3,544	895	9,522
2007	2,692	6,986	9,678	4,576	3,641	935	9,922
2008	2,669	7,024	9,693	4,707	3,742	965	10,018
2009	2,667	8,130	10,797	4,829	3,848	981	10,831
2010	2,671	7,610	10,281	4,982	3,960	1,022	10,583
2011	2,678	8,221	10,899	5,104	4,076	1,028	11,093
2012	2,688	7,667	10,355	5,257	4,202	1,055	10,839
2013	2,699	7,286	9,985	5,392	4,334	1,058	10,726
2014	2,709	7,189	9,898	5,510	4,455	1,055	10,758
2015	2,715	6,705	9,420	5,631	4,574	1,057	10,528
2016	2,718	6,735	9,453	5,739	4,692	1,047	10,616
2017	2,719	6,813	9,532	5,851	4,803	1,048	10,705
2018	2,712	6,700	9,412	5,987	4,934	1,053	10,672
2019	2,702	6,598	9,300	6,125	5,072	1,053	10,647
2020	2,691	6,408	9,099	6,265	5,212	1,053	10,573
2021	2,682	6,077	8,759	6,402	5,352	1,050	10,408
2022	2,672	5,720	8,392	6,537	5,495	1,042	10,228
2023	2,664	5,408	8,072	6,673	5,640	1,033	10,079
2024	2,659	5,117	7,776	6,813	5,788	1,025	9,947
2025	2,657	4,830	7,487	6,962	5,941	1,021	9,822
2026	2,657	4,546	7,203	7,116	6,098	1,018	9,705
2027	2,658	4,161	6,819	7,273	6,256	1,017	9,526
2028	2,660	3,848	6,508	7,432	6,419	1,013	9,400
2029	2,664	3,573	6,237	7,621	6,610	1,011	9,309
2030	2,668	3,186	5,854	7,681	6,707	974	9,102

Source: MMS Manpower Model and Rural Alaska Model, 1995.

APPENDIX F

ENDANGERED SPECIES ACT

SECTION 7

CONSULTATION AND DOCUMENTATION

United States Department of the Interior

TAKE PRIDE IN AMERICA

MINERALS MANAGEMENT SERVICE
Alaska Outer Continental Shelf Region
949 E. 36th Avenue, Room 603
Anchorage, Alaska 99508-4302

IN REPLY REFER TO:

JAN 23 1995

Mr. Steven Pennoyer
Director, Alaska Region
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

Dear Mr. Pennoyer:

The Minerals Management Service has initiated the planning process for leasing and exploration associated with the proposed Outer Continental Shelf (OCS) Oil and Gas Lease Sale 144, Beaufort Sea. This lease sale is tentatively scheduled for March 12, 1997, in the Beaufort Sea Planning Area (see enclosure).

In accordance with the Endangered Species Act, section 7, regulations governing interagency cooperation, we are providing a notification of the listed and proposed species and critical habitat that will be included in our biological evaluation.

It is our understanding that there are no proposed or designated critical habitats for any listed species in OCS regions potentially affected by activities associated with Sale 144. In our biological evaluation, we will review the following listed species that may be present in the proposed lease area.

Common Name	Scientific Name	Status
Bowhead whale	*Balaena mysticetus*	endangered

Please notify us of your concurrence or revisions and of any new information concerning this species in relation to the proposed project area. To facilitate the review, we have provided a copy of this letter to your Anchorage field office. Upon receipt of your reply, we will begin preparation of the biological evaluation reviewing the potential effects of the proposed action.

Mr. Steven Pennoyer

Enclosure

cc: National Marine Fisheries
    Service
    222 W. 7th Ave., Box 43
    Anchorage, Alaska 99513

Official File (EAS) Sale 144
    LE Read
    Author
    RD Chron
k:\users\eas\144\144letnm.fs\WENDLING\kmn\1-20-95

JAN 2 . 1995

original signed by Judith C. Gottlieb

United States Department of the Interior

TAKE PRIDE IN AMERICA

MINERALS MANAGEMENT SERVICE
Alaska Outer Continental Shelf Region
949 E. 36th Avenue, Room 603
Anchorage, Alaska 99508-4302

IN REPLY REFER TO:

[illegible] 1995

Memorandum

To: Regional Director, U.S. Fish and Wildlife Service

From: Regional Director

Subject: Endangered Species - Proposed Oil and Gas Lease Sale 144 (Beaufort Sea)

The Minerals Management Service has initiated the planning process for leasing and exploration associated with the proposed Outer Continental Shelf (OCS) Oil and Gas Lease Sale 144, Beaufort Sea. This lease sale is tentatively scheduled for March 12, 1997, in the Beaufort Sea Planning Area (see Attachment).

In accordance with the Endangered Species Act, section 7, regulations governing interagency cooperation, we are providing a notification of the listed and proposed species and critical habitat that will be included in our biological evaluation.

It is our understanding that there are no proposed or designated critical habitats for any listed or proposed species in OCS regions potentially affected by activities associated with Sale 144. In our biological evaluation, we will review the following listed and proposed species that may be present in the proposed lease area.

Common Name	Scientific Name	Status
Spectacled eider	*Somateria fischeri*	threatened
Steller's eider	*Polysticta stelleri*	proposed threatened
Arctic peregrine falcon	*Falco peregrinus tundrius*	candidate

The potential effects on several species that occur at more southern latitudes along the expected oil transport corridor were included in our biological evaluations for Cook Inlet Lease Sale 149 and Gulf of Alaska/Yakutat Lease Sale 158. The oil transport scenario for Sale 144 remains the same, so species along the southern transportation corridor are incorporated by reference to the biological evaluations for Sale 149 and Sale 158.

Please review our list and notify us of your concurrence or revisions and of any new information concerning these species in relation to the proposed project area. To facilitate the review, we have provided a copy of this letter to your Anchorage Ecological Services field office. Upon receipt of your reply, we will begin preparation of the biological evaluation reviewing the potential effects of the proposed action.

If you have any questions concerning this proposed action, please contact Frank Wendling at (907) 271-6510.

Attachment

cc: U.S. Fish and Wildlife Service
Anchorage Ecological Services Field Office
1011 E. Tudor Road
Anchorage, Alaska 99503

Official File (EAS) Sale 144
LE Read
Author
RD Chron
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JAN 2 . 1995

original signed by

Judith C. Gottlieb

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

February 7, 1995

RECEIVED
FEB 13 1995
1130
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

Judith C. Gottlieb
Regional Director
Minerals Management Service
Alaska Outer Continental Shelf Region
949 E. 36th Avenue, Room 603
Anchorage, Alaska 99508-4302

Dear ~~Ms. Gottlieb~~ Judy -:

Thank you for your letter concerning threatened or endangered species within the planning area for Oil and Gas Lease Sale 144, Beaufort Sea. The National Marine Fisheries Service concurs with your plans to address the endangered bowhead whale in your biological evaluation. No other listed species would be expected to commonly occur in the planning area, and no proposed or designated critical habitat occurs within the Beaufort Sea.

We hope this information is useful to you in your review of threatened or endangered species.

Sincerely,

Steve T. Zimmerman

for: Steven Pennoyer
Director, Alaska Region

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. Tudor Rd.
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:
DES

RECEIVED
MAR 17 1995
12:20pm
REGIONAL DIRECTOR, ALASKA OCS
Minerals Management Service
ANCHORAGE, ALASKA

MAR 13 1995

Memorandum

To: Regional Director, Minerals Management Service
Outer Continental Shelf Region

From: Regional Director
Region 7

Subject: Endangered Species - Proposed Oil and Gas Lease Sale 144 (Beaufort Sea)

This responds to your request for a list of endangered and threatened species and critical habitats pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act), for the above referenced project.

We concur that three species should be considered in your biological evaluation: spectacled eiders (*Somateria fischeri*), Steller's eiders (*Polysticta stelleri*), and Arctic peregrine falcons (*Falco peregrinus tundrius*). Attached is a list of endangered, threatened, and candidate species that occur in Alaska.

Spectacled eiders, a threatened species, nest in coastal tundra areas on the North Slope. The population in Alaska has declined considerably in recent years, and information on nesting habitat and nest locations is limited. The U.S. Fish and Wildlife Service (Service) has developed draft recommended protection measures for spectacled eiders which are attached for your information. There is no designated critical habitat for spectacled eiders in Alaska.

Arctic peregrine falcons were removed from the list of endangered and threatened species on October 5, 1994. This subspecies nests in the tundra areas of northern and western Alaska and migrates throughout the State (except the Aleutian Islands) during spring and fall migration. There is no designated critical habitat for Arctic peregrine falcons in Alaska.

The Service recommends that agencies and applicants avoid impacts to Arctic peregrine falcons as they have recently recovered from threatened status. Monitoring of index population areas will continue for five years after delisting; the species could be emergency listed at any time if survey data indicate a reverse in recovery.

The proposal to list the Alaska breeding population of Steller's eiders as threatened was published in July 1994. A final rule is expected within a year. Steller's eiders nest in coastal tundra areas, and winter along the Alaska Peninsula and in coastal areas of southcentral Alaska. Migration routes and molting areas include nearshore coastal areas along the northern and western coasts of Alaska. Barrow, Alaska is the only place in Alaska where Steller's eiders are currently known to breed regularly although survey data indicate that the species occurs across the Arctic coastal plain as far east as the Colville River.

As referenced in your memorandum, there are potential effects on several species that occur at more southern latitudes along the expected oil transport corridor. A list of these species, which were also included in the consultations regarding Lease Sales 149 and 158, is attached for your information.

If you would like assistance in determining whether this lease sale is likely to adversely impact listed species, please contact Janey Fadely, Northern Alaska Ecological Service, Fairbanks at 456-0297.

This response relates only to endangered species under our jurisdiction. It does not address species under the jurisdiction of National Marine Fisheries Service, or other legislation or responsibilities under the Fish and Wildlife Coordination Act, Clean Water Act, or National Environmental Policy Act.

Thank you for your cooperation in meeting our joint responsibilities under the Act.

Attachments

Dan B. All

ATTACHMENT

Recommended Protection Measures for Spectacled Eiders

The following protection measures are intended as general guidelines and may not be appropriate in all situations. The level of protection needed may vary with topography, vegetation and the sensitivity of individual birds to human activity. When feasible, proposed activities should be examined on a case-by-case basis by a biologist knowledgeable of the habits and behavior of spectacled eiders.

Knowledge of spectacled eider distribution is limited. All projects within the historical breeding range of spectacled eiders have the potential to affect spectacled eiders. Therefore, unless existing data demonstrate that spectacled eiders are not likely to nest in the project area, Fish and Wildlife Service-approved surveys for spectacled eiders must be conducted prior to initiation of project activities.

A. Within 200 m of nest sites:
   1. Prohibit all ground level activity from May 1 to August 1, except on existing thoroughfares, or when nest site is unoccupied in current year.
   2. Prohibit the construction of permanent facilities.
   3. Prohibit habitat alterations.

B. Within 1 km of nest sites, prohibit high noise level activities or operation of high-noise level facilities May 1 through August 31. These include but are not limited to: airports, blasting, and compressor stations. Existing facilities and thoroughfares are excepted.

C. Maintain adequate access from nest sites to potential brood-rearing ponds.

ENDANGERED, THREATENED AND CANDIDATE SPECIES IN ALASKA[1]
U.S. FISH AND WILDLIFE SERVICE
January 1995

LISTED SPECIES	STATUS	LEAD OFFICE	RANGE IN AK
Birds			
Aleutian Canada goose (*Branta canadensis leucopareia*)	T	ANC	Aleutian Is., Semidi Is.
American peregrine falcon (*Falco peregrinus anatum*)	E	FAI	Interior AK
Eskimo curlew (*Numenius borealis*)	E	FAI	No longer occurs in AK
Short-tailed albatross (*Diomedea albatrus*)	E	ANC	Gulf of AK, Aleutian Islands, Bering Sea
Spectacled eider (*Somateria fischeri*)	T	ANC	Western and Northern AK (coastal)
Plants			
Aleutian shield fern (*Polystichum aleuticum*)	E	ANC	Adak Island
PROPOSED SPECIES			
Steller's eider (*Polysticta stelleri*)[2]	PT	FAI	Southwestern, Western and Northern AK
DELISTED SPECIES			
Arctic peregrine falcon (*Falco peregrinus tundrius*)[3]	D	FAI	Northern, Western AK
CANDIDATE SPECIES			
Mammals			
Alexander Archipelago wolf (*Canis lupus ligoni*)	C2	JUN	Southeast AK
Amak tundra vole (*Microtus oeconomus amakensis*)	C2	ANC	Amak Island
Glacier Bay water shrew (*Sorex alaskanus*)	C2	JUN	Glacier Bay
Montague tundra vole (*Microtus oeconomus elymocetes*)	C2	ANC	Montague Island
North American lynx (*Felis lynx canadensis*)	C2	ANC	Alaska-wide
Pribilof Islands shrew (*Sorex hydrodromus*)	C2	ANC	Pribilof Islands
Birds			
Bristle-thighed curlew (*Numenius tahitiensis*)	C2	ANC	Western AK
Evermann's rock ptarmigan (*Lagopus mutus evermanni*)	C2	ANC	Attu Island
Harlequin duck (*Histrionicus histrionicus*)	C2	JUN	Alaska-wide
Kittlitz's murrelet (*Brachyramphus brevirostris*)	C2	JUN	Southern and Southeast AK
Marbled murrelet (*Brachyramphus marmoratus*)	C2	JUN	Southern and southeast AK
Northern goshawk (*Accipiter gentilis*)	C2	JUN	Alaska-wide
Olive-sided flycatcher (*Contopus borealis*)	C2	FAI	Central, Southern and Southeast AK
Red-legged kittiwake (*Rissa brevirostris*)	C2	ANC	Pribilofs, Buldir, and Bogoslof Is.
Yunaska rock ptarmigan (*Lagopus mutus yunaskensis*)	C2	ANC	Yunaska Is.
Amphibians			
Spotted frog (*Rana pretiosa*)	C2	JUN	Southeast AK
Fishes			
Bull trout (*Salvelinus confluentus*)	C2	JUN	Southeast AK
Plants			
Artemisia globularia var. *lutea*	C2	ANC	St. Paul Is., St. Matthew Is.
Artemisia glomerata var. *subglabra*	C2	ANC	Cape Newenham area
Aster yukonensis	C2	FAI	Bettles area
Calamagrostis crassiglumis	C2	JUN	Southeast/Kodiak
Carex lenticularis var. dolia	C2	JUN	Southeast AK
Cryptantha shackletteana	C2	FAI	Eagle area
Draba murrayi	C2	FAI	Eagle area
Draba yukonensis	C2	ANC	Chitina area
Eriogonum flavum var. *aquilinum*	C2	FAI	Eagle area
Mertensia drummondii	C2	FAI	Atqasuk/Umiat area
Oxytropis arctica var. *barnebyana*	C2	FAI	Kotzebue area
Podistera yukonensis	C2	FAI	Eagle area
Primula tschuktschorum	C2	ANC	Western Seward Pen.
Rumex krausei	C2	FAI	Point Hope area, Western Seward Pen.
Smelowskia pyriformis	C2	ANC	Upper Kuskokwim River (screes)
Taraxacum carneocoloratum	C2	ANC	Southcentral, including AK Pen.

SPECIES ASSIGNED CATEGORY 3 STATUS AS OF SEPTEMBER, 1993:

Amak song sparrow (*Melospiza melodia amaka*)	3B
Aleutian Wormwood (*Artemisia aleutica*)	3C

[1] Endangered and Threatened Wildlife and Plants. August 23, 1993, 50 CFR 17.11 & 17.12 [2] Animal Notice of Review, November 15, 1994, 59 FR 58982 / Plant Notice of Review, September 30, 1993, 58 FR 51144

[3] The Steller's eider was proposed for listing as threatened on July 14, 1994 (59 FR 35896).

[4] The Arctic peregrine falcon was delisted on October 5, 1994 (59 FR 50796).

KEY AND DEFINITIONS

E	Endangered:	A species which is in danger of extinction throughout all or a significant portion its range.
T	Threatened:	A species which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
P	Proposed:	A species formally proposed for listing as endangered or threatened in the Federal Register.
C1	Category 1 Candidate:	A species for which the Service has on file enough substantial information on biological vulnerability and threat(s) warrant listing as threatened or endangered.
C2	Category 2 Candidate:	A species for which the best available scientific and commercial information indicates that it might qualify for protection under the Endangered Species Act, but the Service needs additional information on vulnerability and threats before the qualifications for listing can be determined.
C3	Category 3 Candidate:	A species is designated a Category 3 (A,B,C,) when the Service has pervasive evidence that the species is extinct (3A); or, on the basis of current taxonomic understanding, the name does not represent a distinct taxon meeting the Act's definition of "species" (3B); or, a species has proven to be more common than previously known (3C); or, there are, at present, no identifiable threats to the species (3C). The first time a species is given a Category 3 rating, it is published in the Notice of Review, but it is omitted from subsequent updates. The Service does, however, continue to track these species.
D	Delisted:	A species that has been removed from the list of threatened and endangered species. The Fish and Wildlife Service will monitor these species for a period of at least five years following delisting, and, during the Section 7 process, treat them as Category 2 Candidate species.

ADDRESSES: Regional Office:

Fish and Wildlife Service
Division of Endangered Species
1011 E. Tudor Road
Anchorage, Alaska 99503-6199
TEL: 907-786-3520
FAX: 907-786-3625

Field Offices:

Ecological Services, Juneau
Fish and Wildlife Service
3000 Vintage Blvd., Suite 201
Juneau, Alaska 99801
TEL: 907-586-7240
FAX: 907-586-7154

Ecological Services, Fairbanks
Fish and Wildlife Service
1412 Airport Way
Fairbanks, Alaska 99701
TEL: 907-456-0427
FAX: 907-456-0346

Ecological Services, Anchorage
Fish and Wildlife Service
605 West 4th Avenue, Room G-62
Anchorage, Alaska 99501
TEL: 907-271-2888
FAX: 907-271-2786

LISTED SPECIES MANAGED BY THE NATIONAL MARINE FISHERIES SERVICE

Under the Endangered Speceis Act of 1973, as amended, the National Marine Fisheries Service is responsible for listed anadromous and marine fishes and marine mammals other than sea otters, manatees, and dugongs.

<u>Mammals</u>		
Balaena glacialis	Northern right whale	E
Balaena mysticetus	Bowhead whale	E
Balaenoptera borealis	Sei whale	E
Balaenoptera musculus	Blue whale	E
Balaenoptera physalus	Fin whale	E
Megaptera novaeangliae	Humpback whale	E
Physeter macrocephalus	Sperm whale	E
Eumetopias jubatus	Steller sea lion	T
<u>Fishes</u>		
Oncorhynchus nerka	Snake River sockeye salmon	E
Oncorhynchus tshawytscha	Snake River spring/summer chinook salmon	T
Oncorhynchus tshawytscha	Snake River fall chinook salmon	T
<u>Reptiles</u>		
Chelonia mydas (incl. *agassizi*)	Green sea turtle	T
Dermochelys coriacea	Leatherback sea turtle	E
Caretta caretta	Loggerhead sea turtle	T
Lepidochelys olivacea	Olive (Pacific) ridley sea turtle	T

DELISTED

<u>Mammals</u>		
Eschrichtius robustus	Gray whale	D
Effective June 16, 1994		

ADDRESSES

National Marine Fisheries Service
National Oceanic and Atmospheric Administration
222 West 7th Avenue, Box 43
Anchorage, Alaska 99513-7577
TEL: 907-271-5006

National Marine Fisheries Service
National Oceanic and Atmospheric Administration
Protected Resources Division
P.O. Box 21668
Juneau, AK 99802-1668
TEL: 907-586-7235

ATTACHMENT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
911 NE. 11th Avenue
Portland, Oregon 97232-4181

IN REPLY REFER TO:

B 23 1995

Memorandum

To: Regional Director, U.S. Fish and Wildlife Service
Region 7, Anchorage, Alaska

From: Acting Regional Director, U.S. Fish and Wildlife Service
Region 1, Portland, Oregon

Subject: Endangered Species Act Species List, Natural Gas and Oil Lease Sale 158

We have attached the subject species list for the coastal areas of Washington, Oregon, and California in response to your October 21, 1994, memorandum. We apologize for the delay in responding to your request. If you have any questions regarding this matter, please contact Vicki M. Finn, Chief, Division of Consultation and Conservation Planning at (503) 231-6241.

Attachment

LISTED

MAMMALS

salt marsh harvest mouse	*Reithrodontomys raviventris* (E)
southern sea otter	*Enhydra lutris nereis* (T)

BIRDS

Aleutian Canada goose	*Branta canadensis leucopareia* (T)
American peregrine falcon	*Falco peregrinus anatum* (E) (CH)
Arctic peregrine falcon	*Falco peregrinus tundrius* (T)
bald eagle	*Haliaeetus leucocephalus* (E)
brown pelican	*Pelecanus occidentalis* (E)
California clapper rail	*Rallus longirostris obsoletus* (E)
California least tern	*Sterna antillarum browni* (E)
light-footed clapper rail	*Rallus longirostris levipes* (E)
marbled murrelet	*Brachyramphus marmoratus* (E)
western snowy plover	*Charadrius alexandrinus nivosus* (T)

AMPHIBIANS AND REPTILES

foothill yellow-legged frog	*Rana boylii* (2)
leatherback sea turtle	*Dermochelys coriacea* (CH)
northwestern pond turtle	*Clemmys marmorata marmorata* (2)

FISHES

delta smelt	*Hypomesus transpacificus* (T)
tidewater goby	*Eucyclogobius newberryi* (E)

PLANTS

Antioch Dunes evening-primrose	*Oenothera deltoides* ssp. *howellii* (E)
beach layia	*Layia carnosa* (E)
Contra Costa wallflower	*Erysimum capitatum* ssp. *angustatum* (E)

Howell's spineflower	*Chorizanthe howellii* (E)
Menzies' wallflower	*Erysimum menziesii* (E)
Monterey gilia	*Gilia tenuiflora* ssp. arenaria
Pt. Reyes clover lupine	*Lupinus tidestromii* var. *layneae* (E)
robust pineflower	*Chorizanthe robusta* (E)
salt marsh bird's-beak	*Cordylanthus maritimus* ssp. *maritimus*
Sonoma spineflower	*Chorizanthe valida* (E)
Tidestrom's lupine	*Lupinus tidestromii* var. *tidestromii* (E)
INVERTEBRATES	
Lange's metalmark butterfly	*Apodemia mormo langei*(E)
Smith's blue butterfly	*Euphilotes enoptes smithi* (E)

CANDIDATE AND PROPOSED

FISH

California roach	*Lavinia symmetricus* (2R)
green sturgeon	*Acipenser medirostris* (2R)
longfin smelt	*Spirinchus thaleichthys* (2)
Sacramento perch	*Archoplites interruptus* (2)
Sacramento splittail	*Pogonichthys macrolepidotus* (PT)

MAMMALS

greater western mastiff-bat	*Eumops perotis californicus* (2)
ornate salt marsh shrew	*Sorex ornatus salicornicus* (2)
Pacific western big-eared bat	*Plecotus townsendii townsendii* (2)
salt marsh vagrant shrew	*Sorex vagrans halicoetes* (1)
San Pablo California vole	*Microtus californicus sanpabloensis* (2)
spotted bat	*Euderma maculatum* (2)
southern marsh harvest mouse	*Reithrodontomys megalotis limicola* (2)
Suisun ornate shrew	*Sorex ornatus sinuosus* (1)

BIRDS

Alameda (South Bay) song sparrow	*Melospiza melodia pusillula* (2)
black tern	*Chlidonias niger*(C2)
black rail	*Laterallus jamaicensis* (2)
black rail	*Laterallus jamaicensis* (2)
elegant tern	*Sterna elegans* (2)
harlequin duck	*Histrionicus histrionicus* (C2)
long-billed curlew	*Numenius americanus*
salt marsh common yellowthroat	*Geothlypis trichas sinuosa* (2)
San Pablo song sparrow	*Melospiza melodia samuelis* (2)
Suisun song sparrow	*Melospiza melodia maxillaris* (2)

AMPHIBIANS

California red-legged frog	*Rana aurora draytonii* (PE)
foothill yellow-legged frog	*Rana boylii* (2)

REPTILES

northwestern pond turtle	*Clemmys marmorata marmorata* (2)

INVERTEBRATES

Antioch andrenid bee	*Perdita scitula antiochensii* (2)
Antioch cophuran robberfly	*Cophura hurdi* (2)
Antioch Dunes anthicid beetle	*Anthicus antiochensis* (2)
Antioch efferian robberfly	*Efferia antiochi* (2)
Antioch mutillid wasp	*Myrmosula pacifica* (=Myrmosa p.) (2)
Antioch sphecid wasp	*Philanthus nasalis* (2)
bumblebee scarab beetle	*Lichnanthe ursina* (2)
California brackish water snail	*Tyronia imitator*
Ciervo aegialian scarab beetle	*Aegialia concinna* (1)
globose dune beetle	*Coelus globosus* (2)
Hurd's metapogon robberfly	*Metapogon hurdi* (2)
Middlekauf's shieldback katydik	*Idiostatus middlrkaufi* (2)
Newcomb's littorine snail	*Algamorda newcombiana* C2
Oso Flaco patch butterfly	*Chlosyne leanira osoflaco*
Sacramento anthicid beetle	*Anthius sacramento* (2)
salt marsh skipper	*Panoquina errans* (2)
sandy beach tiger beetle	*Cicindella hirticollis gravida* (2)
Santa Cruz Island shore weevil	*Trigonoscuta stantoni* (2)

PLANTS

beach spectacle-pod	*Dithyrea maritima* (1)
black-flowered figwort	*Scrophularia atrata* (2)

Blasdale's bentgrass	*Agrostis blasdalei* var. *blasdalei* (2)
Bolander's beach pine	*Pinus contorta* ssp. *bolanderi* (2)
California sea-blite	*Suaeda californica* (PE)
clustered lady's-slipper	*Cypripedium fasciculatum* (2)
coast lily	*Lilium maritimum* (1)
coastal dunes milk-vetch	*Astragalus tener* var. *titi* (1)
compact cobweb thistle	*Cirsium occidentale* var. *compactum* (2)
crisp monardella	*Monardella crispa* (2)
delta tule-pea	*Lathyrus jepsonii* var. *jepsonii* (2)
Humboldt Bay owl's-clover	*Castilleja ambigua* ssp. *humboldtiensis* ,(2)
Humboldt Bay gumplant	*Grindelia stricta* ssp. *blakei* (2)
la graciosa thistle	*Cirsium loncholepis* (1)
Marin knotweed	*Polygonum mariaense* (2)
Mason's lilaeopsis	*Lilaeopsis masonii* (2)
Mendocino coast paintbrush	*Castilleja mendocinensis* (2)
Monterey gilia	*Gilia tenuiflora* ssp. *arenaria*
northcoast phacelia	*Phacelia insularis* var. *continentis* (2)
northcoast bird's-beak	*Cordylanthus maritimus* ssp. *palustris* (2)
northcoast sand-verbena	*Abronia umbellata* ssp. *breviflora*
pink sand verbana	*Abronia umbellata* ssp. *breviflora* (C2)
Point Reyes stickyseed	*Blennosperma nanum* var. *robustum* (2)
sand dune phacelia	*Phacelia argentea* (2)
sandmat manzanita	*Arctostaphylos uva-ursi* ssp. *pumila*
San Francisco Bay spineflower	*Chorizanthe cuspidata* var. *cuspidata* (2)
San Luis Obispo curly-leaved monardella	*Monardella undulata* var. *frutescens* (2)
Silvery phacelia	*Phacelia argentea* (C2)

Soft-leaved Indian-paintbrush	*Castilleja mollis (1)*
soft bird's-beak	*Cordylanthus mollis* ssp. *mollis* (1)
Suisun aster	*Aster lentus* (2)
western lily	*Lilium occidentale* (PE)
Wolf's evening-primrose	*Oenother wolfii (1)*

BIOLOGICAL EVALUATION FOR THREATENED AND ENDANGERED SPECIES
WITH RESPECT TO THE PROPOSED BEAUFORT SEA OIL AND GAS LEASE SALE 144

(Partial Copy)

PREPARED FOR INITIATION OF SECTION 7 CONSULTATION IN ACCORDANCE
WITH ENDANGERED SPECIES ACT OF 1973, AS AMENDED

Minerals Management Service
Alaska OCS Region
June 1995

I. BACKGROUND

The United States Department of the Interior, Minerals Management Service (MMS), has initiated the presale process for the Beaufort Sea Oil and Gas Lease Sale 144, tentatively scheduled for September, 1996. Sale 144, if held, would be the sixth Federal offshore sale in the Beaufort Sea Planning Area. The Joint Federal and State of Alaska Oil and Gas Lease Sale (Sale BF) held on December 11, 1979 was the first sale in the area. Four subsequent sales followed in the Planning Area: Diapir Field Sale 71 (October, 1982); Diapir Field Sale 87 (August, 1984); Beaufort Sea Sale 97 (March, 1988); and Beaufort Sea Sale 124 (June 26, 1991). Of 631 leased tracts, 62 are still active, and a total of 28 wells have been drilled.

This evaluation document describes the proposed lease sale to the extent feasible, the listed species most likely to be affected, effects of proposed leasing and exploration activities, and potential mitigating measures to reduce potential adverse effects to listed species. Since the purpose of this document is to provide information to be used in an incremental-step consultation on Sale 144 leasing and exploration phases, we have attempted to provide the most detailed information on these phases. The evaluation provides less detail on development and production activities due to their uncertainty at this time; however, we have attempted to provide enough information on development and production to provide an adequate basis for an opinion regarding the reasonable likelihood of the entire action violating Section 7(a)(2) of the Endangered Species Act, as amended (ESA). Should commercially producible quantities of oil be discovered and development and production be proposed, we would evaluate the need for further consultation regarding these activities. We would consider the need for further consultation if additional species were listed or critical habitat designated, if the proposed action were substantially modified, or if significant new effects-related information were developed.

A detailed description of the endangered and threatened species within the Beaufort Sea Planning Area and effects analyses of similar proposed actions may be found in the following previously issued Environmental Impact Statements (EIS's) and biological opinions that are hereby summarized and incorporated by reference as described in the Interagency Cooperation Regulations, 50 CFR 402.12(g):

- Beaufort Sea Joint Federal/State Oil and Gas Lease Sale (Sale BF), Final EIS (USDOI, BLM, 1979)
- Diapir Field Lease Sale 71 Final EIS (USDOI, MMS, 1982)
- Diapir Field Lease Sale 87 Final EIS (USDOI, MMS, 1984)
- Beaufort Sea Sale 97 Final EIS (USDOI, MMS, 1988)
- Beaufort Sea Sale 124 Final EIS (USDOI, MMS, 1991)
- Chukchi Sea Sale 109 Final EIS (USDOI, MMS, 1987)
- Chukchi Sea Sale 126 Final EIS (USDOI, MMS, 1991)
    - Joint Federal/State Sale BF Biological Opinions (USDOI, FWS, 1978; USDOC, NMFS, 1980)
    - Joint Federal/State Sale BF Biological Opinion Revised (USDOC, NMFS, 1982)
- Diapir Field Sale 71 Biological Opinions (USDOI, FWS, 1981; USDOC, NMFS, 1982)
- Diapir Field Sale 87 Biological Opinions (USDOI, FWS, 1983; USDOC, NMFS, 1983)
- Beaufort Sea Sale 97 Biological Opinions (USDOI, FWS, 1985; USDOC, NMFS, 1987)
    - Arctic Region Biological Opinion (USDOC, NMFS, 1988)
    - Beaufort Sea Sale 124 Biological Opinions (USDOI, FWS, 1990; USDOC, NMFS, 1990-referenced 1988 Opinion)

II. PROPOSED ACTIVITIES

This section describes the proposed action for Beaufort Sea Oil and Gas Lease Sale 144. It also contains resource estimates for the proposed sale area and our basic assumptions and estimates of levels of activity associated with exploration (summarized from the Exploration and Development Report, Appendix A).

A. Resource Estimate: The base-case exploration scenario reflects the mid-point conditional resource estimate, 1,200 million barrels (MMbbls) of recoverable oil, and the exploration schedule found in Appendix A. The low case, which includes exploration activities only (no production), and the mid-point high case, 3,900 MMbbls of oil, which provide a range for the proposal, are also summarized in Appendix A.

B. Exploration Scenario: The exploration scenario selected by MMS represents a composite of various feasible options that could be developed for the environmental analysis. It resulted from discussions within MMS, with other government agencies, and with industry. The locations of existing infrastructure, sites with potential as support facilities, area-resource estimates, and scenarios developed for the previous Outer Continental Shelf (OCS) sales in the Beaufort Sea are all considered in developing this scenario.

The facility locations and exploration scenarios discussed represent assumptions that were made as a basis for identifying potential environmental effects as a result of characteristic activities. The assumptions do not represent an MMS recommendation, preference, or endorsement of any facility, site, or exploration plan. A summary of the major base-case exploration assumptions follows:

oo Eight exploration and fourteen delineation wells are expected to be drilled during the period 1998 through 2005 for the mid-point base case. A maximum of two drilling rigs would be operable in any one exploratory year. Drilled depths of exploration and delineation wells should average 3048 meters (10,000 feet).

oo A typical exploratory and delineation well will use about 630 short tons of drilling mud and produce about 820 short tons of dry rock cuttings.

oo Artificial ice islands with ice road support may be used as drilling platforms in shallow water areas near shore, bottom-founded platforms of various designs would likely be used in water depths of 11 to 25 meters (36 to 82 feet), and floating drilling rigs (drillships or floating concrete platforms) with icebreaker support would likely be used in open-water and broken ice conditions.

oo If each of the 22 exploration and delineation wells were covered by site-specific shallow-hazard seismic surveys, the total area covered by seismic surveys could equal 507 kilometers^2 (196 miles^2).

oo On-shore support would be from existing facilities, such as Prudhoe Bay and the Kuparuk unit. Support for operations on ice islands or nearshore gravel islands is expected to be by ice roads. Drilling operations farther offshore would be supported during the open-water season by at least one supply-boat trip/drilling unit/week and one helicopter flight/drilling unit/day. Depending on ice conditions, two or more icebreaking vessels may be required to perform ice-management tasks for the floating units. There may also be one standby vessel for each drilling unit. The time required to drill and test a well is about 90 days.

C. Description of the Proposal (Alternative I): The proposal would offer for lease the portion of the Beaufort Sea Planning Area selected as a result of area identification (Fig. 1). The proposal contains 1,870 blocks encompassing about 4 million hectares (9.8 million acres). The blocks that comprise the proposed action are approximately 3 to 65 nautical miles offshore in water depths that range from approximately 1 to 2,000 meters (3 to 6,562 feet).

In addition to the proposal, four alternatives will be considered in the Sale 144 EIS as described in Appendix B.

III. DESCRIPTIONS OF LISTED, PROPOSED, AND CANDIDATE SPECIES IN THE VICINITY OF THE PROPOSED LEASE-SALE AREA

A complete description of the threatened and endangered species associated with the Beaufort Sea Planning Area is provided in the final EIS's for the Lease Sales and the biological opinions prepared by the National Marine Fisheries Service (NMFS) and the Fish and Wildlife Service (FWS) listed on Pages 1 and 2 The following is a summary and update of this information in relation to the proposed Sale 144 area. Descriptions of species along transportation routes south of the proposed sale area can be found in the Cook Inlet Planning Area Oil and Gas Lease Sale 149 DEIS (USDOI, MMS, 1995), which is incorporated here by reference.

A. <u>Cetaceans</u>: The bowhead whale is the only endangered cetacean species identified, in concurrence with NMFS, as species to include in this biological evaluation (Appendix C). Gray whales were recently removed from the list of endangered and threatened wildlife (59 FR 31094, June 16, 1994).

The Bering Sea stock (western arctic stock) of bowhead whales migrate through the proposed sale area semiannually as they migrate between wintering areas in the Bering Sea and summer-feeding grounds located in the Canadian Beaufort Sea.

The bowhead whale population is estimated to number from 6,400 to 9,200 individuals, with 7,500 as the generally accepted best estimate of the population (Zeh, et al., 1993). There have been no clear trends in recent years in terms of whether the population is increasing, stable, or decreasing. Population estimates in the last fifteen years have risen dramatically. There is evidence that the population was increasing during the 1980's at a rate of about 3 percent/year, although the reason behind this increase is more likely improved data and better censusing techniques rather than a rapidly increasing population. The historic population has been estimated from 10,400 to 23,000 whales in 1848 prior to commercial exploitation (Woody and Botkin, 1993). The species presently appears to be much more abundant than at the close of the commercial whaling period, just after the turn of the century, when it was estimated that there were probably a minimum of 1,000 animals.

Bowhead whales have an affinity for ice and are associated with relatively heavy ice cover and shallow continental-shelf waters for much of the year. During the winter they are associated with the marginal ice zone, regardless of where the zone is located, and with polynyas. Polynyas in the Bering Sea along the northern Gulf of Anadyr, south of St. Matthew Island, and near St. Lawrence Island, are important wintering areas for bowheads. Bowheads also congregate in these polynyas prior to the beginning of the spring migration.

The bowheads' northward spring migration appears to be timed with the ice breakup. They pass through the Bering Strait and eastern Chukchi Sea from late March to mid-June through newly opened leads in the shear zone between the shorefast ice and the offshore pack ice. Several studies of acoustical and visual comparisons of the bowhead spring migration off Barrow indicate that bowheads may also migrate under ice within several kilometers of the leads. Several observer's data indicate that bowheads migrate underneath ice and can break through ice from 14 to 18 cm (5.5 to 7 inches) thick to breathe (George et al., 1989, and Clark et al., 1986). It is possible that bowheads use ambient-light cues and possibly echos from their calls to navigate under ice and to distinguish thin ice from multi-year floes (thick ice). After passing Barrow from April through mid-June, they move through or near offshore leads in an easterly direction. East of Point Barrow, the lead systems divide into numerous branches that vary in location and extent from year to year. Bowheads arrive on their summer feeding grounds in the vicinity of Banks Island from mid-May through June and remain in the Canadian Beaufort Sea and Amundsen Gulf until late August or early September (Moore and Reeves, 1993).

After summer feeding in the Canadian Beaufort Sea, bowheads begin moving westward into Alaskan waters in August and September. Generally, few bowheads are seen in Alaskan waters until the major portion of the migration occurs, typically between mid-September and mid-October. Conditions can vary during the fall migration from open water to over nine-tenths ice coverage, and the extent of ice cover may influence the timing or duration of the fall migration. The medium water depth over which the greatest number of whales appears to migrate is from 20 to 50 meters (22 to 55 yards). An analysis of median water depths of bowheads sighted during fall aerial surveys from 1982 through 1993 provides an overall median depth of 37 meters (40 yards) for all years combined. Greater median depths were observed for heavy ice years, especially for 1983, the heaviest ice year, which had a median depth of 347 meters (380 yards)(Treacy, 1994).

Data on the bowhead fall migration through the Chukchi Sea before they move south into the Bering Sea is limited. Whales are commonly seen from the coast to about 150 kilometers (93 miles) offshore between Point Barrow and Icy Cape, suggesting that most bowheads disperse southwest after passing Point Barrow and cross the central Chukchi Sea near Herald Shoal to the northern coast of the Chukotsk Peninsula. However, scattered sightings north of 72°N. latitude suggest that at least some whales migrate across the Chukchi Sea farther to the north. After moving south through the Chukchi Sea, bowheads pass through the Bering Strait in late October through early November on their way to overwintering areas in the Bering Sea.

Bowheads apparently feed throughout the water column, including bottom or near-bottom feeding as well as surface feeding, and have been observed feeding in or near the proposed sale area during their spring and fall migrations (Lowry, 1993). Food items most commonly found in the stomachs of harvested bowheads include euphausiids, copepods, mysids, and amphipods, with euphausiids and copepods being the primary prey species. Bowheads continue to feed intermittently as they migrate across the Alaskan Beaufort Sea. Areas to the east of Barter Island appear to be used by many bowheads for feeding briefly as they migrate slowly westward across the Beaufort Sea (Thomson and Richardson, 1987). Bowheads have also been observed feeding north of Flaxman Island and in some years sizeable groups of bowheads have been seen feeding east of Point Barrow between Smith Bay and Point Barrow. A study of the importance of the eastern Beaufort Sea to feeding bowhead whales indicated that, for the population as a whole, food resources consumed there did not contribute significantly to the whales' annual energy needs (Richardson, 1987). Carbon isotope analysis of bowhead baleen has indicated that a significant amount of feeding may occur in wintering areas (Schell, Saupe, and Haubenstock, 1987). In some years bowheads have also been observed feeding in the spring in the region just west of Point Barrow, indicating that bowheads will opportunistically feed in this area when food is available.

The mating season for bowhead whales is not known with certainty. Most bowhead mating and calving appear to occur from April through mid-June, coinciding with the spring migration. Mating may start as early as January and February, when most of the population is located in the Bering Sea, but has also been reported as late as September and early October (Koski, et al., 1993). Calving occurs from March to early August with the peak probably occurring between early April and the end of May.

B. Birds: The threatened arctic peregrine falcon was identified, in concurrence with FWS, as the species to include in this biological evaluation (see Appendix C).

1. Arctic Peregrine Falcon: The arctic peregrine falcon was removed from the list of endangered and threatened wildlife on October 5, 1994 (59 FR 50796); however, the USFWS is required to monitor this species for 5 years, during which period it will be have the same status as a candidate species. Based on 1993 surveys, the population of arctic peregrine falcons now stands at about 200-250 pairs and is increasing; productivity from 1980-1992 varied between 1.3-2.0 yg/pr, sufficient to support annual recruitment into the breeding population of about 12 percent (unpubl. FWS data, Fairbanks AK).

Arctic peregrine falcons nest north of the Brooks Range and on the Seward Peninsula. On the North Slope, nesting sites nearest the coast occur about 32 kilometers (20 miles) inland (Ambrose, pers. comm., 1991). There are no known active nest sites along the coast between Barrow and Demarcation Point. The major nesting areas occur inland along the Colville and Sagavanirktok Rivers with scattered nest sites along other North Slope rivers. Peregrine falcons usually are present in Alaska from about mid-April to mid-September. Egg laying begins in mid-May on the North Slope and the young fledge from about the end of July to mid-August (USDOI, FWS, 1982).

Immature arctic peregrines are known to use northern Alaskan coastal habitats east of the Colville River on a transient basis from mid-August to mid-September (USDOI, MMS, 1984).

Data regarding the migration routes of Alaskan peregrine falcons are limited; however, it appears that falcons from the North Slope generally follow the central flyway. Peregrine falcons winter in Latin America from September to April (USDOI, FWS, 1982).

2. Spectacled Eider: Spectacled eiders breed discontinuously, and in most areas sparingly, along the coast of Alaska from Bristol Bay north to Barrow and east almost to the Canadian border, and along the Siberian coast from the Chukotsk Peninsula to the Yana Delta. An estimated 1,700-3,000 pairs of spectacled eiders have nested recently (1990-1992) on the Yukon-Kuskokwim (Y-K) Delta (Stehn et al., 1993); this represents a 94-98 percent decline from the early 1970's. Declines have been substantial across the arctic slope (e.g., 80% at Prudhoe Bay 1981-1991) similar to that observed during the same period on the Y-K Delta; up to a few thousand pairs may nest in this area (Warnock and Troy, 1992; 58 FR 27474). Declines also have been reported on the Seward Peninsula, and at St. Lawrence Island (Kessel, 1989). Recent estimates from Siberia are lacking, but surveys in the 1960's indicated that numbers were dwindling at that time on the Indigirka Delta (Dau and Kistchinski, 1977).

Few spectacled eiders nest more than 20 kilometers (12 miles) inland on the Y-K Delta, but in the arctic may occupy areas farther inland (20-120 kilometers [12 to 75 miles]) because coastal dependency is likely to less in a region where the sea is frozen during migration and nest initiation periods (Dau and Kistchinski, 1977; Warnock and Troy, 1992). Nest sites are associated with pond areas containing emergent vegetation; the latter probably helps to reduce predation on ducklings (Warnock and Troy, 1992). Nest densities are 0.20 pairs/km^2 on the Y-K Delta and 0.13 pairs/km^2 in the Prudhoe Bay area (Stehn, Wege, and Walters, 1992; Warnock and Troy, 1992). Nest success is relatively high on both the Y-K Delta and the Prudhoe Bay area (40% in the latter), suggesting that the population decline is caused by factors operating outside the nesting period.

Spectacled eider molting and wintering areas basically are unknown, although post-breeding flocks observed moving past St. Lawrence Island have suggested areas in the Bering Sea are used. Recent locations from satellite tagged post-breeding males (June through October) have been concentrated along the Y-K Delta, the Indigirka Delta in the Russian Far East, as well as scattered localities north and east of St. Lawrence Island--some of these may be molting birds (Petersen, Douglas, and Mulcahy, 1995). Tagged postbreeding females have been concentrated, in Norton Sound, along the Y-K Delta, and just southwest of St. Lawrence Island in December--the latter may include wintering areas. More recently, tagged individuals have been detected at various Beaufort Sea locations and Icy Cape in fall, and between St. Matthew and St. Lawrence Islands in winter (Petersen, 1995, pers. comm.).

3. Steller's Eider: Holarctic population estimates for the Steller's eider range from 150,000-200,000; an estimated 50 percent decline in the population has occurred since the early 1970's (59 FR 35896). Most of the 70,000-100,000 Steller's eiders wintering in Alaska nest in northern Siberia (57 FR 19852; Kertell, 1991). Approximately 1,000 pairs nest in northwestern Alaska, primarily within 100 kilometers (62 miles) south and southeast of Barrow (Quakenbush and Cochrane, 1993). Recent population estimates for the arctic coastal plain (these include a substantial correction factor error) range from 2,000-7,000 (Brackney and King, 1993); only small numbers have been observed between Barrow and the Colville River. Elsewhere, recent surveys along the entire western Alaska coast and extensive research on the Yukon-Kuskokwim Delta have detected no Steller's eiders in suitable nesting habitat; this represents a substantial contraction of their former breeding range in Alaska (Kertell, 1991; Larned et al., 1993).

Males depart the nesting areas in late June, while females with broods remain in until late August or early September. Reproductive success generally is low with occasional good years, suggesting that productivity is dependent primarily on adult survival.

Most of the population molts along the Alaskan coast from Nunivak Island to Cold Bay and winters from the eastern Aleutian Islands to lower Cook Inlet. Winter surveys in this region since 1983 have counted fewer than 65,000 individuals (USDOI, FWS, 1991). Recent Christmas count and other survey information suggest that as many as 6,000 occupy the Kodiak Island area (MacIntosh, 1994, pers. comm.; Zwiefelhofer, 1993).

Steller's eiders occupy nearshore marine habitats most of the year, feeding on crustaceans and mollusks (e.g., blue mussels) in protected bays.

IV. EVALUATION OF EFFECTS FROM LEASING AND EXPLORATION

Leasing and exploration may result in noise and disturbance and altered habitat effects on behavior, distribution, and abundance of individuals or populations occurring in or adjacent to the lease-sale area. Contaminants, such as drilling muds and cuttings, released during exploration activities may cause adverse effects on individuals either through direct contact or indirectly as a result of effects on prey populations or important habitats. Based on industry's record on the OCS, the probability of crude-oil release during exploration is assumed to be zero. The Sale 144 base-case scenario assumes that one or two drilling units will drill one or two exploration wells each year between 1998 and 2002 and one or two delineation wells each year between 1998 and 2005. Information on drilling operations and logistical support for drilling operations is discussed in Section II.B.

A. Effects on the Bowhead Whale: Noise-producing exploration activities, including aircraft traffic, icebreaking or other vessel traffic, geophysical-seismic surveys, and drilling are the activities most likely to affect bowhead whales.

Most offshore aircraft traffic in support of the oil industry involves turbine helicopters flying along straight lines. Data on reactions of bowheads to helicopters are limited. Most bowheads are unlikely to react significantly to occasional single passes by low-flying helicopters ferrying personnel and equipment to offshore operations.

Observations of bowhead whales exposed to helicopter overflights indicate that most bowheads exhibited no obvious response to helicopter overflights at altitudes above 150 meters (164 yards). If bowheads are overflown at altitudes less than 150 meters (164 yards), some would probably dive quickly in response to the aircraft noise (Richardson and Malme, 1993). However, this noise generally is audible for only a brief time (tens of seconds) if the aircraft remains on a direct course, and the whales should resume their normal activities within minutes. Fixed-wing aircraft overflights at low altitude ($\leq$300 meters [328 yards]) often cause hasty dives. Reactions to a circling aircraft are sometimes conspicuous if it is below 300 meters (328 yards) altitude, uncommon at 460 meters (503 yards), and generally undetectable at 600 meters (656 yards) (Richardson and Malme, 1993). The effects from such an encounter are brief and the whales should resume their normal activities within minutes.

Bowheads react to the approach of vessels at greater distances than they react to most other industrial activities. Most bowheads begin to swim rapidly away when vessels approach rapidly and directly. Avoidance usually begins when a rapidly approaching vessel is 1 to 4 kilometers (0.62 to 2.5 miles) away. Received noise levels as low as 84 decibels relative to 1 microPascal (dB re 1 μPa) or 6 dB above ambient may elicit strong avoidance of an approaching vessel at a distance of 4 kilometers (2.5 miles). In the Canadian Beaufort Sea, bowheads observed in vessel-disturbance experiments began to orient away from an oncoming vessel at a range of 2 to 4 kilometers (1.2 to 2.5 miles) and to move away at increased speeds when approached closer than 2 kilometers (1.2 miles) (Richardson and Malme, 1993). Vessel disturbance under experimental conditions caused a temporary disruption of activities and sometimes disrupted social groups when groups of whales scattered as a vessel approached. Reactions to slow-moving vessels, especially if they do not approach directly, are much less dramatic. Fleeing from a vessel generally stopped within minutes after the vessel passed, but scattering may persist for a longer period. In some instances bowheads have returned to their original locations. There are no observations of bowheads reactions to icebreakers breaking ice.

Bowhead whales probably would encounter a few vessels associated with Sale 144 activities during their fall migration or while feeding in the eastern Alaskan Beaufort Sea. Vessel traffic would be generally limited to routes between the exploratory-drilling units and the shore base. Each floating drilling unit probably would have one vessel remaining nearby for emergency use. Depending upon ice conditions, floating drilling units may have two or more icebreaking vessels standing by to perform ice-management tasks. It is likely that vessels actively involved in ice management or moving from one site to another would be more disturbing to whales than vessels idling or maintaining their position. In either case, bowheads probably would adjust their individual swimming paths to avoid approaching within several kilometers of vessels attending a drilling unit and probably would move away from vessels that approached within a few kilometers. Vessel activities associated with the sale are not expected to disrupt the bowhead migration, and small deflections in individual bowhead-swimming paths and a reduction in use of one to several small areas of bowhead-feeding habitat near exploration units should not result in significant adverse effects on the species. Bowheads during their spring migration (April through June) are expected to encounter few, if any, vessels along their migration route since ice at this time of year would typically be too thick for drillships and supply vessels to operate in.

Sound from seismic exploration is another potential source of noise disturbance to bowhead whales. Marine seismic exploration utilizes underwater sounds with source levels exceeding those of other activities discussed here. Seismic surveys are of two types: low-resolution, deep-seismic and high-resolution, shallow-seismic surveys. Deep-seismic surveys emit loud sounds, which are pulsed rather than continuous, and can propagate long distances from their source. When an operating seismic vessel approaches within a few kilometers, most bowheads exhibit strong avoidance response and specific changes in surfacing, respiration, and dive patterns. Strong pulses of seismic noise are often detectable 25 to 50 kilometers (15.5 to 31 miles) from seismic vessels, but most bowheads exposed to seismic sounds from vessels more than about 7.5 kilometers (4.7 miles) away rarely show avoidance. Strong avoidance occurs when received levels of seismic noise are 150-180 dB re 1 μPa (Richardson and Malme, 1993). Besides avoidance whales may exhibit significant tendencies for reduced surfacing and dive durations, fewer blows per surfacing, and longer intervals between successive blows. Bowheads' surface-respiration-dive characteristics appeared to recover to pre-exposure levels within 30 to 60 minutes following the cessation of the seismic activity.

High-resolution seismic surveys, which are much quieter, are generally conducted on leases following the lease sale to evaluate potential shallow hazards to drilling. Shallow hazard seismic surveys for exploration or delineation well sites would most likely be conducted during the ice-free season. Because high-resolution seismic surveys are relatively quiet, these activities are not likely to have significant effects on endangered whales. Bowheads appear to continue normal behavior at closer distances to high-resolution seismic surveys than for low-resolution surveys.

Bowheads will likely temporarily change their individual swimming paths as they approach or are closely approached by seismic vessels. These short-term responses are not likely to preclude a successful migration or to significantly disrupt feeding activities. Seismic surveys are not expected to be conducted in or near the spring lead system through which bowheads migrate because (1) degraded ice conditions would not allow on-ice surveys and (2) insufficient open water is present for open-water seismic surveys.

Another source of noise would be from the exploration drilling units. Stationary sources of offshore noise (such as drilling units) appear less disruptive to bowhead whales than moving sound sources (such as vessels). Bowhead whales exhibiting normal behavior while on their summer-feeding grounds have been observed on several occasions within a few miles of operating drillships, well within the zone where drillship noise is clearly detectable. In playback experiments, some bowheads showed a weak tendency to move away from the sound source at a level of drillship noise comparable to that which would be present several kilometers from an actual drillship. Reactions to drilling sound from artificial islands and caisson-retained islands have yet to be observed, but underwater-sound levels at various distances from a caisson-retained island (with support vessels nearby) in the Canadian Beaufort Sea were similar to those produced by a drillship. In general, it appears that bowhead avoidance is less around an unattended structure than one attended by support vessels.

Fall-migrating bowheads could be exposed to drilling operations on one to four exploration or delineation wells per year with a maximum of 2 drilling units operating concurrently as a result of Sale 144. An estimated 22 exploration and delineation wells would be drilled within the Sale 144 area during the 8 years following the sale. Spring migrating bowheads are not likely to be exposed to drilling noise. Bowhead whales whose behavior appeared normal have often been observed within 10 to 20 kilometers (6.2 to 12.4 miles) of drillships in the eastern Beaufort Sea and there have been a number of reports of sightings within 0.2 to 5 kilometers (0.12 to 3 miles) from drillships (Richardson and Malme,1993). Some bowheads in the vicinity would be expected to respond to noise from drilling units by slightly changing their migration speed and swimming direction so as to avoid closely approaching these noise sources. Under open-water, mean ambient-noise conditions, it has been estimated that bowheads might respond to drilling noise at 1.0 to 8.0 kilometers (0.62 to 5.0 miles) from a drillship but only 0.2 to 1.8 kilometers (0.12 to 1.12 miles) from an artificial-island drilling site (Miles, Malme, and Richardson, 1987). If the drillships are attended by icebreakers, as is typically the case during the fall in the U.S. Beaufort Sea, the drillship noise may frequently be masked by icebreaker noise which is often louder. Based on models, bowhead whales would then likely respond to the sound of the attending icebreakers at distances of 2 to 25 kilometers (1.24 to 15.53 miles) from the icebreakers (Miles, Malme, and Richardson, 1987). Response distances would vary depending upon icebreaker activities and sound propagation conditions.

Concerns have also been raised regarding the effects of noise from OCS exploration and production operations in the spring lead-system and the potential for this noise to delay or block the bowhead spring migration. As stated previously, spring migrating bowheads are not likely to be exposed to drilling noise. Unlike previous Beaufort Sea sales, Sale 144 does not extend west and southwest of Barrow. Only the portion of the spring lead-system east of Barrow is included in the sale. To date, there have been no drilling or production operations in the vicinity of the spring-lead system during the bowhead migration and none is anticipated for Sale 144. Consequently, the following discussion is theoretical.

If drilling operations were to occur in the spring-lead system, drilling activities from bottom-founded drilling units would be the principal sources of OCS-related noise. The MMS is funding a study on the effects of production activities on whales in the arctic, and a portion of that study will include observations of bowhead whale behavior in the presence of recorded noise from production operations played back as whales migrate through the spring lead system. When that study has been completed, we should have a better idea of how whales would react to noise in the lead system. We can, however, project--based on noise conditions in the lead system and whale behavior in general in the presence of exploration units and production platforms--how bowheads might react to exploration and production noise in or near the lead system. The following information is summarized from pages IV-B-80 through IV-B-82 of the Chukchi Sea Oil & Gas Lease Sale 109 FEIS (USDOI, MMS, 1987) which is hereby incorporated by reference. One factor to consider in assessing the possible effects of exploration and production noise in the lead system is that exploration units and production platforms are stationary, whereas the lead system is not. Consequently, a platform present within or near a lead one day may be well outside the lead the next day, possibly an obstacle to the whale migration on one day and not the next. High ambient noise levels have been measured at the boundary between open water and pack ice; consequently ambient noise could be high in the area of the spring lead. If this is the case, ambient noise would tend to mask distant industry noise, making it less audible and probably less disturbing to the bowheads. Gray whales, which appear to react to noise disturbance at levels fairly similar to bowheads, show little avoidance of production-or drilling-platform noise. Experimental evidence using playback noise indicated that the point at which 50 percent of migrating gray whales would avoid platform noise was 56 meters (61 yards) for production platforms and 40 meters (44 yards) for drilling platforms. Sightings of migrating gray whales immediately adjacent to production platforms off the California coast seem to support this experimental evidence. Consequently, if bowheads react to platforms as do gray whales, there should be little avoidance of platforms or drilling units located in or near the spring lead system and adverse effects on the migration should be minimal.

There could also be a number of minor alterations in bowhead habitat as a result of Sale 144 exploration. Discharge of drilling muds and cuttings could interfere with a whales' ability to locate prey species, but the area affected would be very localized around the drill rig. Bottom-founded drilling units and/or gravel islands may cover small areas of benthic habitat, and drilling muds and cuttings may cover portions of the sea floor that support epibenthic invertebrates utilized for food by bowhead whales; however, the effects are expected to be negligible since bowheads feed primarily on pelagic zooplankton and the areas of sea bottom that are impacted would be inconsequential in relation to the available habitat.

Summary: Bowheads may exhibit avoidance behavior if approached by vessels at a distance of 1 to 4 kilometers (0.62 to 2.5 miles). They are not affected much by any aircraft overflights at altitudes above 300 meters (328 yards). Most bowheads exhibit avoidance behavior when exposed to sounds from seismic activity at a distance of a few kilometers but rarely show avoidance behavior at distances of more than 7.5 kilometers (4.7 miles). Bowheads have been sighted within 0.2 to 5 kilometers (0.12 to 3 miles) from drillships, although some bowheads probably change their migration speed and swimming direction to avoid close approach to noise-producing activities. Bowheads do not seem to travel more than a few kilometers in response to a single disturbance incident and behavioral changes are temporary, lasting from minutes (in the case of vessels and aircraft) up to 30 to 60 minutes (in the case of seismic activity).

Occasional brief interruption of feeding by a passing vessel or aircraft is probably not of major significance. Similarly, the energetic cost of travelling a few additional kilometers to avoid closely approaching a noise source is very small in comparison with the cost of migration between the central Bering and eastern Beaufort Seas. However, these disturbance or avoidance factors might become significant if industrial activity were sufficiently intense to cause repeated displacement of specific individuals (which we do not believe to be the case at the level of activity projected under the base case). Reactions are less obvious in the case of industrial activities that continue for hours or days, such as distant seismic exploration, drilling, and dredging. Behavioral studies have suggested that bowheads habituate to noise from distant ongoing drilling, dredging, or seismic operations (Richardson et al., 1985), but there is still some apparent localized avoidance (Davis, 1987). There is insufficient evidence to indicate whether or not industrial activity in an area for a number of years would adversely impact bowhead use of that area (Richardson et al., 1985), but there has been no documented evidence that noise from OCS operations would serve as a barrier to migration.

Conclusion: Bowheads may exhibit avoidance behavior to vessels and activities related to seismic surveys, drilling, and construction during exploration and development and production. Overall, bowhead whales exposed to noise-producing activities would most likely experience temporary, sublethal effects.

B. Effects on the Arctic Peregrine Falcon: Nesting peregrines could, on rare occasions, be disturbed by aircraft overflights related to the proposed sale that may occur inland from the coast. Nesting sites such as those near Ocean Point on the Colville River, about 40 kilometers (25 miles) inland, may be vulnerable to such occasional disturbance. The extent of such disturbance would depend on future locations of support facilities. Aircraft based in Deadhorse or Barrow typically would not fly over these areas. Thus, significant disturbance of peregrine falcons associated with the exploration phase is unlikely. Gravel mining for any artificial islands associated with Sale 144 is unlikely to affect the peregrine because extraction is expected to occur near the Beaufort Sea coast where peregrines are not known to nest.

Conclusion: It is unlikely that noise and disturbance would affect the peregrine falcon; any possible disturbance would be short-term and localized, with <5 percent of the population exposed to potentially adverse factors.

C. Effects on the Spectacled Eider: Spectacled eiders migrating in nearshore areas along the Beaufort Sea coast are not expected to experience substantial adverse effects from potentially disturbing routine activities (primarily helicopter flights) because of the apparent low probability that routes travelled and area covered by small scattered flocks of this small Alaskan population would be intersected by the flight paths of support-aircraft flights between rigs or platforms and onshore facilities at Kuparuk Field or Deadhorse (1-2 round-trip flights/day). It is likely that only a limited degradation of available foraging habitat would occur, within about 1 to 2 kilometers (0.62 to 1.2 miles) of the established flight paths from platforms west of Oliktok Point during the limited time males in late June and females with juveniles in late August are traversing the area. However, if helicopters servicing platforms in the western sale area first return to and then follow the coastline to onshore facilities, a more widespread disruption of foraging activity would be anticipated. Because it is unlikely that the primary nesting area would be overflown by helicopters from offshore units, significant disturbance of nesting or brood-rearing eiders is not expected to occur.

Conclusion: Because potentially disturbing routine activities associated with this sale would be far removed from most of the spectacled eiders migrating or nesting along the western Beaufort Sea coast, <2 percent of the population is expected to be affected and no significant effects are anticipated from such activities.

D. Effects on the Steller's Eider: Steller's eiders migrating in nearshore areas along the western Beaufort Sea coast are not expected to experience substantial adverse effects from potentially disturbing routine activities (primarily helicopter flights) because of the apparently low probability that the routes travelled and area covered by small scattered flocks of this small Alaskan population would be intersected by the flight paths of support aircraft flights between rigs or platforms and onshore facilities at Kuparuk Field or Deadhorse (1-2 round-trip flights/day). It is likely that only a limited reduction of available foraging habitat would occur, within about 1 to 2 kilometers (0.62 to 1.2 miles) of the established flight paths from platforms west of Oliktok Point during the limited time males in late June and females with juveniles in late August are traversing the area. However, if helicopters servicing platforms in the western sale area first return to and then follow the coastline to onshore facilities, a more widespread disruption of foraging habitat would be anticipated. Because it is unlikely that the primary Alaskan nesting area, located south and southeast of Barrow and extending as much as 100 kilometers (62 miles) inland, would be overflown by helicopters from offshore units, significant disturbance of nesting or brood-rearing eiders is not expected to occur.

Conclusion: Because potentially disturbing routine activities associated with this sale would be far removed from most of the Steller's eiders migrating along the western Beaufort Sea coast or nesting south of Barrow, <2 percent of the population is expected to be affected and no significant effects are anticipated from such activities.

E. Cumulative Effects: Cumulative effects are defined in 50 CFR 402.02 (Interagency Cooperation on the Endangered Species Act of 1973, as amended: ". . . those effects of future State or private activities not involving Federal activities that are reasonably certain to occur within the action area of the Federal action subject to consultation".

State or private actions reasonably certain to occur within or near the proposed sale area would include State of Alaska oil and gas lease sales and possibly some Canadian Beaufort Sea oil and gas activities in the future, and subsistence-harvest activities.
Three additional State oil and gas lease sales are scheduled for the Beaufort Sea in the next five years, Sales 86, 83, and 89 (April 1997, March 1999, and December 1999, respectively). If these sales occur, additional effects similar to those described below for previous State lease sales could occur.

For the total number of oil spills from Federal and State lease activity for the cumulative case, the OSRA estimated 3 spills ≥1,000 bbl from pipelines or platforms, with an estimated 96-percent chance of one or more such spills occurring over the production life of the proposed action and 8 spills ≥1,000 bbl as a result of tankering operations from Valdez to U. S. ports south of Alaska, with an estimated 99.5-percent chance of one or more such spills occurring over the production life of the proposed action. The contribution from tanker spills from Sale 144 production is estimated at approximately 20 percent of the total tanker spills.

1. Cumulative Effects on the Bowhead Whale: Some effects on bowhead whales may occur from previously held State offshore lease sales. Generally, bowhead whales remain far enough offshore so as to be found mainly in Federal waters; however, in some areas (e.g., the Beaufort Sea southeast and north of Kaktovik and near Point Barrow) the whales may occur in State waters. If exploration and development and production activities occur on leases from previous or proposed State sales, noise effects on whales may occur as described under the base case. These effects could include local avoidance of aircraft, vessels, seismic surveys, dredging, exploratory drilling, and production operations that occur within several miles of the whales. Whales may react briefly by diving in response to low-flying helicopters. Current State leases with production are well removed from the normal fall migration route of the bowhead whale. It is unlikely that there would be any major changes in the overall fall bowhead migration route resulting from noise associated with previous or future State lease sales.

Should an oil spill occur, effects on whales could include those discussed under the base case including inhalation of hydrocarbon vapors, a loss of prey organisms, ingestion of spilled oil or oil-contaminated prey, baleen fouling with a reduction in feeding efficiency, and skin and/or sensory-organ damage.

On their summer feeding grounds in the Canadian Beaufort Sea, bowhead whales may be subject to some disturbance from activities associated with offshore oil and gas exploration and development and production at some time in the future. Apparently the Canadian government has released a request for industry interest in the Canadian Beaufort Sea. The main area of industry interest to date has centered around the Mackenzie Delta and offshore of the Tuktoyaktuk Peninsula, although there has little industry activity there in recent years. This area comprises a minor portion of the bowhead's summer range. Possible disturbance to bowhead whales from helicopters, vessels, seismic surveys, and drilling would be as previously described. Bowhead whales would be exposed to the risk of oil spills from exploration, development and production, and transportation of oil from the Canadian Beaufort Sea. Oil-spill effects on the bowhead whales would be as described in Section V.B.

It is expected that there would be few effects on bowhead whales during their fall migration through the Beaufort and Chukchi Seas to overwintering areas in the Bering Sea as a result of previous Federal offshore lease sales. Noise effects on bowheads under the cumulative case could be expected to result from activities associated with previous Federal offshore lease sales, including drilling exploration and delineation wells, support-vessel and helicopter activity, and shallow-hazards seismic surveys within the Beaufort Sea Planning Area. There are three potentially producible prospects from previous Federal lease sales. Two of the prospects, the Kuvlum and Hammerhead Units, are within the normal fall-migration route of the bowhead whale. Should development of these units proceed, production platforms would be installed and pipelines would be constructed. Some minor disturbance to bowhead whales on their fall migration might occur in the vicinity of these activities. Support traffic (helicopters and vessels) likely would travel between Prudhoe Bay and any exploration units or production platforms in the planning area. Bowheads may dive if helicopters passed low overhead, and they would seek to avoid close approach by vessels. Behavioral studies have suggested that bowhead whales habituate to noise from distant ongoing drilling, dredging, or seismic operations (Richardson, Wells, and Wursig, 1985; Richardson et al., 1985), but there still is some apparent localized avoidance (Davis, 1987). There is insufficient evidence to indicate whether or not industrial activity in an area for a number of years would adversely affect bowhead use of that area (Richardson et al., 1985), and there has been no documented evidence that noise from OCS operations would serve as a barrier to migration.

In the event a spill occurred during the fall bowhead migration through the Beaufort and Chukchi Seas, effects as previously described for the proposed action could occur. These effects generally would be minor and transient unless whales were confined to an area of freshly spilled oil. After bowheads move westward past Point Barrow, they tend to fan out and cross the Chukchi Sea in a broad front. Consequently, this dispersion also reduces the risk of many whales contacting a fresh spill. Of course, if the spill occurred over a prolonged period of time, more individuals could be contacted. A low number of individuals could be killed as a result of prolonged contact with freshly spilled oil, particularly if spills were to occur within ice-lead systems. The probability of an oil spill adversely affecting fall-migrating bowheads in the Hope Basin is very low, as most bowheads appear to migrate south within Soviet waters along the coast of the Chukchi Peninsula. If oil is spilled into the spring-lead system, effects may occur as described for the proposed action.

Proposed Federal Sale 148 in the Chukchi Sea has been postponed, although a Chukchi Sea/Hope Basin Sale will be considered in the 1997-2002 5-Year Program. Currently, there are no plans for future oil and gas exploration activities in the Bering Sea. Bowheads may encounter from one to several exploratory operations or production platforms in the future along their fall migration route through the Beaufort Sea, Chukchi Sea, and Hope Basin Planning Areas. Bowheads likely would make small changes in swimming speed and direction to avoid closely approaching these operations.

A non-OCS activity that affects the bowhead whale is the annual subsistence harvest by Alaska Natives. Bowheads are taken in the northern Bering Sea and in the Chukchi Sea on their spring migration and in the Beaufort Sea on their fall migration. A quota of 54 strikes or 41 whales landed per year was authorized by the International Whaling Commission for 1992, 1993, and 1994. This level of harvest was allowed under the supposition that it still would allow for slow growth in the bowhead population. It was assumed that in future years, the bowhead whale population will continue to be monitored and that harvest quotas will be set in order to maintain a healthy bowhead population level.

Whenever vessels are nearby, whales likely would try to avoid being closely approached by motorized hunting boats; however, once the whales migrate out of the Beaufort Sea, there probably would be few whales interacting with hunters during the fall season, and none during the winter. As the bowheads migrate northward through northern Bering, Chukchi, and Alaskan Beaufort Seas during the spring, they are subject to being taken by subsistence whalers. A few whales also may be approached by Natives hunting seals and walruses. These whales likely would attempt to avoid being closely approached.

Conclusion: Bowheads may exhibit avoidance behavior to vessels and activities related to seismic, drilling, and construction during exploration and development and production. Some bowhead whales could be exposed to spilled oil, resulting in temporary, sublethal effects, although some mortality might result if there were a prolonged exposure to freshly spilled oil. Overall, bowhead whales exposed to noise-producing activities and oil spills associated with the proposal and other future and existing projects within the arctic-region area—combined with the other activities within the range of the migrating bowhead whale—most likely would experience temporary, sublethal effects. However, exposure to oil spills could result in lethal effects to a few individuals, with the population recovering within 1 to 3 years. Bowheads may also exhibit avoidance behavior to subsistence hunting vessels. Approximately 41 whales are expected to be killed annually during the subsistence harvest.

2. Cumulative Effects on the Arctic Peregrine Falcon: The State lease sales and possible future Canadian Beaufort activities described above are expected to contribute only slightly to cumulative effects that may affect the arctic peregrine falcon. Onshore projects have greater potential for adverse effects, but noise and oil-spill effects (such as those described for the proposal) from State and Canadian lease sales and activities should have only occasional, brief adverse effects on the peregrine falcon.

Adverse effects on peregrines primarily result from intake of pesticides and other toxic contaminants, habitat destruction, and disturbance of nest sites. The ban of DDT use in the United States has greatly reduced the bioaccumulation and reproductive failure of the peregrine falcon; however, the continued use of toxic pesticides (including DDT) in Central and South America results in a persistence of the contamination in the peregrine. Large-scale habitat destruction in these countries (clearing of forests for agriculture), as well as habitat disruption along migration routes and disturbance near nest sites and in foraging areas, probably also have slowed recovery of the peregrine population. Oil spills are considered a minor threat to peregrines because they are not likely to contact oil directly. However, peregrines could contact oil while feeding on oiled seabirds, waterfowl, or shorebirds and also could be affected by a reduction in prey availability if these species were oiled in large numbers.

Both disturbance and oiling of peregrines are considered unlikely results of the proposed action and other Federal lease sales because situations involving these adverse factors generally are far-removed from primary areas of falcon activity and thus should have only occasional, brief, adverse effects. Disturbance associated with onshore activities has the greatest potential for adverse effects. Although the cumulative effect of all OCS lease sales throughout the arctic range of the peregrine falcon is expected to have a slightly greater effect than the proposed action, the overall effect on the population is expected to be minimal.

Conclusion: The contribution of activities associated with proposed Sale 144 to the cumulative effect of all projects and activities within the range occupied by nesting, migrating, or wintering peregrines is not expected to increase the overall effect on the arctic peregrine falcon population above a minimal level, requiring no more than 1 generation for recovery to their original status.

3. Cumulative Effects on the Spectacled Eider: In addition to Proposed OCS Lease Sale 144, other projects or activities that could contribute to cumulative effects on spectacled eiders include past and projected Federal and State oil and gas lease sales, current and projected State oil production, subsistence harvests, commercial fishing, marine shipping, and recreational activities. These projects and activities could result in disturbance of nest sites and areas occupied during brood-rearing, molting, and migration, as well as habitat degradation and oil or other toxic pollution effects. Disease, predation, fluctuations in prey availability, and severe weather, as well as the unknown factors that have caused the spectacled eider population in Alaska to decline 90+ percent in the past several decades, presumably would contribute to the cumulative effect or affect the intensity with which other factors operate.

Because potentially disturbing routine activities associated with Federal OCS sales would be far removed from most spectacled eiders nesting or migrating along the western Beaufort Sea coast, the population is not expected to experience significantly greater effects from increases in such activities. On the arctic slope, an estimated 15 percent of available nesting habitat has been developed as oil-production fields; however, <5 percent of the tundra wetlands within the developed area has been destroyed (58 FR 27474). Future State onshore development could result in increased eider disturbance and habitat degradation, but the extent of such development will depend on economic factors. Relatively low spectacled eider mortality is expected from oil spills (<200 individuals); however, recovery from cumulative spill-related losses may require as much as 3 generations in view of this species' declining numbers on the breeding grounds in recent decades and their relatively low reproductive rate. Subsistence harvest is estimated to remove at least 500 spectacled eiders from the Alaskan population annually (58 FR 27474). Effects of the other factors (e.g., fishing net entanglement, bioaccumulation of toxins in the food chain) on the spectacled eider population currently are unknown.

Conclusion: Overall routine cumulative effects on the Alaskan spectacled eider population are expected to be minimal, affecting <5 percent of the population; however, mortality resulting from oil spills is expected to require up to 3 generations for recovery. Overall cumulative effects could require 4 generations or more for recovery, although any estimate of severity is confounded by the uncertainty regarding the recent population decline.

4. Cumulative Effects on the Steller's Eider: In addition to Proposed OCS Lease Sale 144, other projects or activities that could contribute to cumulative effects on Steller's eiders include past and projected Federal and State oil and gas lease sales, current and projected State oil production, subsistence harvests, commercial fishing, marine shipping, and recreational activities. These projects and activities could result in disturbance of nest sites and areas occupied during brood-rearing, molting and migration, as well as habitat degradation and oil or other toxic pollution effects. Disease, predation, fluctuations in prey availability, and severe weather, as well as the unknown factors that have caused the Steller's eider population to decline more than 50 percent in the past several decades, presumably would contribute to the cumulative effect or affect the intensity with which other factors operate.

Because potentially disturbing routine activities associated with Federal OCS sales would be far removed from most Steller's eiders nesting primarily south of Barrow or migrating along the western Beaufort Sea coast, the population is not expected to experience significantly greater effects from increases in such activities. Future State onshore or NPR-A development could result in increased eider disturbance and habitat degradation, but the extent of such development will depend on economic factors. Relatively low Steller's eider mortality is expected from oil spills (<200 individuals); however, recovery from cumulative spill-related losses may require as much as 3 generations in view of this species' declining numbers on the breeding ground in recent decades and their relatively low reproductive rate. Effects of the other factors (e.g., fishing net entanglement, bioaccumulation of toxins in the food chain, subsistence harvest) on the Steller's eider population currently are unknown.

Conclusion: Routine cumulative effects on the Alaskan Steller's eider population are expected to be minimal, affecting <2 percent of the population; however, mortality resulting from oil spills is expected to require up to 3 generations for recovery. Overall cumulative effects could require 4 generations or more for recovery, although any estimate of severity is confounded by the uncertainty regarding the recent population decline.

V. DEVELOPMENT AND PRODUCTION

This section describes the Sale 144 base-case development and production scenario and the possible effects to endangered and threatened species, including candidate species. Analysis of the potential effects of an oil spill on species along transportation routes south of the proposed sale area can be found in the Cook Inlet Planning Area Oil and Gas Lease Sale 149 DEIS (USDOI, MMS, 1995), which is incorporated here by reference. The estimated level of activity associated with the base-case development and production is summarized from the Exploration and Development Report, Appendix A.

A. Scenario: It is assumed that oil resources discovered as a result of previous lease sales and Sale 144 will be developed simultaneously. The discovery of economically recoverable oil on Sale 144 leases and/or on previously leased sale tracts would initiate the process to plan, design, and construct the production platforms, support facilities, and transportation infrastructure for petroleum exploitation in the Federal waters of the Beaufort Sea.

The development and production scenario selected by MMS represents a composite of various feasible options that could be developed for the environmental analysis. It resulted from discussions within MMS, with other government agencies, and with industry. The locations of existing infrastructure, sites with potential as support facilities, area-resource estimates, and scenarios developed for the previous Outer Continental Shelf (OCS) sales in the Beaufort Sea are all considered in developing this scenario.

Work on offshore and onshore production and transportation facilities would not begin until the engineering and economic assessments of the potential reservoirs have been completed and the conditions of all the permits have been evaluated.

The facility locations and transportation scenarios discussed represent assumptions that were made as a basis for identifying characteristic activities and any resulting environmental effects. The assumptions do not represent an MMS recommendation, preference, or endorsement of any facility, site, or development plan. A summary of the major development and production assumptions follows:

oo The first production platform is projected to be completed by 2002, with production well drilling also commencing in 2002. Eight production platforms would be installed between 2002 and 2007. An estimated 273 production/service wells are expected to be drilled between 2002 and 2010 to an average target depth of 915 meters (3,000 feet). Gravel islands will probably be constructed for production facilities in water depths less than 11 meters (36 feet), bottom-founded structures designed for extreme ice conditions would likely be used in water depths between 11 meters and 38 meters (36 and 125 feet), and floating concrete structures anchored tothe seafloor would likely be used in water depths greater than 38 meters (125 feet).

oo The average production/service well will use approximately 150 to 680 short tons of dry mud and produce an average of 1180 short tons of dry rock cuttings.

oo A three-dimensional, multichannel, seismic-reflection survey covering an area of approximately 670 kilometers^2 (259 miles^2) would be conducted for the production platforms. A total of 515 kilometers (320 miles) seismic-line miles of shallow-hazards surveys would be conducted for pipeline construction.

oo On-shore support would probably be from Prudhoe Bay. Support for operations on production islands in nearshore shallow waters is expected to be by ice roads during the winter. Drilling operations farther offshore would be supported during the open-water season by barge and one helicopter flight/drilling unit/day. There may also be one standby vessel for each drilling unit.

oo For the transportation scenario for the base-case, it is assumed (1) pipelines would be used to transfer oil from the production platforms to the TAPS Pump Station No. 1; (2) the configuration of the pipelines basically would be that of a combination offshore/existing onshore infrastructure; and (3) the landfalls would be in the vicinity of Oliktok Point (utilizing the Kuparuk field infrastructure), Point McIntyre/West Dock area (utilizing the Prudhoe Bay field infrastructure), and at a point about 32 kilometers (20 miles) east of Bullen Point (to utilize future development infrastructure in the Point Thompson area). Pipelines will likely be trenched in water less than 45 meters (148 feet) for protection against ice damage and at landfalls pipelines will be elevated on gravel structures (extending seaward approximately 91 meters (100 yards) from the shore) to protect them against shore erosion processes. Pipeline installation between production platforms and onshore facilities would take 1 to 2 years. Pipelines would total an estimated 298 kilometers (185 miles), with about 129 kilometers (80 miles) offshore and 169 kilometers (105 miles) onshore.

B. Evaluation of Effects from Development and Production: Activities during development and production, like those occurring during exploration, may result in noise and disturbance and altered habitat effects on behavior, distribution, and abundance of individuals or populations occurring in or adjacent to the sale area or along tanker routes. Also, contaminants released during development or production may cause adverse effects on individuals either through direct contact or indirectly as a result of effects on prey populations or important habitats. Contaminants, other than crude oil, such as drilling muds and cuttings, are not expected to cause significant effects because they are likely to rapidly become diluted near the point of release and/or are not known to be harmful to species considered below. In addition, cleanup activities associated with any oil spill may result in disturbance.

Using base-case resource and transportation assumptions, the OSRA estimated 2 spills $\geq$1,000 bbl, with an estimated 88-percent chance of a spill occurring over the production life of the proposed action. The oil-spill-risk-analysis probabilities (Appendix D) cited in discussions below were developed from base-case assumptions and thus represent the expected probability of a substantial spill occurring and contacting specific areas or biological resources, given the projected oil volume of 1200 MMbbl.

1. Effects on the Bowhead Whale: The effects of an oil spill on bowhead whales are unknown. According to Geraci and St. Aubin (1982) and St. Aubin (1984), short-term exposure to spilled oil is unlikely to have serious direct effects on baleen whales. Assuming an oil spill occurred in bowhead whale habitat while bowheads are present, some whales could experience one or more of the following: skin contact, baleen fouling, respiratory distress caused by inhalation of hydrocarbon vapors (from a fresh spill), localized reduction in food resources, consumption of some contaminated prey items, and perhaps a temporary displacement from some feeding areas. The number of whales contacted would depend on the size, timing, and duration of the spill, the density of the whale population in the area of the spill, and the whales' ability or inclination to avoid contact with oil.

Bowhead whales have not been observed in the presence of an oil spill, so it is uncertain if they can detect an oil spill or would avoid surfacing in the oil. Several investigators have observed a variety of cetaceans in the presence of spilled oil. It was noted that cetaceans, including fin whales, humpback whales, gray whales, dolphins, and pilot whales did not avoid slicks but swam through them, apparently showing no reaction to the oil. During one study humpback whales, fin whales, and a whale tentatively identified as a right whale, were observed surfacing and even feeding in or near an oil slick off Cape Cod, Massachusetts (Geraci and St. Aubin, 1990). None of the observations provide a definitive picture of whether cetaceans are capable of detecting oil and avoiding it. Some researchers have concluded that the surface vision of baleen whales is so effective that they rely upon visual clues for a variety of activities. Bowhead whales have been observed "playing" with floating logs and sheens of floating dye on the sea surface, suggesting that bowheads may be able to recognize oil floating on the sea surface (Bratton, et al., 1993).

If a bowhead comes in contact with spilled oil, the skin would be the first organ to be exposed to the oil. Oil is unlikely to adhere to smooth areas of bowhead skin, but might adhere to rough areas on the skin surface. If bowheads vacate oiled areas, it is probable that most of the oil would wash off the skin and body surface within a short period of time. However, if bowheads remain in oiled areas, oil might adhere to the skin and other surface features (such as sensory hairs) for longer periods of time. Histological data and ultrastructural studies from the work of Geraci and St. Aubin showed that long exposures to petroleum hydrocarbons produced only transient damage to cells of the epidermis, with cells showing signs of recovery within 3 to 7 days after exposure. They concluded that cetacean skin presents a formidable barrier to the toxic effects of petroleum (Bratton et al., 1993). Although oil adhering to sensory hairs may very well be washed away by passing water, it has been suggested that the function of these structures could be altered. Since the function of the hairs are unknown, it is difficult to assess the impact of their loss of function to the bowhead.

Bowheads are most likely to contact spilled oil as they surface to breathe. It is unlikely that they would inhale oil into the blowhole while breathing, although bowheads surfacing in a spill of lightly weathered oil could inhale some hydrocarbon vapors which might result in pulmonary distress. Perhaps the most serious situation would occur if oil were spilled into a lead from which bowheads could not escape, although the probability of such an occurrence is extremely low. In this situation, whales could experience irritation of the mucous membranes or respiratory tract and possibly absorb hydrocarbons into the bloodstream as a result of inhalation of toxic vapors. Vapor concentrations that could be harmful to whales would be expected to dissipate within several hours after termination of a spill. Whales exposed to toxic vapors within a few hours after the spill could suffer pulmonary distress and possible mortality. Generally only a few whales would be likely to occupy the affected lead at any given time.

While feeding, bowheads sometimes skim the water surface, filtering large volumes of water for extended periods, and consequently might ingest some spilled oil if any were present. There is no evidence from observational studies or stranding records to suggest that cetaceans would feed around a fresh oil spill long enough to accumulate a critical dose of oil. It has also been suggested that baleen filaments and ingested oil may clump together to form a gastrointestinal obstruction, although this has never been observed in nature.

If feeding bowheads contact spilled oil, the baleen hairs may be fouled, resulting in a reduced filtration efficiency. Studies conducted by Geraci and St. Aubin found that 70 percent of the oil adhering to baleen plates was removed within 30 minutes after fouling and 95 percent of the oil was removed within 24 hours after exposure. Their data suggests that the residual level of fouling of the baleen causes no compromise in the function of the baleen 24 hours after exposure to petroleum (Bratton, et al., 1993). Bowheads most likely would occupy oiled waters for only a short period of time and zooplankton filtration efficiency would return to normal in a matter of hours as oil is flushed from the baleen; however, repeated baleen fouling over an extended period of time might result in reduced food intake and blubber deposition which might, in turn, adversely affect the health and survival of bowheads.

The population of zooplankton, the major food source of bowhead whales, would not likely be permanently affected by an oil spill. The amount of zooplankton lost in even a large oil spill would be negligible in comparison to the plankton resources available on the whale's summer feeding grounds (Bratton et al., 1993). Bowheads might ingest some oil-contaminated prey items, but it is likely these organisms would comprise only a small portion of the bowheads' food intake. Some zooplankton consumed by bowheads actively consume oil particles, but apparently can excrete hydrocarbons from their system relatively rapidly as well. Tissue studies analyzing the level of naphthalene in the liver and blubber of whales indicated low levels of naphthalene in baleen whales, suggesting that prey species have low concentrations in their tissues or that baleen whales may be capable of metabolizing and excreting petroleum hydrocarbons (Geraci and St. Aubin, 1990).

Concern has been raised about the effects of oil spilled into the spring lead system during the bowhead whale migration. A discussion of such effects is contained on pages IV-B-78 through IV-B-82 of the Chukchi Sea Oil & Gas Lease Sale 109 FEIS (USDOI, MMS, 1987) and is hereby summarized and incorporated by reference. The presence of ice could restrict the spread of the oil. Agitation of ice particles in combination with oil could initially increase oil dispersion into the water column; however, it would also result in a more rapid formation of a water-in-oil emulsification. Grease ice (newly formed ice) and spilled oil would be blown downwind and would accumulate in a band along the downwind edge of open leads or ice floes. When the lead closes or ice floes are blown together, the accumulated grease ice and oil would be pushed onto the adjacent ice. It is unlikely that oil would completely cover the surface of the water except in cracks and small pools sheltered from the wind. Toxic vapors would be carried away from any leads by the wind, and volatile compounds would be lost within 24 to 48 hours of weathering at the surface. Harmful concentrations of toxic vapors from spilled oil should not persist for more than a few hours after the oil has weathered at the surface. Oil spilled under winter ice would pool and freeze to the underside of the ice. First-year arctic ice--the most prevalent type in the area--can store up to 150,000 to 300,000 barrels of oil per square kilometer in under-ice relief. Consequently, oil spilled in heavy ice cover would be unlikely to spread appreciably under the ice before being frozen into the ice. The spilled oil would then move as part of the pack ice. The oil would either melt out at the southern ice edge as the pack retreated or migrate through brine channels and pool on top of the ice as melting conditions begin to occur.

Effects of oil contacting bowheads under winter or broken-ice conditions would generally be similar to those previously described including baleen fouling, inhalation of toxic vapors, ingestion of oil or oil-contaminated prey, and irritation of skin or sensitive tissues. Bowheads may migrate through an oil-spill area without actually contacting oil since, as mentioned earlier, the oil would accumulate along the downwind edge of any open-water areas. On occasion, bowheads have been observed continually returning to the same small area of open water, presumably because there was no other readily available open water where they could surface. If a substantial quantity of fresh crude oil or an aromatic refined petroleum product were spilled into such an area of open water, it is possible that the animals trapped there could die or suffer pulmonary distress from the inhalation of toxic vapors. However, this is expected to be a very rare case that would only affect a low number of whales.

Should a large oil spill occur which covers a substantial stretch of a major spring lead used by migrating bowheads, a number of bowheads may contact oil and/or a portion of the spring bowhead migration might be delayed or temporarily blocked. Bowheads would probably not migrate through the pack-ice zone to avoid an oil spill blocking a lead unless the pack-ice zone had an adequate number of cracks or small ponds for bowhead respiration. Bowheads may migrate under the ice and avoid the oil contamination. Such a spill could affect a substantial portion of the bowhead population; but unless the spill were prolonged, its effects would likely be short-lived. Within several hours to several days after cessation of the spill, the oil should have accumulated along the downwind or downcurrent edge of the lead and should no longer pose an impediment to the migration. Such a short-term delay in the migration should not result in significant effects on the population, since there is considerable natural variability in the timing of the migration due to ice conditions. A substantial number of bowheads could contact oil if individuals, driven by the migratory urge, attempt to swim through the oil-covered lead. Some of these individuals might succumb to toxic vapors if the spill were very fresh. It has been shown, however, that bowheads are quite adept at migrating beneath at least thin ice (George et al., 1989); and bowheads may migrate under the ice around the area of oil contamination.

The OSRA probabilities are found in Appendix D. The OSRA model estimated a 6%-45%-percent chance (Table 8) of one or more spills ≥1,000 bbl occurring and contacting bowhead whale habitat such as Ice/Sea Segments 5-11 (Fig. IV.A.2-3), areas where bowheads may be present during the fall migration, within 30 days over the production life of the proposed action. The probability of contact in Ice/Sea Segment 9 is estimated at 45 percent and is the area of highest probability of contact. The OSRA model estimated only a 5%-percent chance of one or more spills ≥1,000 bbl occurring and contacting bowhead whale habitat such as SLSN (Spring Lead System-North) (Fig. IV.A.2-5), an area where bowheads may be present during the spring and fall migration, within 30 days over the production life of the proposed action. For conditional probabilities, the OSRA model estimated a 72-percent and a 94-percent chance (Table C-3) of a spill ≥1,000 bbl contacting SLSN within 30 days during the winter (October through June), assuming that a spill occurred at Launch Area L3 (Fig. IV.A.2-1) and Pipeline Segment P1 (Fig. IV.A.2-6), respectively. The OSRA model estimated an 8-percent and a 7-percent chance of a spill ≥1,000 bbl contacting FFA (Fall Feeding Area) (Fig. IV.A.2-4) within 30 days during the winter, assuming that a spill occurred at Launch Area L2 and Pipeline Segment P1, respectively. The OSRA model estimated a 75-percent and a 91-percent chance (Table C-6) of a spill ≥1,000 bbl contacting SLSN within 30 days during the summer (July through September), assuming that a spill occurred at Launch Area L1 and Pipeline Segment P1, respectively. The OSRA model estimated a 26-percent and a 21-percent chance of a spill ≥1,000 bbl contacting FFA within 30 days during the summer, assuming that a spill occurred at Launch Area L2 and Pipeline Segment P1, respectively.

If commercial quantities of oil are discovered and development and production proceed, pipeline construction activities would occur. Dredging or trenching may be utilized in construction of the gathering pipeline from the production platform to shore. Bowhead reactions to dredge noise have been observed to be similar to their reactions to drilling noise including avoidance of the near vicinity of the activity. In one instance, as many as 12 bowheads were observed within 5 kilometers (3 miles) from active dredging operations on their summer-feeding grounds. However, some bowheads were detected within 800 meters (875 yards) of the site (Richardson and Malme, 1993). Dredge sounds were well above ambient levels up to several kilometers away (22 dB above average ambient level at 1.2 kilometers (0.75 miles) from the dredge). In other instances bowheads were observed at distances where they were well within the ensonified area of dredging operations. However, in playback experiments, some whales responded to the onset of similar levels of dredge noise by exhibiting weak avoidance. Bowheads seen in the vicinity of actual dredging operations may have habituated to the activity, or there may be variation among bowheads in the degree of sensitivity toward noise disturbance, so that bowheads seen in the vicinity of dredging operations may have been the more tolerant individuals.

Summary: Noise effects from development and production activities on endangered whales would be similar to those described earlier in Section IV. Whales may exhibit avoidance behavior if approached by supply vessels, barge traffic, icebreakers, or seismic-survey vessels. Some whales may temporarily interrupt their activities and swim away from the vessel's path. There would be additional noise-producing activities such as dredging (trenching) for pipeline construction and the production operations from the eight platforms. Bowhead reactions to dredge noise have been observed to be similar to their reactions to drilling noise. Noise from these activities may cause whales to avoid the immediate vicinity of the pipeline construction and platforms; however, it is felt that the area of avoidance would be relatively small since whales appear to exhibit less avoidance behavior with stationary sources of relatively constant noise than with moving sound sources.

If oil is discovered in a commercially producible quantity within or near a bowhead-migration corridor, bowheads could be exposed to noise from production platforms during their spring or fall migration or both, depending upon where the platform(s) is located. For a discussion concerning effects of noise from production in the spring-lead system see Section IV.A. If migrating bowheads react to production noise in the same manner as migrating gray whales off the California coast (Malme et al., 1984), their response to noise from production platforms would be expected to be much less than their response to drillship noise.

There is an 88-percent chance of one or more oil spills of 1,000 barrels or more occurring. The OSRA model estimated a 6%-45%-percent chance of one or more spills ≥1,000 bbl occurring and contacting bowhead whale habitat such as Ice/Sea Segments 5-11, areas where bowheads may be present during the fall migration, within 30 days over the production life of the proposed action. The OSRA model estimated only a 5%-percent chance of one or more spills ≥1,000 bbl occurring and contacting bowhead whale habitat such as SLSN, an area where bowheads may be present during the spring and fall migration, within 30 days over the production life of the proposed action. The probability of oil actually contacting whales would be considerably less than the probability of contact with bowhead habitat. If an uncontrolled, uncontained spill were to occur, a few bowheads could experience one or more of the following: skin contact with oil, baleen fouling, inhalation of hydrocarbon vapors, a localized reduction in food resources, the consumption of oil-contaminated prey items, and perhaps temporary displacement from some feeding areas. Some individuals may be killed or injured as a result of prolonged exposure to freshly-spilled oil; however, the number of individuals so affected is expected to be small.

Conclusion: Bowheads may exhibit avoidance behavior to vessels and activities related to seismic surveys, drilling, and construction during exploration and development and production. Some bowhead whales could be exposed to spilled oil, resulting primarily in temporary, sublethal effects. Some mortality might result if exposure to freshly spilled oil were prolonged. Overall, bowhead whales exposed to noise-producing activities and oil spills would most likely experience temporary, sublethal effects. However, prolonged exposure to oil spills could result in lethal effects to a few individuals, with the population recovering within 1 to 3 years.

2. Effects on the Arctic Peregrine Falcon: If oil is released and contacts coastal areas near peregrine nest sites or feeding areas, peregrine falcons may be affected through direct contact by adults (when hunting or via prey caught in the vicinity of the spills) or indirectly through disruption or a reduction in prey organisms (seabirds and shorebirds). The probability of such an event would be related to the probability of spilled oil being present in the vicinity of peregrine nesting and/or feeding areas. There is a very low probability that arctic peregrine falcons may contact spilled oil. Peregrines may occur in coastal areas such as the Colville or Canning River Deltas in the fall. Appendix D, Table 8, shows <3-percent probability that one or more spills ≥1,000 barrels could occur and contact the Colville Delta (Land Segments 31-32) or the Canning River Delta (Land Segment 36) within a 30-day period following a spill. Probabilities of spilled oil contacting the coast south of Barrow (Land Segments 1-19) during the nesting season are <0.5 percent. Because the actual risk (probability) of spill contact in these areas probably is even less than suggested by the OSRA values, due to the transient occurrence of peregrines in the areas likely to be contacted, and the fact that they do not typically contact the water the water surface, it is very unlikely that peregrines would be significantly affected by oil spills. If oil spills affected peregrine prey populations, then short-term, localized reductions in food availability could occur.

Conclusion: Effects of development and production activities on the arctic peregrine falcon would be low and similar to those described for the exploration phase. Significant population-level-disturbance effects associated with the development and production phases would be unlikely. It appears that the onshore gathering pipeline projected for the production phase would be routed coastward of all peregrine falcon nesting sites, and it should not affect any nesting pairs.

3. Effects on the Spectacled Eider: Spectacled eiders are not expected to survive oil contact. A small proportion of the eider population could be vulnerable to any oil spill contacting the Beaufort coastline west of Oliktok Point during the migration season; however, the population is spread in relatively small flocks along the coast, so < 10 percent of the Alaskan population is expected to be contacted by an oil spill. The combined probability (expressed as a percent chance) of one or more ≥ 1,000-bbl spills occurring and contacting areas occupied during migration periods within 30 days (Elson Lagoon-C2; Land Segments 20-32) ranges from < 0.5 to 1 percent (Appendix D, Table 8). If a spill occurred, the conditional probability of contact in these areas within 30 days (expressed as a percent chance) from Launch Areas L1-L8 and Pipeline Segments P1-P4 and P13 is 6 percent or less (Appendix D, Tables 4 and 7); most are < 3 percent. Eiders occupying spring leads offshore the nesting ground would be vulnerable if oil entered such habitat (e.g., Ice/Sea Segments 4-6; Northern Spring Lead System).

Conclusion: Relatively low spectacled eider mortality is expected from an oil spill (< 100 individuals); however, recovery from spill-related losses may require as much as 2 generations in view of their declining numbers on the breeding grounds in recent decades and their relatively low reproductive rate.

4. Effects on the Steller's Eider: Steller's eiders are not expected to survive oil contact. A small proportion of the eider population could be vulnerable to any oil spill contacting the Beaufort coastline west of Oliktok Point during the migration season; however, the population is spread in relatively small flocks along the coast, so < 10 percent of the Alaskan population is expected to be contacted by an oil spill. The combined probability (expressed as a percent chance) of one or more ≥ 1,000-bbl spills occurring and contacting areas occupied during migration periods within 30 days (Elson Lagoon-C2; Land Segments 20-32) ranges from < 0.5 to 1 percent (Appendix D, Table 8). If a spill occurred, the conditional probability of contact in these areas within 30 days (expressed as a percent chance) from Launch Areas L1-L8 and Pipeline Segments P1-P4 and P13 is 6 percent or less (Appendix D, Tables 4 and 7); most values are < 3 percent. Eiders occupying spring leads offshore the nesting ground would be vulnerable if oil entered such habitat (e.g., Ice/Sea Segments 4-6; Northern Spring Lead System).

Conclusion: Relatively low Steller's eider mortality is expected if there were an oil spill (< 100 individuals); however, recovery from spill-related losses may require as much as 2 generations in view of this species' declining numbers on the breeding grounds in recent decades and their relatively low reproductive rate.

VI. GENERAL CONCLUSIONS

Considering that no oil spills are expected to occur during exploration, and that a low level of support activity is projected, we conclude that proposed lease Sale 144 will have no effect and the resulting exploration activities are likely to have a low level of effect on endangered, threatened, proposed, and candidate species that may occur in or near the proposed sale area (bowhead whale, spectacled eider, Steller's eider, and arctic peregrine falcon). In view of these projected low levels of activity and effects, we believe that exploration activities would be unlikely to adversely affect any endangered, threatened, proposed, or candidate species' population to the point of possible jeopardy, especially if proposed mitigating measures (Appendix F) are included in the proposed sale. Also, we accept the opinion of FWS in their recent biological opinions for Beaufort Sea Sale 124 and the NMFS Arctic Region Biological Opinion wherein they conclude that reinitiation of consultation will be required for the development and production phase. Therefore, given the development and production scenario projected for Sale 144 and the uncertainty as to when, where, and if these activities will occur, we conclude there is no basis at this time for projecting jeopardy for either the development and production incremental step or the entire action.

VII. MITIGATING MEASURES

Stipulations and Information to Lessees (ITL's) are measures that can be included in the leasing process to reduce or eliminate the identified potential effects to endangered, threatened, proposed, and candidate species. Stipulations that are included in the lease are legally binding. The ITL's advise lessees of other legal responsibilities, such as the ESA, provide the means to help them comply with these responsibilities, and help to make them aware of other protection measures. The Secretary of the Interior decides which stipulations and ITL's will be included in the sale prior to issuance of the Final Notice of Sale. Stipulations and ITL's similar to those suggested for the Beaufort Sea Sale 124 oil and gas lease sale will be developed for the Secretary's consideration for proposed Sale 144. A description of the stipulations and ITL's proposed for Sale 144 can be found in Appendix F. Several of the stipulations and ITL's were developed in response to biological opinions received from NMFS and FWS during

Section 7 ESA consultation for previous Federal Beaufort Sea sales. Examples of stipulations are "Industry Site-Specific Bowhead Whale-Monitoring Program" and "Subsistence Whaling and Other Subsistence Activities" and of ITL's are "Endangered Whales and the MMS Monitoring Program" and "Consultation with NMFS to Protect Bowhead Whales in the Spring-Lead System". These along with the stipulations for "Protection of Biological Resources" and "Orientation Program" and the ITL's for "Bird and Marine Mammal Protection", "Sensitive Areas to be Considered in Oil-Spill Contingency Plans", "Polar Bear Interaction", "Availability of Bowhead Whales for Subsistence- Hunting Activities", "Information on Spectacled and Steller's Eiders", and the "Arctic Biological Task Force", if adopted, would increase the protection level for the endangered bowhead, the threatened spectacled eider, and the proposed Steller's eider; and help prevent potential adverse effects from the proposed Beaufort Sea 144 oil and gas lease sale.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

NOV 16 1995

Thomas A. Readinger
Deputy Associate Director for
Resources and Environmental Management
Minerals Management Service
Washington, D.C. 20240

Dear Mr. Readinger:

Thank you for your letter concerning consultation under Section 7 of the Endangered Species Act (ESA) on the potential effects of proposed oil and gas lease Sale 144. The Minerals Management Service (MMS) has recognized the similarities between Sale 144 and previous lease Sale 124. The implications of Sale 124 on threatened and endangered species were considered within the Arctic Region Biological Opinion (ARBO). The National Marine Fisheries Service (NMFS) prepared the ARBO to address leasing and exploration activities in the Beaufort Sea, Chukchi Sea, and Hope Basin outer continental shelf planning areas. The ARBO considered the potential for these activities to jeopardize the existence of the western arctic stock of bowhead whales and concluded work outside of the spring lead system would not affect the survival and recovery of the species. The 1988 ARBO addressed the gray whale, now recovered and removed from the endangered species list. Additionally, certain Conservation Recommendations (CR) presented in the 1988 ARBO no longer represent current circumstances. Specifically, CR No. 6 encourages MMS to determine the nature and effects of industrial noise on migrating bowhead whales. The MMS and the oil and gas industry have funded several research efforts since 1988 which describe these effects. The CR No. 9 concerns input from two Biological Task Forces that are no longer in existence.

We have considered the MMS recommendation to apply the ARBO to Sale 144 and believe the conclusions and recommendations within that opinion remain applicable and appropriate. The ARBO continues to represent the best available information and is consistent with findings from applicable research which has occurred since 1988. Therefore, we find that the requirements of Section 7 of the Endangered Species Act are satisfied by the inclusion of the Arctic Region Biological Opinion in the Sale 144 planning process. This finding reflects the mitigating measures identified in Appendix F of the Biological Evaluation for Threatened and Endangered Species with Respect to the Proposed Beaufort Sea Oil and Gas Lease Sale 144. The Stipulations presented in that document are considered part of the proposed action and alternatives, and address such important issues as protection of biological resources and site-specific bowhead whale monitoring programs. The Information to Lessees, also a part of the proposed action, provides important information on marine mammals, NMFS authorities and permits, and methods to avoid or minimize disturbance.

Readers of the ARBO are reminded of the recent de-listing of the gray whale. Additionally, the 1990 Incidental Take Statement has expired, and there are no currently valid regulations under Section 101(a)(5) of the Marine Mammal Protection Act governing the incidental take of marine mammals. MMS should ensure that the Notice to Lessees notifies lessees that no takes, including takes by harassment are authorized for bowhead whales in Arctic waters. NMFS has issued a proposed rule that would establish procedures for authorizing harassment of marine mammals under the new subsection 101(a)(5)(D), and anticipates final action by February 1996. Before authorization to harass marine mammals could be issued for activities in the Arctic, however, a monitoring plan to determine the effects of OCS activities on the availability of stocks used for subsistence purposes would need to be prepared and subjected to independent peer review. A cooperation plan between the applicant and Alaskan Natives would also be required. Upon re-authorization under Section 101(a)(5), an incidental take statement under the ESA could be appended to the current ARBO.

Please direct any questions in this matter to Ronald Morris or Brad Smith, NMFS, 222 West 7th Avenue, Box 43, Anchorage, Alaska 99513, telephone (907) 271-5006.

Sincerely,

William W. Fox, Jr.
Director
Office of Protected Resources

CC: Mr. Jack Lewis
Mr. Frank Wendling

NOTICE

The preceding Biological Opinion prepared by the National Marine Fisheries Service finds that the conclusions and recommendations contained in the Arctic Region Biological Opinion (ARBO), prepared for previous lease sales in the Beaufort and Chukchi Seas, remain applicable and appropriate to Proposed Beaufort Sea Oil and Gas Lease Sale 144. Therefore the ARBO, most recently published in the Beaufort Sea Planning Area Oil and Gas Lease Sale 124 FEIS (1990), is incorporated by reference.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. Tudor Rd.
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:

NAES/DES

APR 9 1996

Memorandum

To: Regional Director, Alaska OCS Region
Minerals Management Service

From: Regional Director
Region 7

Subject: Section 7 Consultation for Proposed Natural Gas and Oil Lease Sale 144, Beaufort Sea - Final Biological Opinion

This responds to your July 31, 1995, request for formal section 7 consultation pursuant to the Endangered Species Act of 1973, as amended (Act), for Lease Sale 144 and associated exploration activities in the Beaufort Sea Planning Area. A chronology of the consultation actions up to the present regarding Lease Sale 144 is provided in Attachment 1. Although this is an "incremental step" consultation on leasing and exploration, information was also provided by your office on potential development and production scenarios so that the U.S. Fish and Wildlife Service could evaluate the likelihood of the entire action proceeding without violation of section 7(a)(2) of the Act. Section 7(a)(2) of the Act "requires federal agencies, in consultation with and with the assistance of the Secretary, to insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of habitat of such species which has been designated as critical habitat."

The Service reviewed the Biological Evaluation for Threatened and Endangered Species and other relevant information to evaluate the effects of the proposed leasing and exploration actions. This document represents the Service's biological opinion on the effects of that action on the threatened spectacled eider (*Somateria fischeri*) and the conference opinion on the proposed Steller's eider (*Polysticta stelleri*) in accordance with section 7 of the Act. The Service also evaluated the effects of the proposed action on the recently delisted Arctic peregrine falcon (*Falco peregrinus tundrius*).

In the first step of an incremental consultation, the Service must evaluate not only the proposed action, but also the potential entire action in order to determine the likelihood of the entire action violating section 7(a)(2) of the Act. In this case, leasing and exploration are the proposed actions. Development and production are actions that may occur at a later date and will require separate consultation. Based on the information provided on the proposed and potential activities, and the information currently available on listed and proposed species, the Service has determined that it is unlikely that the entire action, including development and production, will violate section 7(a)(2) of the Act.

BIOLOGICAL AND CONFERENCE OPINIONS FOR LEASING AND EXPLORATION

Description of the Proposed Action

The activities considered in this consultation are oil and gas lease sales and subsequent exploratory drilling, testing, and surveying. Separate consultations for development and production activities will be conducted if oil is discovered and development plans are proposed. Lease Sale 144 is tentatively scheduled for September 1996. If held, Lease Sale 144 would be the sixth Federal offshore sale in the Beaufort Sea Planning Area. The proposal would offer for lease 1,870 blocks encompassing about 4 million hectares (9.8 million acres). The blocks that comprise the proposed action are approximately 3 to 65 nautical miles offshore in water depths that range from approximately <1 to 2,000 meters (2 to 6,562 feet).

Eight exploration and 14 delineation wells are expected to be drilled during the period 1998 through 2005 for the mid-point base case. A maximum of 2 drilling rigs would be operable in any 1 exploratory year. If each of these 22 exploration and delineation wells were covered by site-specific shallow-hazard seismic surveys, the total area covered by seismic surveys could equal 507 km^2 (196 $miles^2$). A typical exploratory and delineation well will use about 630 tons of drilling mud and produce about 820 tons of dry rock cuttings.

Human-made ice islands, accessed by ice roads, may be used as drilling platforms in shallow water areas near shore. Bottom-founded platforms with supply boat support would likely be used during the open water season in water depths of 11 to 25 meters (35 to 80 feet). Floating drilling rigs (drill ships or floating concrete platforms) with icebreaker support would likely be used in open-water and broken ice conditions. Drilling operations at these sites far offshore would be supported during the open-water season by at least one supply-boat trip/drilling unit/week and one helicopter flight/drilling unit/day. Onshore support facilities would be those currently existing such as Prudhoe Bay and Kuparuk.

In the formulation of this biological opinion, the Service considered activities that would be interrelated and interdependent to the proposed action. Interrelated actions are those actions that are part of a larger action and depend on the larger action for their jurisdiction. Interdependent actions are those actions that have no independent utility apart from the action being considered in the biological opinion. Interrelated and interdependent activities that may occur in conjunction with the proposed action include construction of onshore support facilities, construction of onshore and offshore pipelines, and oil spills originating from platforms, pipelines, or tanker and supply vessels.

Status of Listed, Proposed, and Delisted Species

Spectacled Eider

The spectacled eider was designated as a threatened species on June 9, 1993. On the Yukon-Kuskokwim Delta, nesting spectacled eiders have declined from approximately 47,740 pairs in the early 1970's to 1,721 by 1992--a decline of over 96 percent (Stehn et al. 1993). Limited data from the Prudhoe Bay area suggest that the spectacled eider population may have declined by approximately 80 percent between 1981 and 1992 (Warnock and Troy 1992). While this study may not be indicative of all of northern Alaska, Native elders from Wainwright believe that local spectacled eider populations have declined (U.S. Fish and Wildlife Service 1994).

Possible causes of the decline are being investigated. They include: 1) lead contamination within breeding grounds in the Yukon-Kuskokwim Delta, and possibly in small, localized hunting areas on the North Slope; 2) changes in predator populations; 3) contamination of marine habitat by toxic materials spread from Russian or North American sources of disposal or accidental spills; 4) over harvest of fisheries resources in the Bering Sea; 5) indirect effects of population fluctuations in species with overlapping food habits, or direct effects of population fluctuations in prey species; 6) subsistence and sport harvest; 7) and habitat loss on the North Slope due to growing human populations (U.S. Fish and Wildlife Service 1994).

Spectacled eiders breed discontinuously along the coast of Alaska from the Nushagak Peninsula on Bristol Bay north to Barrow and east nearly to the Yukon border; and in Arctic Russia from the Lena River (central Siberia) east to Chaun Bay (northeastern Siberia). Few spectacled eiders nest more than 20 km (12 miles) inland on the Yukon-Kuskokwim Delta, but in the Arctic they may occupy areas further inland (20-120 km [12-75 miles]) because coastal dependency is likely to be less in a region where the sea is frozen during migration and nest initiation periods (Dau and Kistchinski 1977, Warnock and Troy 1992). Nest sites are associated with pond areas containing emergent vegetation (Warnock and Troy 1992, Anderson and Cooper 1994). Nest densities are 0.20 pairs/km^2 on the Yukon-Kuskokwim Delta (Stehn et al. 1992) and 0.13 pairs/km^2 in the Prudhoe Bay area (Warnock and Troy 1992).

Molting and wintering locations of significant numbers of spectacled eiders have recently been discovered (Petersen et al. 1995, W. Larned, pers. comm.). Post-breeding flocks of staging and molting spectacled eiders were surveyed in Mechigmenan Bay, on the eastern coast of Russia's Chukotsk Peninsula (W. Larned, pers. comm.); Peard Bay (Laing and Platte 1994); W. Larned, pers. comm.); Norton Sound (Larned and McCaffery 1993; W. Larned, pers. comm.), and 80 km south of St. Lawrence Island (W. Larned, pers. comm.). Larned (pers. comm.) has found eiders isolated in relatively small areas in both Ledyard Bay and Norton Sound. Preliminary information suggests males from the Yukon-Kuskokwim Delta and Arctic Russia use all major molting/staging areas (M.R. Petersen, pers. comm.). Females from the Yukon-Kuskokwim Delta were found in Norton Sound (Petersen et al. 1995); females from the North Slope were found in the other major molting /staging areas (M.R. Petersen, pers. comm.).

In March and April 1995, the combination of satellite telemetry (Petersen et al. 1995) and aerial survey techniques (W. Larned, pers. comm.) helped biologists discover spectacled eiders in late winter. Information from a single satellite transmitter signal from a female spectacled eider directed biologists to an area 110 km NNE of St. Matthew Island in the north central Bering Sea. In March, they found large, dense flocks of spectacled eiders in small holes in the nearly-continuous sea ice. Larned (pers. comm.) calculated a population estimate in this area to be 148,059 spectacled eiders with 95 percent CI = 137,136 to 158,982. Spectacled eiders were seen in the same vicinity in April, but observers had the impression that open water was more abundant and spectacled eiders were more sparsely distributed.

While most evidence indicates that the primary winter range of spectacled eiders is located in the northcentral Bering Sea, scattered sightings have been recorded in near-shore waters of Alaska and British Columbia (AOU 1983).

Migration routes of spectacled eiders between wintering, breeding, and molting areas are not well-documented. Leads in ocean ice are important pathways for marine bird and mammal species migrating along the Beaufort Sea coast in Alaska and Canada. All species of eiders use this lead system, flying at altitudes that are usually less than 100 feet. Very little is known about the migratory pathway east of Barrow, but the definitive lead system transforms into numerous branches varying in location and extent from year-to-year. Eider migration (the majority of which are king and common eiders) along Alaska's northern coast has been described by Thompson and Person (1963), Johnson (1971), and Woodby and Divoky (1982). Spectacled eiders are observed in mixed flocks of king, common, and sometimes Steller's eiders but the percentage of both spectacled and Steller's eiders is quite small (Robert Suydam, North Slope Borough, Dept. of Wildlife Management, pers. comm. and pers. obs.). Currently, studies are underway to document the timing of migration, the magnitude of eider migration past Barrow, and the relationship of various environmental conditions with migration (Robert Suydam, North Slope Borough, Dept. of Wildlife Management, pers. comm.).

Steller's Eider

The Service published a proposal to list the Alaska breeding population of Steller's eiders as threatened in July 1994. A final rule on this proposal has been delayed because of the Congressional listing moratorium. Holarctic population estimates for the Steller's eider range from 150,000-200,000 individuals. This is an estimated 50 percent decline in the population since the early 1970s (Kertell 1991). Steller's eiders were locally common breeders within the Yukon-Kuskokwim Delta region before the 1950s, however waterfowl researchers in this area have seen only one Steller's eider nest since 1975 (Paul Flint, pers. comm.).

Possible causes of the observed decline include: 1) lead contamination within breeding grounds in the Yukon-Kuskokwim Delta, and possibly in small, localized hunting areas on the North Slope; 2) loss of breeding habitat due to human population growth in Native communities on the North Slope and/or oil and gas development activities; 3) changes in predator populations; 4) contamination of marine habitat by toxic materials spread from Russian or North American sources of disposal or accidental spills; 5) indirect effects of population fluctuations in species with overlapping food habits, or direct effects of population fluctuations in prey species; 6) taxidermist collecting; 7) and subsistence and sport harvest.

In Alaska, aerial surveys indicate that as many as 1,000 pairs may nest in northern Alaska (Brackney and King 1993), however, the only confirmed nesting concentration used currently in North America is in the vicinity of Barrow (Quakenbush and Cochrane 1993). Only small numbers have been observed between Barrow and the Colville River (Brackney and King 1993). Elsewhere, recent surveys along the entire western Alaska coast and extensive research on the Yukon-Kuskokwim Delta have detected no Steller's eiders in suitable nesting habitat; this represents a substantial contraction of their former breeding range (Kertell 1991, Larned et al. 1993).

Most of the world's population of Steller's eiders winters along the Alaska Peninsula from the eastern Aleutian Islands to southern Cook Inlet in shallow, near-shore marine waters (Kertell 1991). There have been occasional sightings in the western Aleutian Islands and along the Pacific coast south to California (AOU 1983). The winter range of the Alaska breeding population probably overlaps with the winter range of Steller's eiders that breed in Russia.

Migration routes of Steller's eiders between wintering, breeding, and molting areas are not well documented. Leads in ocean ice are an important pathway for marine bird and mammal species migrating along the Beaufort Sea coast in Alaska and Canada. All species of eiders use this lead system, flying at altitudes that are usually less than 100 feet. Very little is known about the migratory pathway of eiders east of Barrow but the definitive lead system transforms into numerous branches varying in location and extent from year-to-year.

Arctic Peregrine Falcon

The Arctic peregrine falcon was removed from the list of endangered and threatened wildlife in 1994 (59 FR 50796, October 5, 1994). Information and recommendations to avoid impacts on this subspecies is provided for your information and planning. Based on recent surveys, the population of Arctic peregrine falcons in Alaska is estimated to be about 200-250 pairs and increasing. Productivity from 1980-1992 varied between 1.3-2.0 young per pair, which has been sufficient to support a growth rate of about 12 percent per year (unpubl. U.S. Fish and Wildlife Service data, Fairbanks, AK).

Beginning in the late 1940s, the use of toxic organochlorine pesticides in agricultural regions of North and South America, and the subsequent bioaccumulation of the pesticides within the food chain, resulted in a decline in productivity of the migratory Arctic peregrine falcon and other birds of prey. The toxicity of these pesticides caused peregrines to lay thin-shelled eggs which often failed to hatch. In Alaska, the Arctic peregrine falcon population declined to approximately 20 percent of historical levels by 1972, at which time the United States restricted the use of organochlorine pesticides. The population remained stable for the next 6 years, and in 1978, began to increase. In 1984, the Service, prompted by improved status of Arctic peregrine falcons, reclassified them from endangered to threatened (49 FR 10520, March 20, 1984).

In Alaska, Arctic peregrine falcons nest north of the Brooks Range and on the Seward Peninsula. On the North Slope, nesting occurs primarily 20-80 km inland although some nesting occurs on the coast. The major nesting areas occur along the Colville and Sagavanirktok rivers with scattered nest sites along other North Slope rivers. Arctic peregrine falcons are usually present in Alaska from about mid-April to mid-September. Egg laying begins in mid-May on the North Slope, and the young fledge between the end of July and mid-August (U.S. Fish and Wildlife Service 1982).

Arctic peregrine falcons are known to migrate great distances between summer breeding grounds in northern Alaska and Canada to warmer winter climates in the southern United States and Central and South America. During spring and fall migration, they often occur along the coastal areas of Alaska, British Columbia, Washington, Oregon, and California.

Environmental Baseline

The environmental baseline is the current status of listed or proposed species or their habitat as a result of past and ongoing human and natural factors *in the area* of the proposed action.

Spectacled Eiders and Steller's Eiders

Possible human and natural factors leading to the current status of both spectacled and Steller's eiders on the North Slope include, but are not limited to loss of habitat, toxic contamination of habitat or prey species, increase in predator populations, and over harvest.

Breeding habitat on the North Slope has remained relatively unaltered and uninhabited by humans. A small portion of the species' potential breeding range has been altered by oil and gas development. Impacts include construction, accidental spills of toxic materials, off-road vehicle use, wetland filling, and indirect effects of human presence in areas previously uninhabited. Human population growth in the vicinity of Barrow and other North Slope communities has also resulted in localized areas of habitat loss due to construction activities and off-road vehicle use.

Lead or other sources of contamination of habitat or prey species is possible in localized areas within the range of spectacled eiders on the North Slope. Such contamination would be possible in areas of subsistence hunting where lead shot has been used, in areas of oil and gas development, and at former sites of U.S. Navy, Army, and Air Force activity (e.g., DEW line sites).

Often, with increases in human presence, there is a concomitant increase in nest predator populations such as gulls, ravens, and foxes. Residents of Barrow have observed an increase in populations of gulls and Arctic foxes, and the North Slope Borough has taken an active role in reducing the populations of those species (R. Suydam pers. comm.). Impacts of predators on the breeding success and population of spectacled eiders on the North Slope are not known, but studies in other spectacled eider breeding regions have reported mixed results. For example, Kistchinski and Flint (1974) reported "apparent" nest success (see Mayfield 1975) on the Indigirka River Delta, Russia in 1971 was 10-15 percent, and that eiders nesting in close proximity to gull nests had higher nesting success. However, in 1994, D. Esler (pers. comm.) measured nest success to be <2 percent and nest predators such as Arctic foxes, glaucous and herring gulls, and parasitic and pomarine jaegers are suspected to have depredated most of the nests. Kondratev and Zadorina (1992) also recorded nearly complete predation of spectacled eider nests by jaegers and foxes on the Chaun River Delta, Russia after a June snow storm. Predation by gulls, jaegers, and arctic foxes probably affects the survival of spectacled eider eggs and ducklings throughout the species' range.

Harvest of eiders, including sport hunting and subsistence use, may have contributed to the decline of spectacled and Steller's eiders on the North Slope. The Service is addressing this concern through hunting closures and an outreach program in coastal villages.

All of the factors discussed here may have influenced populations of spectacled and Steller's eiders in northern Alaska. Given the relatively small and localized nature of these actions in northern Alaska, it is unlikely that these factors played a major role in either species' decline.

Arctic Peregrine Falcon

Past and current impacts to this recently delisted species that have occurred within the area of the proposed action include toxic contamination, reduced populations of prey species, and increased human disturbance associated with oil and gas exploration and development. The effects of these activities on Arctic peregrine falcons in northern Alaska have been negligible compared to the effects resulting from the use of organochlorine pesticides, which occurred primarily outside Alaska.

Effects of the Action on Listed, Proposed and Delisted Species

Leasing and exploration may result in some disturbance to staging, nesting, migrating and molting birds, and may alter migration routes and use of established molting areas, primarily due to disturbance caused by aircraft and boat traffic. Additionally, some loss of habitat due to construction of facilities could occur as a result of the proposed actions.

Leasing and exploration may also result in increasing contamination of marine habitats, due to the disposal of drilling muds and cuttings, or accidental eruption of oil from test wells during a blowout. Such contamination may cause adverse effects on individuals either through direct contact or indirectly as a result of effects on prey populations or important habitats. Information provided by the MMS indicates that industry's record on the Outer Continental Shelf allows the assumption of a probability of crude-oil release during exploration to be zero, however the potential for such an occurrence exists.

The Lease Sale 144 base-case scenario developed by the MMS, which this opinion will assume, indicates that one or two drilling units will drill one or two exploration wells each year between 1998 and 2002, and one or two delineation wells each year between 1998 and 2002. Discharges as a result of these wells are regulated by the Environmental Protection Agency through a National Pollutant Discharge Elimination System. The EPA initiated consultation with the Service in January 1994 to determine the likelihood that the proposed discharges associated with exploratory drilling would adversely affect listed species. The Service concurred with the EPA that the proposed NPDES permit issuance would not be likely to adversely affect listed species. Therefore, the EPA and MMS have already satisfied the requirements of the Endangered Species Act regarding effluent discharges associated with oil and gas exploration in the Beaufort and Chukchi seas (State and Federal waters).

Effects on Spectacled Eiders and Steller's Eiders

Nesting spectacled and Steller's eiders could be disturbed by aircraft overflights related to exploration activity (one to two trips/drilling site/day). Adverse effects include flushing staging birds from preferred habitats, altering normal migration paths, and startling females on nests (which could potentially cause them to leave the nest quickly and break eggs as well as alert predators to a nest location). Overflights could also force females with broods from habitats preferred for feeding and predator avoidance. Based on the relatively small number of helicopter trips estimated to occur, however, it is unlikely that aircraft overflights will adversely affect spectacled or Steller's eiders nesting in the vicinity of the proposed action.

If exploration occurs between October and May, the probability of exploratory activities (not including accidental discharge of oil) in the Beaufort Sea resulting in encounters with spectacled or Steller's eiders would be zero. This probability increases, however, if the action occurs between May and October because of the presence of spectacled and Steller's eiders migrating across the Chukchi and Beaufort seas to reach breeding grounds.

If there is an accidental discharge of oil (i.e., a blowout) in any season, there would likely be lasting adverse impacts to marine habitats used by spectacled and Steller's eiders. Although the probability of a blowout is very low, the Service is likely to request that the MMS provide information in the development of future contingency plans for such accidents. However, in the development of future oil exploration plans, the Service will likely request that MMS provide information on a contingency plan for such accidents. Such a plan would outline how efforts would be made to minimize long term effects of oil spills due to blowouts.

Encounters between supply boats and/or icebreakers and spectacled and Steller's eiders at sea is also a possibility. However, eiders typically avoid such encounters by diving or flying away from such disturbance. Therefore, substantial adverse effects on spectacled or Steller's eiders as a result of supply boat or icebreaker activities in the vicinity of the proposed area of the action are unlikely. Incidental take of spectacled and Steller's eiders will be addressed in a subsequent section titled "Incidental Take Statement."

Effects on Arctic Peregrine Falcons

Nesting peregrine falcons could possibly be disturbed by aircraft overflights related to the proposed sale especially if these flights occur inland. The extent of such disturbance would also depend on locations of support facilities. Barrow and Deadhorse are the most likely support facilities, and since both are located on the coast, aircraft would not typically fly over a significant portion of peregrine falcon nesting habitat. If main aircraft support is located at Barrow or Deadhorse, significant disturbance of nesting peregrine falcons during the exploration phase is unlikely.

Cumulative Effects

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

State or private actions reasonably certain to occur within or near the proposed sale area would include: State of Alaska oil and gas lease sales, exploration, development, and production; gravel mining, support facility and road construction to support these activities as well as pipelines and related oil and gas transport facilities, including feeder lines, Trans-Alaska Pipeline operation and maintenance, and oil tanker traffic from the Valdez terminal to points in the lower 48 states; possibly some future Canadian Beaufort Sea oil and gas activities; land reconveyances from Native corporations to private individuals; subsistence harvest activities; commercial fishing; marine shipping; and recreational activities.

Three additional State oil and gas lease sales are scheduled for the Beaufort Sea in the next 5 years, Lease Sales 86, 83, and 89 (April 1997, March 1999, and December 1999, respectively).

Biological and Conference Opinions for Leasing and Exploration

After reviewing the proposed action, the current status of spectacled and Steller's eiders, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion (for listed species) and conference opinion (for proposed species) that Beaufort Sea Oil and Gas Lease Sale 144 and associated activities, as proposed, are not likely to jeopardize the continued existence of the spectacled and Steller's eider. There is no designated critical habitat for spectacled eiders, and none proposed for Steller's eiders.

The Service recommends that agencies and applicants avoid impacts to Arctic peregrine falcons as they have recently recovered from threatened status. Monitoring of index population areas is required by the ESA for 5 years after delisting, and the species could be emergency listed at any time if survey data indicate a reverse in recovery. After reviewing the proposed action, the current status of Arctic peregrine falcons, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's opinion that the Beaufort Sea Oil and Gas Lease Sale 144 and associated activities, as proposed, are not likely to adversely affect Arctic peregrine falcons.

Incidental Take Statement

Sections 4(d) and 9 of the Act, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The Service does not anticipate that activities associated with the leasing and exploration of proposed Lease Sale 144 will result in the incidental take of spectacled eiders. No incidental take is anticipated and accordingly no incidental take is authorized. Should any incidental take occur, MMS must reinitiate formal consultation with the Service.

While the incidental take statement provided in this consultation satisfies the requirements of the Act, as amended, it does not constitute an exemption from the prohibitions of take of listed migratory birds under the more restrictive provisions of the Migratory Bird Treaty Act.

Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary actions designed to minimize or avoid adverse effects of a proposed action on listed or proposed species or critical habitat, or to help implement recovery plans. We recommend the following actions be implemented during the leasing and exploration phase of this lease sale:

1. The MMS should work with the Service and other Federal and State agencies in implementing recovery actions identified in approved recovery plans. Research to determine important habitats, migration routes, and wintering areas of spectacled and Steller's eiders would be an important step toward minimizing conflicts with current and future oil and gas development activities.

2. From May to October, aircraft should maintain an altitude greater than 1,500 feet above ground level to avoid disturbing nesting, brood-rearing, and migrating spectacled and Steller's eiders and Arctic peregrine falcons.

3. The MMS should encourage leasing oil companies to produce wallet-sized information cards with descriptions and pictures of spectacled and Steller's eiders for company and contracted employees. Recognizing the presence of a listed or proposed species during activities associated with exploration would alert the employee to take measures to minimize disturbance, and most importantly, avoid unauthorized incidental take. The most useful format of such a card would provide descriptions and pictures of various stages and sexes of all four species of eiders (spectacled, Steller's, king, and common). Correctly identifying different eider species is often difficult because of their similarity in appearance depending on their life history stage and sex.

Additional conservation recommendations may be proposed during subsequent incremental steps of this lease sale. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

EVALUATION OF POTENTIAL DEVELOPMENT AND PRODUCTION ACTIONS

Under the regulations governing incremental step consultations, an agency action cannot proceed until the Service determines there is a reasonable likelihood that the entire action (in this case, leasing, exploration and development and production) could proceed without violation of section 7(a)(2) of the Act. For the development and production phases of this action, this determination must be founded on assumption-based scenarios and our current understanding of natural conditions, both of which are subject to change prior to initiation of development and production. An accurate evaluation of impacts from development and production is not possible because a definitive development and production scenario has not been provided. However, an evaluation of a reasonable scenario is provided below.

Description of Potential Development, Production, and Transportation

A projected oil volume of 1,200 million barrels (mid-point base case of proposal) was used to project the future development and production activities. Interrelated, interdependent, and cumulative effects are the same as those identified previously in the description of the proposed actions related to exploration.

The Biological Evaluation describes a base-case development and production scenario which is based on a composite of feasible options developed through discussions within your agency, other agencies, and industry. The locations of existing infrastructure, sites with potential as support facilities, area-resource estimates, and scenarios developed for the previous Outer Continental Shelf sales in the Beaufort Sea were all considered in developing the scenario. It was developed for the purpose of evaluating the potential effects of the entire action associated with Lease Sale 144.

Eight production platforms are projected to be installed between 2002 and 2007. An estimated 273 production/service wells are expected to be drilled between 2002 and 2010. Gravel islands will probably be constructed for production facilities in water depths less than 11 meters (36 feet), bottom-founded structures designed for extreme ice conditions would likely be used in water depths between 11 meters and 38 meters (36 and 125 feet), and floating concrete structures anchored to the sea floor would likely be used in water depths greater than 38 meters (125 feet). The average production/service well will use approximately 150 to 680 short tons of dry mud and produce an average 1180 short tons of dry rock cuttings. A three-dimensional, multichannel, seismic-reflection survey covering an area of approximately 670 km^2 (259 $miles^2$) would be conducted for the production platforms. A total of 515 km (320 miles) of shallow-hazards surveys would be conducted for pipeline construction. Onshore support would probably be from Prudhoe Bay. Support for operations on production islands in near shore shallow waters is expected to be by ice roads during the winter. Drilling operations farther offshore would be supported during the open-water season by barge and one helicopter flight/drilling unit/day. There may also be one standby vessel for each drilling unit.

The transportation scenario for the base-case is assumed to be: 1) pipelines to transfer oil from the production platforms to the TAPS Pump Station No. 1; 2) pipeline configuration combination of offshore/existing onshore infrastructure; and 3) landfalls that utilize Kuparuk field infrastructure, Prudhoe Bay infrastructure, and potential future development infrastructure in the Point Thompson area. Pipelines will likely be trenched in water less than 45 meters (148 feet) and at landfall pipelines will be elevated on gravel structures.

It is assumed that all products would be loaded onto tankers in Valdez for trans-shipment to processing facilities on the coast of the western United States. No particular receiving ports along the west coast were specified; however, those currently in use are located in Puget Sound, San Francisco Bay, and Long Beach. With the recent lifting of the Oil Export Ban, there is now the possibility that oil shipments from Alaska may go directly to Pacific Rim countries. If the Oil Export Ban is lifted and oil tankering is rerouted through areas not considered in the MMS' Biological Evaluation and this biological opinion, reinitiation of formal consultation will be necessary.

Environmental Baseline

In addition to the species discussed earlier, the Service considered other listed species that may be affected by the development, production and transportation phases of Lease Sale 144. Those species are Aleutian Canada goose (*Branta canadensis leucopareia*), American peregrine falcon (*Falco peregrinus anatum*), short-tailed albatross (*Diomedea albatrus*), southern sea otter, brown pelican (*Pelecanus occidentalis*), California clapper rail (*Rallus longirostris obsoletus*), light-footed clapper rail (*R. l. levipes*), western snowy plover (*Charadrius alexandrinus nivosus*), California least tern (*Sterna antillarum browni*), marbled murrelet, and bald eagle (*Haliaeetus leucocephalus*). The Arctic peregrine falcon, harlequin duck (*Histrionicus histrionicus*), the Alaska population of the marbled murrelet, and the Kittlitz's murrelet (*B. brevirostris*) are species of concern that occur in portions of the oil tanker transportation area. The species of concern within the project area are identified for your information and environmental planning and were previously Category 2 Candidate Species under the Act. The Service concentrated its evaluation on species which would be most directly affected by an undersea pipeline- or tanker-related oil spill: the Aleutian Canada goose, short-tailed albatross, spectacled eider, Steller's eider, southern sea otter and marbled murrelet. In-depth analysis of the brown pelican, California clapper rail, western snowy plover, California least tern, bald eagle, and American peregrine falcon may be necessary as the consultation progresses.

Aleutian Canada Goose

Although the Gulf of Alaska transportation corridor is generally outside the current range of Aleutian Canada geese, migrating birds have been reported as close as the Kalsin Bay area on Kodiak Island. It is also likely that other areas of the Kodiak Archipelago are visited occasionally during migration. The Semidi Islands are the location of an Aleutian Canada goose breeding population consisting of 132 birds with at least 28 nesting pairs (Anderson et al. 1993). It is possible that a large oil spill in the Prince William Sound area or in the Gulf of Alaska could contact the Semidi Islands. Although Aleutian Canada geese normally use only upland habitats during the nesting season, molting geese have been observed to fly from an island and alight on the sea surface when alarmed. Individual birds could potentially be harmed if they come into contact with floating oil.

Short-tailed Albatross

Several sightings of this species have recently been reported from the northern Gulf of Alaska and Kodiak Island continental shelf. It is reasonable to assume that low numbers of this wide-ranging seabird may occasionally be present in the vicinity of oil tanker traffic. Like other albatrosses, shearwaters, and petrels, the short-tailed albatross is a surface-feeder. Hasegawa and DeGange (1982) report that much surface-feeding occurs at night when squid are close to the surface. Individual birds could potentially be harmed if they come into contact with floating oil or fuel leaked from support vessels or rigs.

Spectacled Eiders and Steller's Eiders

The environmental baseline for spectacled and Steller's eiders discussed previously is also applicable to the development, production, and transportation components. Spectacled and Steller's eiders may potentially be susceptible to breeding habitat loss if the proposed development of infrastructure in the Point Thompson area occurs, and they would be susceptible to oil spills in the Beaufort Sea, Prince William Sound, and in the Gulf of Alaska.

Southern Sea Otter

The southern sea otter occurs in the area of transportation corridors along the west coast of Canada and the contiguous United States. This species is very vulnerable to hypothermia if its pelage is oiled. Depending on the size, location, and a variety of other factors, an accidental oil spill could result in injury or death to a significant proportion of the southern sea otter population (U.S. Fish and Wildlife Service 1993).

Marbled Murrelet

Marbled murrelets are very susceptible to mortality from oil spills because they tend to spend most of their time swimming on the sea surface and feeding in local concentrations close to shore. Marbled murrelets are found both during the nesting season and during winter within transportation corridors. Depending on the location, extent, and season of an oil spill, significant adverse effects could occur to local or regional populations of marbled murrelets. Local populations were adversely affected by the Exxon Valdez oil spill in 1989, and marbled murrelets were subjected to proportionately higher mortality than other seabirds inhabiting Prince William Sound (Piatt et al. 1990).

Reasonable Likelihood Determination

Under the regulations governing incremental step consultations, a Federal agency action cannot proceed until the Service determines there is a reasonable likelihood that the entire action could proceed without violation to section 7(a)(2) of the Act (50 CFR 402.14(k)(5)). In a previous consultation (proposed Lease Sale 149), the Service was concerned that the potential future transportation of oil to ports along the Pacific Coast might result in a violation of section 7(a)(2) of the Act, because of likelihood of adverse effects on southern sea otters (*Enhydra lutris nereis*) and marbled murrelets (*Brachyramphus marmoratus*). The MMS subsequently coordinated with the U.S. Coast Guard to obtain the most recent information on that agency's progress toward reducing the threat of tanker-related oil spills. Much of the current momentum in reducing this threat is due to provisions of the Oil Pollution Act of 1990 (OPA 90) which mandate adoption of new regulations for improved tanker safety, pollution prevention, and response preparedness. In response to the OPA 90, the USCG has taken or proposed the following actions (U.S. Coast Guard 1994):

1. Single hull tankers must be accompanied by two tow vessels when in Prince William and Puget Sounds (a public comment period on the proposed regulation closed January 30, 1995).

2. Oil carrying vessels operating within the U.S. Exclusive Economic Zone must, according to a phase-in schedule based on age and size of vessels, be equipped with a double hull or double containment system between 1995 and 2015. The proposed regulation was included in a Federal Register notice which was published in December 1994.

3. Single-hulled tanker vessels must have equipment necessary to affix emergency lighting equipment for removing oil from ship storage tanks. A final rule containing this regulation was published in the Federal Register on August 5, 1994.

4. The qualifications of individuals applying for USCG licensing and certification to pilot oil-carrying vessels will be subject to a more rigorous review. The USCG anticipates publishing a Federal Register notice announcing the revised review requirements in 1995.

5. Tankers must have warning devices installed to detect overfills of tanks (which would likely result in leaks) by 1999. The USCG anticipates publishing a Federal Register notice announcing this proposed regulation in 1996.

6. Tankers must carry oil removal equipment on board in order to respond to spills. The USCG anticipates publishing a Federal Register notice announcing this proposed regulation in 1995.

7. Response plans will be required for tanker vessel and onshore facilities worst case discharge emergencies. The USCG anticipates publishing a Federal Register notice announcing this proposed regulation in 1996.

8. A tanker navigation safety study, and a report on the study, are due to be completed in 1995. The study will include analyses of appropriate crew size, extent of crew training, adequacy of navigation equipment, navigation procedures, potential tanker-free zones, inspection standards, effectiveness of simulator training, and a 20-year risk analysis.

The measures identified in the OPA 90 address the Service's concerns relating to the potential for spills during oil transport regulated by the U.S. Coast Guard. Although some important measures will not be phased in entirely until as late as 2015, most of the measures will be in effect before the onset of oil production from Lease Sale 144.

Because the OPA 90 requires regulatory agencies such as the USCG to adequately address tanker passage routes, navigation equipment and safety procedures, and other precautions, the potential for oil spills should decrease, and the ability for rapid containment of spills to limit their effect on coastal wildlife should increase. Additionally, the USCG and the National Oceanic and Atmospheric Administration are conducting a study to evaluate the need for vessel routing measures in the approaches to California ports and the regulation of vessel traffic in offshore marine sanctuaries (58 FR 44634).

Given the rarity of major oil spills associated with oil tanker activities between Alaska and the West Coast of the United States, and OPA 90 activities to prevent and/or effectively respond to oil spills, the Service believes that there is a reasonable likelihood that the entire action associated with Lease Sale 144 (leasing, exploration, production, development, and transportation) could proceed without violation to Section 7(a)(2) of the Act.

SUMMARY

This concludes formal consultation and conferencing on the actions outlined in the MMS's letter dated July 31, 1995. Reinitiation of formal consultation is required if: 1) there is any incidental take; 2) new information reveals effects of the action that may affect listed or proposed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the action is subsequently modified in a manner that causes an effect to listed or proposed species or critical habitat that was not considered in this opinion; or 4) a new species is listed or proposed or critical habitat designated or proposed that may be affected by the action. If incidental take occurs, operations causing such take must cease pending reinitiation.

If the Steller's eider is listed, you may ask the Service to adopt the conference opinion incorporated in this consultation as a biological opinion issued through formal consultation. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the proposed action or in the information used during the conference, the Service will adopt the conference opinion as the biological opinion on the project and no further section 7 consultation for the leasing and exploration actions will be necessary.

Thank you for your concern for endangered species and for your cooperation in the development of this biological opinion. If you have any comments or require additional information, please contact Cathy Donaldson at (907) 456-0354, or Skip Ambrose (907) 456-0239, Northern Alaska Ecological Services, Endangered Species Office, Fairbanks, Alaska.

cc: Regional Director, Region 1

Dan R. B. Ahl

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ATTACHMENT 1

OCS Oil and Gas Lease Sale 144, Beaufort Sea
Consultation History

01/23/95 -	MMS requests concurrence for species list from Service.
03/13/95 -	Service transmits revised species list to MMS.
07/31/95 -	MMS requests formal consultation from Service for Lease Sale 144, and transmits Biological Evaluation.
10/17/95 -	Service transmits acknowledgment of receipt of request for formal consultation and agrees to prepare Draft Biological Opinion.
11/13/95-	Service transmits draft biological opinion to MMS.
1/17/96-	Service communicates with MMS regarding the potential effect of lifting the Oil Export Ban on future oil transportation related to Lease Sale 144.
1/19/96-	MMS responds that Lease Sale 144 will be delayed indefinitely and that they may reinitiate consultation at some later date.
4/1/96-	MMS transmits memorandum listing reasons for taking no further action on Lease Sale 144.
4/4/96-	MMS transmits memorandum stating that they had reviewed the draft biological opinion and provided comments on the draft.
4/8/96-	Service transmits Final Biological Opinion for Lease Sale 144.

APPENDIX G

FATE AND EFFECTS

OF

EXPLORATORY PHASE OIL AND GAS DRILLING DISCHARGES

IN THE

BEAUFORT SEA PLANNING AREA

EIS Appendix

Fate and Effects of Exploratory Phase Oil and Gas Drilling Discharges in the Beaufort and Chukchi Sea Planning Basins Lease Sale 144

Prepared by:
U.S. Environmental Protection Agency
Region 10
Seattle, WA

In association with:

Tetra Tech, Inc.
Redmond, WA

April 4, 1996

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ACC	Alaskan Coastal Current
ACMP	Alaska Coastal Management Program
ACW	Alaska Coastal Water
AMSA	Areas Meriting Special Attention
BCF	Bioconcentration Factors
BSW	Bering Sea Water
BPT	Best Practicable Control Technology Currently Available
CDU	Conical Drilling Unit
CIDS	Concrete Island Drilling System
CFR	Code of Federal Regulations
CIDS	Concrete Island Drilling System
CMF	Consumption of Marine Fish
CMP	Coastal Management Plan
CWA	Clean Water Act
CZMP	Coastal Zone Management Program
DOI	United States Department of the Interior
DMR	Discharge Monitoring Report
EC_{50}.	Effective Concentration Causing a Non-Lethal Effect to 50 Percent of Test Organisms
EOP	End of Pipe
EPA	United States Environmental Protection Agency
FDA	Food and Drug Administration
FEIS	Final Environmental Impact Statement
FR	Federal Register
ha	Hectares
HQ	Hazard Quotient
KCl	Potassium chloride
LC_{50}	Lethal Concentration to 50 Percent of Test Organisms
LOEL	Lowest Observed Effects Level

MZ	Mixing Zone
nmi	Nautical miles
NPDES	National Pollutant Discharge Elimination System
OCS	Outer Continental Shelf
ODCE	Ocean Discharge Criteria Evaluation
OOC	Offshore Operators Committee
PAH	Polycyclic Aromatic Hydrocarbons
PRESTO	Probabilistic Resource Estimate-OCS
ppm	Parts per million
SSDC	Single Steel Drilling Caisson
SSP	Suspended solid particulates
TVD	True Vertical Depth
v/v	Volume to volume ratio

1.0 INTRODUCTION

1.1 PURPOSE OF EVALUATION

The U.S. Environmental Protection Agency (EPA) intends to issue a National Pollutant Discharge Elimination System (NPDES) general permit for effluent discharges associated with oil and gas exploration in the Outer Continental Shelf (OCS) areas designated as the Beaufort and Chukchi Sea Areas of Coverage off northern Alaska, as well as all Alaskan state waters contiguous with the OCS areas (Figure 1). Section 403(c) of the Clean Water Act (CWA) requires that NPDES permits for such ocean discharges be issued in compliance with U.S. EPA's Ocean Discharge Criteria for preventing unreasonable degradation of ocean waters. The purpose of this report is to identify the salient information and concerns relative to the Ocean Discharge Criteria and exploratory petroleum drilling in these waters.

U.S. EPA's Ocean Discharge Criteria (40 CFR Part 125, Subpart M) sets forth specific determinations of unreasonable degradation that must be made prior to permit issuance. "Unreasonable degradation of the marine environment" is defined (40 CFR 125.121[e]) as follows:

"(1) Significant adverse changes in ecosystem diversity, productivity, and stability of the biological community within the area of discharge and surrounding biological communities,

(2) Threat to human health through direct exposure to pollutants or through consumption of exposed aquatic organisms, or

(3) Loss of aesthetic, recreational, scientific, or economic values, which are unreasonable in relation to the benefit derived from the discharge."

This determination is to be made based on consideration of the following 10 criteria (40 CFR 125.122):

"(1) The quantities, composition, and potential for bioaccumulation or persistence of the pollutants to be discharged;

(2) The potential transport of such pollutants by biological, physical, or chemical processes;

(3) The composition and vulnerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act, or the presence of those species critical to the structure or function of the ecosystem, such as those important for the food chain;

(4) The importance of the receiving water area to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, migratory pathways, or areas necessary for other functions or critical stages in the life cycle of an organism;

(5) The existence of special aquatic sites including, but not limited to, marine sanctuaries and refuges, parks, national and historic monuments, national seashores, wilderness areas, and coral reefs;

(6) The potential impacts on human health through direct and indirect pathways;

(7) Existing or potential recreational and commercial fishing, including finfishing and shellfishing;

(8) Any applicable requirements of an approved Coastal Zone Management Plan;

(9) Such other factors relating to the effects of the discharge as may be appropriate;

(10) Marine water quality criteria developed pursuant to Section 304(a)(l)."

If the Regional Administrator determines that the discharge will not cause unreasonable degradation of the marine environment, an NPDES permit may be issued. If the Regional Administrator determines that the discharge will cause unreasonable degradation of the marine environment, an NPDES permit may not be issued.

If the Regional Administrator has insufficient information to determine, prior to permit issuance, that there will be no unreasonable degradation of the marine environment, an NPDES permit will not be issued unless the Regional Administrator, on the basis of the best available information, determines that: 1) such discharge will not cause irreparable harm to the marine environment during the period in which monitoring will take place, 2) there are no reasonable alternatives to the onsite disposal of these materials, and 3) the discharge will be in compliance with certain specified permit conditions (40 CFR 125.122). "Irreparable harm" is defined as "significant undesirable effects occurring after the date of permit issuance which will not be reversed after cessation or modification of the discharge" (40 CFR 125.121[a]).

1.2 SCOPE OF EVALUATION

This document evaluates the impacts of waste discharges as provided for by the Arctic NPDES general permit proposed for offshore oil and gas exploration in the Beaufort and Chukchi Seas. Unlike previous general permits for the Beaufort and Chukchi Seas, the Arctic general permit will cover a geographic area not defined by specific state and federal lease sale tracts. The area of coverage includes the following: federal waters of the Beaufort Sea and Chukchi Sea planning basins as defined by Minerals Management Service (MMS) (see U.S. DOI 1992) and state waters contiguous to the landward boundary of the Beaufort and Chukchi Sea planning basins (Figure 1).

The permit will authorize discharges from exploratory operations in all areas offered for lease by MMS included in previous general permits and in areas offered for lease in future lease sales. This method of defining the Area of Coverage will insure that all areas potentially leased during the term of this general permit will be covered. While the MMS planning basins (i.e., Beaufort and Chukchi Sea Planning Areas) are generally larger than the areas offered for lease by MMS, discharges under this general permit would occur in only those areas ultimately offered for lease.

This document relies extensively on information provided in the Final Environmental Impact Statements (FEIS) for Sale 124 (U.S. DOI 1990) and Sale 126 (U.S. DOI 1991); Sale 87, which includes State Lease Sales 39, 43, and 43a

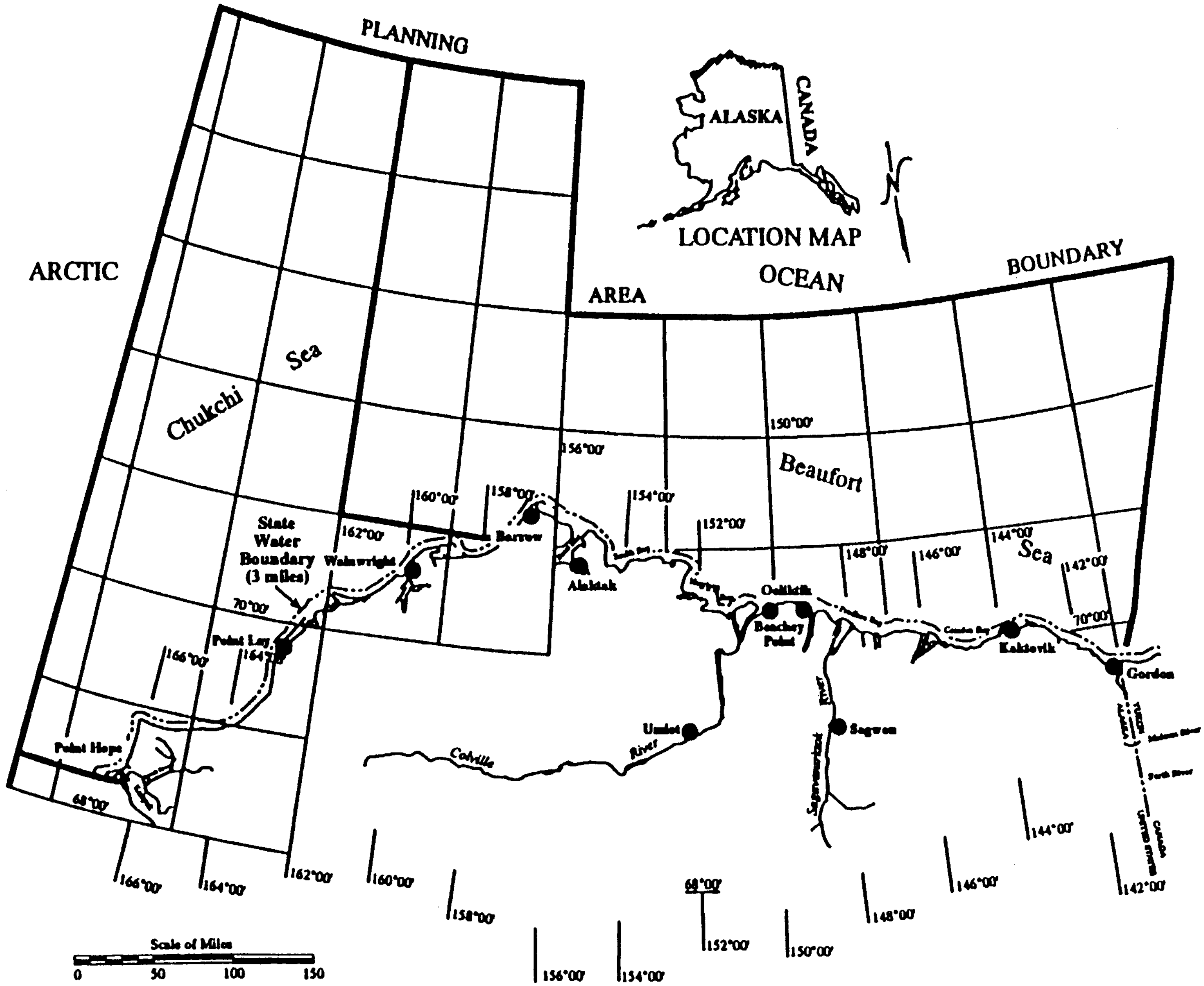

Figure 1. Arctic NPDES General Permit Area of Coverage.

(U.S. EPA 1984a), and Sale 97 (U.S. EPA 1988a) Ocean Discharge Criteria Evaluations (ODCE) for the Beaufort Sea; and the previous Sale 109 ODCE for the Chukchi Sea (U.S. EPA 1988b). Additional information is included within other recent ODCE's for Alaskan outer continental shelf (OCS) regions [i.e., the Norton Basin Sale 100 ODCE (U.S. EPA 1986a)]. Where appropriate, the reader will be referred to these publications for more detailed information concerning certain topics. The information presented here is a synthesis of these documents, along with the inclusion of discharge modeling results and findings recently published in the scientific literature.

1.2.1 Beaufort Sea

The general permit applies to the entire Beaufort Sea Planning Area (Figure 1), however, for the term of the proposed permit MMS will likely only consider leasing the area identified in U.S. DOI (1992). This area is roughly consistent with federal OCS Lease Sale 124. For purposes of this document and because no leasing will likely occur outside Lease Sale 124 boundaries, the area of Sale 124 will be considered as the Beaufort Sea Area of Coverage for this ODCE.

The Beaufort Sea Area of Coverage includes approximately 8.95 million hectares [(ha) 22.1 million ac] of the Beaufort Sea Planning Area (Figure 1). The area of coverage extends from the U.S./Canadian boundary in the Beaufort Sea (approximately 141° W) westward to Icy Cape in the Chukchi Sea (161° W). It is located about 5 to 260 km [3 to 140 nautical miles (nmi)] offshore in water depths ranging from about 2 to 1000 m (7 to 3,280 ft). The Beaufort Sea Area of Coverage encompasses previous Lease Sale area 87, including State Lease Sales 39, 43, and 43a, [7.0 million ha (17.2 million ac)] and Sale 97 [7.9 million ha (19.4 million ac)].

An area of 412,000 ha (1.0 million ac) located along the coast from Elson Lagoon on the Beaufort Sea side of Point Barrow to Peard Bay on the Chukchi Sea side, and an area of 290,000 ha (0.7 million ac) located between Barter Island and the Canadian border in the Beaufort Sea are proposed deferral areas within the Area of Coverage.

1.2.2 Chukchi Sea

As described above for the Beaufort Sea, the general permit technically encompasses the entire Chukchi Sea Planning Area (Figure 1), however, because potential leasing will likely only occur in an area similar to that described for OCS Lease Sale 126, this area will be referred to as the Chukchi Sea Area of Coverage throughout this document.

Federal Outer Continental Shelf Oil and Gas Lease Sale 126, hereafter referred to as the Chukchi Sea Area of Coverage includes approximately 12 million hectares [(ha) 29.7 million ac] of the eastern Chukchi Sea (Jones & Stokes 1990, p. 21). The area of coverage lies between latitudes 69° and 73° N and longitudes 162° and 169° W. Depths in the area range from approximately 6 to 80 m (20 to 263 ft), with 80 percent lying between 30 and 60 m (98 and 197 ft) (U.S. DOI 1990, p. III-1). The area of coverage covers the same area included in the previous Chukchi Sea Lease Sale 109 (U.S. EPA 1988a).

An area of approximately 1.15 million ha (2.84 million ac) within the Chukchi Sea Area of Coverage is a proposed deferral area. This region, termed the Point Lay Deferral Area, is located approximately 40 to 120 km [22 to 65 nautical miles (nmi)] west of Point Lay. Future lease sale configuration may include or omit this area.

1.2.3 State Waters

The "state waters" under consideration in this ODCE are those that are contiguous to the Beaufort and Chukchi Sea Areas of Coverage. State waters typically extend from the coastal baseline defined as part of the 403(c) program to three miles offshore. Five State Lease Sales are proposed in the Beaufort and Chukchi Seas in the period of 1995-1997. Four of these Lease Sales are located in the Beaufort Sea (81, 83, 86, and 89), while one is located in the Icy

Cape region of the Chukchi Sea (82)(Alaska DNR 1993).

1.2.4 Exploration Scenarios

The results presented in this appendix are based on MMS's High Case Scenario for development.

2.0 COMPOSITION AND QUANTITIES OF MATERIALS DISCHARGED

2.1 TYPES OF DISCHARGES FROM EXPLORATORY DRILLING

Exploratory oil and gas drilling generates a wide range of waste materials related to the drilling process, equipment maintenance, and personnel housing. These materials are commonly discharged directly from the rig into the receiving water. Discharges of primary concern to this evaluation are drilling fluids, also called drilling muds, and cuttings. Drilling muds are the fluids used to lubricate the drill bit and stem and to remove waste rock particles ("cuttings") that are brought up from the hole during the drilling operation.

During a typical drilling operation, the drilling fluids are recirculated. The major components of the mud are mixed on board. These components are fed into mud pits or bins that are then pumped down the central shaft of the drill pipe to the drill bit. At this point, they pass through holes in the bit, pick up rock chips (cuttings) loosened by the bit and return to the surface between the drill pipe and the bore hole. At the surface, the mud and cuttings are passed through a shale shaker, where the cuttings and mud are separated. The cuttings are either saved for analysis or are washed overboard. The mud is returned to the mud pits for recycling. The solids-control equipment is unable to separate fine clay and colloidal particles that accumulate in the mud system during drilling. Therefore, as drilling proceeds, these components accumulate and eventually the mud becomes too viscous for further use. When this happens, a portion of the mud is discharged, and water and mud additives are added to the remaining drilling mud to bring concentrations back to proper levels (Menzie 1982). According to U.S. EPA (1985, p. 2-54), discharges occur at time intervals ranging from less than 1 h/day to 24 h/day, depending on the type of operations and the characteristics of the specific well.

Muds and cuttings are of prime concern due to their volume and composition, and are discussed in Section 2.2. Other discharges of lesser significance are discussed in Section 2.3.

2.1.1 Pollutant Sources from Drilling Rigs

Exploratory oil and gas well drilling activities produce a wide range of waste materials that are discharged into receiving waters. The major discharges are drilling muds (fluids) and cuttings. Other discharges may include sanitary and domestic wastes, desalination unit wastes, boiler blowdown, test fluids, deck drainage, blowout preventer fluids, uncontaminated ballast and bilge water, excess cement slurry, non-contact cooling water, and fire control system test water.

2.2 DRILLING MUDS AND CUTTINGS

2.2.1 Function

Drilling muds serve several functions: transporting and removing solids from the hole, cooling and lubricating the drill bit, and controlling formation pressures. As the hole becomes deeper and encounters different formations, the type or composition of mud may need to be changed.

2.2.2 Control of Discharge

Previous general permits for oil and gas offshore operations issued by U.S. EPA, Region 10 have utilized a case-by-case approach to limiting the toxicity of discharged mud/additive systems. A new approach will be employed in the proposed permit for the Arctic. U.S. EPA, Region 10 is proposing to incorporate an end-of-pipe whole effluent toxicity limit of a minimum 96-hour LC50 of 30,000 ppm suspended particulate phase (SPP) on discharged drilling muds. This limit is a technology-based control on toxicity, as well as toxic and nonconventional pollutants. The 30,000 ppm SPP criterion is based upon the Agency's evaluation of what constitutes an exemplary level of performance on a national basis and is part of the effluent guidelines (58 FR 12469, March 4, 1993). Before promulgation of the guideline, this criterion has been used by U.S. EPA, Region 10 in evaluating the case-by-case mud discharge authorizations.

2.2.3 Composition

Drilling muds are complex mixtures of clays, barite, and specialty additives used primarily to remove rock particles from the hole created by the drill bit. The composition of drilling mud can vary over a wide range from one hole to the next, as well as during the course of drilling a single hole.

2.2.3.1 Metals. The presence of potentially toxic trace elements in drilling muds and cuttings is of primary concern. Metals including lead, zinc, mercury, arsenic, vanadium, and cadmium can be present as impurities in barite; chromium is present in chrome lignosulfonates and chrome-treated lignite (U.S. EPA 1984a, p. 14). According to Jones & Stokes (1990, p. 14), drill pipe dope (which is known to contain 15 percent copper and 7 percent lead), and drill collar dope (which can contain 35 percent zinc, 20 percent lead, and 7 percent copper), may also contribute trace metals to the muds and cuttings discharge.

2.2.3.2 Trace Metal Concentrations of Drilling Muds. Trace metal concentrations expected in oil and gas exploratory drilling muds are presented in Table 1. The metal concentrations at the left of Table 1 were determined by CENTEC (1984). The laboratory-produced muds in this study were hot-rolled prior to analysis to simulate chemical changes induced by downhole conditions; however, the muds contained no additives. The concentrations at the right of Table 1 represent the median, minimum, and maximum values, respectively, obtained from the used mud database (created from end-of-well reports, primarily) maintained by U.S. EPA, Region 10. The variation in metal concentrations has been attributed to the addition of authorized specialty additives, variations in base mud components (i.e., chrome-free lignosulfonate replacing chrome-containing lignosulfonate), incidental contamination from pipe dope, and possibly to differences in laboratory analyses and sample sources (Jones & Stokes 1989a, p. 13).

The average trace metal concentrations in the earth's continental crust provide an estimate of metal concentrations to be expected in drilling cuttings. Comparison of these concentrations with the maximum values reported for muds and the maximum values reported during a recent permitting period of discharge in Alaskan waters (Table 2) indicates that, with the exception of nickel and copper, drilling mud discharge contains concentrations of trace metals higher than that found in the continental crust. Barium shows the greatest enrichment, with mud discharge having levels as much as 1,165 times higher than the average value for the continental crust.

2.2.3.3 Specialty Additives. These additives include a wide range of substances, ranging from simple inorganic salts to complex polymers. Among the additives used in large enough quantities to result in significant mass loadings to the environment are spotting materials, lubricants, zinc compounds, and materials added to prevent loss of circulation (Jones & Stokes 1989b, p. 16).

2.2.3.4 Spotting Compounds. Spotting compounds are used to help free stuck drill strings. Some of these (e.g., vegetable oil or fatty acid glycerol) are easily broken down in the environment. The most effective and, consequently, most frequently used compounds are oil-based. The discharge of muds and cuttings contaminated by diesel oil or diesel oil spots is prohibited. However, previous oil and gas exploration NPDES permits have authorized, with restrictions, the use of mineral oil as a spotting agent (U.S. EPA 1988c). The discharge of residual amounts of mineral oil pills is authorized in recent permits provided that the mineral oil pill and at least a 50 barrel buffer of drilling fluid is removed from the system and not discharged. The residual mineral oil content should not exceed 2 percent (v/v).

TABLE 1. TRACE METAL CONCENTRATIONS IN DRILLING MUDS DISCHARGED IN ALASKAN WATERS

Metal	Generic[a] Muds (mg/kg dry)	Drilling Muds Discharged to Alaskan Waters[b] (mg/kg dry) (n = 168)		
		Median[c]	Minimum[c]	Maximum
Arsenic	17.2	2.8	1.2	7.9
Barium	1,240	62,300	7	495,000
Cadmium	0.7	0.38	0.001	12
Chromium	908	130	0.5	1820
Copper	77.3	30	2.0	86.5
Lead	52.5	23.5	0.05	1270
Mercury	0.7	0.103	0.001	1.46
Nickel	9.8	NA	NA	NA
Zinc	90.4	168.5	1.0	3420

NA = Data not available.

[a] CENTEC (1984). These laboratory-produced muds were hot-rolled prior to analysis to simulate chemical changes induced by downhole conditions (Jones and Stokes 1990, p. 14).

[b] Source: U.S. EPA Region 10 (1993a) database (entries made through March 8, 1993). Includes all end-of-well mud data except those reported in format inconsistent with permit requirements (i.e., mg/L). Data are from generic mud types (n=140), non-generic mud types (n=9) and unspecified mud types (n=19).

[c] One-half detection limit was used for those samples reported as not detected.

TABLE 2. COMPARISON OF THE RANGE OF TRACE METAL CONCENTRATIONS IN DRILLING MUDS DISCHARGED IN ALASKAN WATERS AND AVERAGE EARTH'S CONTINENTAL CRUST

Metal	Drilling Muds[a]	Continental Crust[b]
	Metal Concentration in mg/kg dry weight	
Arsenic	7.9	1.8
Barium	495,000	425
Cadmium	12	0.15
Chromium	1,820	120
Copper	86.5	60
Lead	1,270	14
Mercury	1.46	0.08
Nickel	NA	84
Zinc	3,420	70

NA = Data not available.

[a]Data from Table 1.

[b]Ronov and Yaroshevsky 1972, pp. 252-254.

TABLE 3. CONCENTRATION OF ORGANIC POLLUTANTS IN THREE MINERAL OILS			
	Concentration in Oils (mg/kg)		
Pollutant	Oil A	Oil B	Oil C
Benzene	ND	ND	ND
Ethylbenzene	ND	ND	ND
Naphthalene	50	ND	ND
Fluorene	ND	150	10
Phenanthrene	ND	200	40
Phenol	ND	ND	ND
Alkylated benzenes	30,000	ND	ND
Alkylated naphthalenes	280	690	ND
Alkylated fluorenes	ND	1,740	ND
Alkylated phenanthrenes	ND	140	ND
Alkylated phenols	ND	ND	ND
Alkylated biphenyls	230	5,570	20
Alkylated dibenzothiaphenes	ND	370,000	ND
Aromatic content (%)	10,700	2,100	3,200

ND = Not detected.

Source: Battelle (1984).

Mineral oils can contribute potentially toxic organic pollutants to drilling muds to which they are added. These data show that the concentration of organic pollutants in the drilling muds is roughly proportional to the amount of mineral oil added. Table 3 presents the chemical analyses of three different mineral oils (Battelle 1984). Alkylated biphenyls were detected in all three mineral oils; naphthalene, fluorene, phenanthrene, alkylated benzenes, alkylated naphthalenes, alkylated fluorenes, alkylated phenanthrenes, alkylated biphenyls, and alkylated dibenzothiaphenes were detected in one or more of the oils. Naphthalene is the only one of the individual compounds detected for which Federal marine water quality criteria exist.

2.2.3.5 Lubricants. Lubricants are added to the drilling mud when high torque conditions are encountered on the drill string. These can be vegetable, paraffinic, or asphaltic-based compounds such as Soltex. When needed, these lubricants are used to treat the entire mud system [roughly 32,000 L (8,453 gal)] and are discharged into receiving waters along with the muds (U.S. EPA 1984a, p. 19). This can result in a 746-1,493 kg (1,650-3,300 lb) mass loading of the substances into the environment for each treatment of the system (U.S. EPA 1986a, pp. 2-17 to 2-19). Mineral oils, mentioned above, may also be used as lubricants and may, therefore, contribute to organic pollutant loading.

2.2.3.6 Zinc Carbonate. Zinc carbonate is used as a sulfide scavenger when formations containing hydrogen sulfide are expected to be encountered during drilling. Typically the entire mud system is treated with zinc carbonate to achieve mud concentrations of zinc between 1.5 and 5.5 kg/m^3 (0.01-0.05 lb/gal), resulting in 240-940 kg (520-2,080 lb) of zinc in the mud system (Jones & Stokes 1989a, p. 20). The zinc sulfide and unreactive zinc compounds are discharged with the drilling mud into the environment, thus contributing to the overall loading of zinc.

2.2.3.7 Other Materials. In cases when circulation of the mud system is lost, combinations of cellophane, mica, and walnut hulls, or other inert substances such as vegetable and polymer fibers, flakes, granules, and glass or plastic spheres may be added to the mud in one of two methods. The entire system can be treated with typically 0.2 to 2.0 kg (0.5-5.0 lb) per barrel (bbl) of mud, which results in 220 to 2,200 kg (1,000 to 10,000 lb) of additives to the system. Alternatively, a pill of 15,899-31,797 L (4,200-8,400 gal) containing 57-170 g/L of additive (0.5-1.4 lb/gal) can be sent downhole (U.S. EPA 1984b, p. 19). When drilling resumes, the additives are separated from the drilling muds by screening and discharged into the environment along with the cuttings.

2.3 MINOR POLLUTANTS

The proposed NPDES General permit for the Chukchi Sea and Beaufort Sea Areas of Coverage authorize the discharge of fifteen different wastestreams. The major wastestreams, drilling mud and drill cuttings, have been discussed above. Monitoring requirements for the discharge of the other thirteen wastestreams generally include a monthly estimate of volume discharged. A discharge monitoring study of oil and gas production facilities has been completed for the Cook Inlet (Ebasco Environmental 1990). While the discharges of minor pollutants from production facilities are generally expected to be greater than that occurring from exploratory drilling facilities, the data summarized in the Cook Inlet study may be a reasonable estimate of the upper range for the discharge of minor pollutants in the Arctic Region. Summary statistics for wastestream discharges of minor pollutants derived from the Cook Inlet study (Ebasco Environmental 1990) and other sources are provided in subsequent sections.

2.3.1 Sanitary Waste Discharges

Sanitary waste consists of primary and possibly secondary treated chlorinated effluent. Discharge of sanitary waste is expected to be less than 5,300 L/day (1,400 gal/day) per rig (Menzie 1982, p. 455).
The current NPDES permit stipulates that these discharges are required to have a chlorine residual concentration as close as possible to, but no less than, 1.0 mg/L.

2.3.2 Domestic Waste

Discharge of domestic waste (shower and sink drainage) from an Alaskan offshore oil rig is usually less than 30,600 L/day (8,084 gal/day) (Jones & Stokes 1989b, p. 9). This waste is sometimes reused to make drilling mud rather than being discharged directly into receiving waters. The environmental effect of these discharges is difficult to determine given the absence of any analytical measurements of their content. However, this discharge is not expected to produce substantial pollutant loading.

2.3.3 Desalination Wastewater and Boiler Blowdown

Discharge from desalination units may vary greatly [190 to 650,000 L/day (50 to 172,000 gal/day) (Ebasco 1990, p. 15)] depending on the freshwater needs of the rig. Additives discharged with desalination wastes include cleanser [up to 1,250 L/month (330 gal/month)], water purifier [up to 7.5 L/month (2 gal/month)], and acidifier/scale remover [up to 6.8 kg/month (15 lb/month)]. Boiler blowdown may be discharged once or twice a year per rig in volumes of around 230 L (60 gal) (Ebasco Environmental 1990, p. 15). Discharge volumes from boiler blowdown are usually small, and will therefore not typically contribute substantially to pollutant loading.

2.3.4 Test Fluids from the Well

Test fluids are discharged from the well upon completion of drilling. These may consist of formation water, vegetable or mineral oil, natural gas, formation sands, any added acids or chemicals, or any combination thereof (U.S. EPA 1985). Test fluids are generally stored and treated with acid to remove oil before being discharged. During a typical 5-day well test, approximately 1 percent, or 7,949 L (2,100 gal), of the total test fluids will have a pH of 2. The remaining 99 percent, or 771,067 L (203,694 gal), of test fluids will have a pH ranging from 5.0 to 8.5 (U.S. EPA 1988b, p. 2-6). One well reported a maximum value of 30,600 L (8,085 gal). The addition of strong acidic solutions downhole could cause substantial leaching of heavy metals from the formation and residual drilling mud (Jones & Stokes 1989a, p. 10). The current NPDES permits have required that the pH of this discharge be between 6.5 and 8.5.

2.3.5 Deck Drainage

Deck drainage, which consists of precipitation and wash-water from the deck, is expected to occur only during summer months due to the low Arctic temperatures. Menzie (1982) estimated deck drainage at 53,000 L/day (14,000 gal/day). Oil is the primary pollutant in deck drainage, with a reported range of 24 to 450 mg/L, although these discharges may also contain small quantities of detergents, spilled drilling mud, water purifiers, corrosion inhibitors, biocides, and solvents (Ebasco Environmental 1990, p. 13). If the collection system is operating normally, the mass loading of pollutants to the environment should be minimal.

2.3.6 Blowout Preventer Discharge

The blowout preventer is a device designed to contain pressures in the well that cannot be contained by the drilling mud. It may be located on the sea floor or on the drilling platform. Fluid may be discharged when the blowout preventer is actuated, generally on a weekly basis for testing (Jones & Stokes 1990, p. 9). The volume of fluid discharged when the device is actuated is not well documented; however, U.S. EPA (1984b, p. 12) reported that such discharges are on the order of 757 L/day (200 gal/day). The mass loading of pollutants from such a small discharge are expected to be minimal. The primary constituents of blowout preventer fluid are ethylene glycol and water. Ethylene glycol is not considered to be highly toxic to aquatic life (Jones & Stokes 1990, p. 9). Given the minimal expected mass loading of ethylene glycol, no adverse impacts are anticipated from blowout preventer fluid discharge.

2.3.7 Miscellaneous Discharges

Other minor discharges, in addition to those listed above, may include noncontact cooling water, fire control system test fluids, uncontaminated ballast and bilge water, excess cement slurry, and cement. The volume of noncontact cooling water required for drilling operations can vary depending on the system used. Closed-system, air-cooled designs require no cooling water, whereas other systems may discharge up to 7 million L (1.87 million gal) per day. Discharge of cooling water in Cook Inlet ranged from 47,700 to 25.4 million L (12,600 to 6.7 million gal) per day (Ebasco Environmental 1990, p. 15). Reported temperatures for discharged cooling water range from 15° to 25° C (62° to 84° F) (Jones & Stokes 1990, p. 11), which are substantially higher than ambient seawater. In addition to elevated temperatures, cooling water may contain biocides added to control fouling in the heat exchanger units of cooling systems (Jones & Stokes 1989a, p. 10). The substantial volumes of cooling water discharged indicates that significant mass loading of pollutants into the immediate marine environment could result if the chemicals are not consumed or detoxified prior to discharge (Jones & Stokes 1990, p. 11).

Bilge waters are treated to remove oil prior to discharge. If the collection system is operating normally, the mass loading of pollutants to the environment should be minimal. However, discharge of bilge water can be large, so the potential impacts to the environment could be significant if the collection system malfunctions. Ballast waters are not treated, but should have a composition similar to seawater unless contaminated by machinery lubricants or fuel. The proposed NPDES general permit prohibits the discharge of any materials that may cause a visible sheen of oil.

Cement, along with spud mud and cuttings, will also be discharged from drillships and on the ocean floor in the early phases of drilling before the well casing is set, and during well abandonment and plugging. Aside from cement, cement extenders, accelerators, and dispersants are the main chemicals added to this discharge. Excess cement slurry will result from equipment washdown after cementing operations. The concentration of cement used as slurry discharged in the Cook Inlet ranged from 254 to 539 lb/bbl (Ebasco Environmental 1990, p. 16). The specific volume of cement slurry discharged ranged from 0 to 167 bbl on specific discharge dates. The exact composition and potential toxicity of cement is not documented, but it is generally expected to be nontoxic (U.S. EPA 1984a, p. 12). No adverse impacts are expected from the discharge of cement and other materials on the ocean floor.

2.4 QUANTITY OF DRILLING MUDS AND CUTTINGS

2.4.1 Production Per Well

Each exploratory well in the Beaufort Sea Area of Coverage is expected to produce about 571 dry metric tons [mt (630 short tons)] of dry drilling mud and 743 dry mt (820 short tons) of cuttings (U.S. DOI 1990, p. B-4). Using these estimates for muds and cuttings production, annual mass loadings have been computed for each of the three resource development scenarios (low, base, and high) and are presented in Table 4.

Estimates of the amount of drilling muds and cuttings expected to be discharged from exploratory wells in the Chukchi Sea Area of Coverage are provided in Appendix B of the FEIS for Sale 126 (U.S. DOI 1991). Each exploratory well is expected to produce approximately 599 metric tons [mt (660 short tons)] of dry drilling mud and 771 mt (850 short tons) of cuttings. Each delineation well is expected to produce an identical amount of drilling mud and cuttings. Using these estimates for muds and cuttings production, annual mass loadings have been computed for each of the three resource development scenarios (low, base, and high) and are presented in Table 5.

No estimate is available for the amount of drilling muds and cuttings expected to be discharged in State waters due to future exploratory oil and gas exploration.

2.4.2 Rate of Discharge of Mud and Cuttings During Well Operation

The discharge rate of mud and cuttings during well drilling operations is quite variable. The allowable discharge rate is a function of the discharge depth. During actual drilling and circulation of the drilling mud, cuttings are brought up from the hole, removed by the solids control equipment (approximately 90 to 95 percent efficient), and discharged on a relatively continuous basis. However, muds are discharged less regularly (U.S. EPA 1984a, p. 23). Drilling muds are discharged in bulk when the mud type is changed or altered during cementing operations, or at the end of drilling. Bulk discharge rates reportedly range from 4,769 to 190,779 L/h [30 to 1,200 bbl/h (1,260 to 50,400 gal/h)], with total volumes discharged ranging from 15,898 L [100 bbl (4,200 gal)] to more than 317,966 L [2,000 bbl (84,000 gal)] (U.S. EPA 1984a, p. 33). It should be noted that the maximum discharge rate of muds and cuttings allowed in the current Beaufort and Chukchi Sea permits is 158,980 L/h [1,000 bbl/h (42,000 gal/h)].

2.5 SUMMARY

Drilling muds and cuttings are the major discharges during exploratory drilling. The FEIS for the Beaufort Sea Area of Coverage estimates that a total of 4 exploration and delineation wells will be drilled for the low resource scenario, 14 for the base resource scenario, and 36 for the high resource scenario. Exploration and delineation wells are expected to have an average true vertical depth (TVD) of 3,048 m (10,000 ft) (U.S. DOI 1990, p. B-4). The FEIS for the Chukchi Sea Area of Coverage estimates that a total of 2 exploration and delineation wells will be drilled for the low resource scenario, 39 for the base resource scenario, and 53 for the high resource scenario. Exploration and delineation wells are expected to have an average depth of 3,170 m (10,400 ft), ranging to nearly 4,267 m (14,000 ft) (U.S. DOI 1991, Appendix B, p. 4).

Components of concern in drilling muds include trace metals and specialty additives used with generic drilling mud systems. The majority of trace metals will remain bound to particulates in the whole mud. Specialty additives could be a source of trace metals (e.g., zinc) and petroleum hydrocarbons. Mass loadings of the additives depend on the concentrations, frequency of usage, and conditions encountered during the drilling.

TABLE 4. ESTIMATED ANNUAL PRODUCTION OF DRILLING MUDS AND CUTTINGS DURING EXPLORATION AND DELINEATION ACTIVITIES IN THE BEAUFORT SEA AREA OF COVERAGE[a]

		Exploration[b]				Delineation[c]		
	Year	Number of Rigs	Number of Wells	Mud (mt)	Cuttings (mt)	Number of Wells	Mud (mt)	Cuttings (mt)
Low Case	1992	2	2	1,142	1,486	0	0	0
	1993	2	2	1,142	1,486	0	0	0
	Total		4	2,284	2,972	--	--	--
Base Case	1992	2	2	1,142	1,486			
	1993	3	2	1,142	1,486	2	1,142	1,486
	1994	3	2	1,142	1,486	2	1,142	1,486
	1995	2	2	1,142	1,486			
	1996	2	2	1,142	1,486			
	Total		10	5,710	7,430	4	2,284	2,972
High Case	1992	4	4	2,283	2,972			
	1993	6	5	2,854	3,715	4	2,283	2,972
	1994	5	5	2,854	3,715	3	1,713	2,229
	1995	5	4	2,283	2,972	3	1,713	2,229
	1996	3	3	1,713	2,229	1	571	743
	1997	2	2	1,142	1,486			
	1998	2	2	1,142	1,486			
	Total		25	14,271	18,575	11	6,280	8,173

[a] Estimated number of wells and hypothetical drilling schedule.

[b] The average exploration well is assumed to use 571 mt (630 short tons) of dry mud and 743 mt (820 short tons) of cuttings.

[c] The average delineation well is assumed to use 571 mt (630 short tons) of dry mud and 743 mt (820 short tons) of cuttings.

Source: U.S. DOI (1990).

TABLE 5. ESTIMATED ANNUAL PRODUCTION OF DRILLING MUDS AND CUTTINGS DURING EXPLORATION AND DELINEATION ACTIVITIES IN THE CHUKCHI SEA AREA OF COVERAGE[a]

	Year	Exploration[b]				Delineation[c]		
		Number of Rigs	Number of Wells	Mud (mt)	Cuttings (mt)	Number of Wells	Mud (mt)	Cuttings (mt)
Low Case	1[d]	0	0	0	0	0	0	0
	2	2	2	1,197	1,542	0	0	0
	Total		2	1,197	1,542	0	--	--
Base Case	1[d]	0	0	0	0	0	0	0
	2	4	4	2,395	3,084	0	0	0
	3	5	6	3,592	4,627	4	2,395	3,084
	4	5	6	3,592	4,627	3	1,796	2,313
	5	4	4	2,395	3,084	3	1,796	2,313
	6	3	3	1,796	2,313	1	599	771
	7	3	3	1,796	2,313	0	0	0
	8	2	2	1,197	1,542	0	0	0
	Total		28	16,763	21,590	11	6,586	8,481
High Case	1[d]	0	0	0	0	0	0	0
	2	4	4	2,395	3,084	0	0	0
	3	6	6	3,592	4,627	4	2,395	3,084
	4	5	6	3,592	4,627	3	1,796	2,313
	5	5	5	2,994	3,856	3	1,796	2,313
	6	4	4	2,395	3,084	2	1,197	1,542
	7	4	4	2,395	3,084	2	1,197	1,542
	8	3	3	1,796	2,313	1	599	771
	9	2	2	1,197	1,542	1	599	771
	10	2	2	1,197	1,542	0	0	0
	11	1	1	599	771	0	0	0
	Total		37	22,152	28,530	16	9,579	12,336

[a] Estimated number of wells and hypothetical drilling schedule [U.S. DOI (1991), Appendix B].

[b] The average exploration well is assumed to use 599 mt (660 short tons) of dry mud and 771 mt (850 short tons) of cuttings.

[c] The average delineation well is assumed to use 599 mt (660 short tons) of dry mud and 771 mt (850 short tons) of cuttings.

[d] Sale year.

3.0 TRANSPORT, PERSISTENCE, AND FATE OF MATERIALS DISCHARGED

3.1 TRANSPORT AND PERSISTENCE

Factors influencing the transport and persistence of discharged drilling muds and cuttings include oceanographic characteristics of the receiving water, characteristics of the discharge, depth of discharge, discharge rate, and method of disposal. Because ice covers the Arctic region during most of the year, three disposal methods are discussed in this section: open water disposal, on-ice disposal, and below-ice discharge. Shunting, the extension of the discharge outlet well below the sea surface, of drilling mud discharges is also discussed. Oceanographic considerations include tides, wind, freshwater overflow, ice movement, stratification, and current regime. Several studies conducted for other outer continental shelf locations were considered for application in this report.

3.1.1 Summary of Transport/Persistence Studies in Other OCS Lease Areas

The transport, persistence and fate of materials discharged into the marine environment from exploratory drilling operations has been previously evaluated for several northern Alaska offshore areas of coverage [e.g., Beaufort Sea OCS Sale 97 (U.S. EPA 1988a), Diapir Field OCS Sale 87 and State Lease Sales 39, 43, and 43a (U.S. EPA 1984a), Norton Sound OCS Sale 100 (U.S. EPA 1986a), Chukchi Sea OCS Sale 109 (U.S EPA 1988b)]. The general conclusions reached in these studies regarding the transport, dispersion, and persistence of drilling discharges are summarized below:

- The primary materials discharged during drilling activities that are of concern to the marine environment include drilling fluids (muds), specialty additives, and cuttings.

- The drilling mud discharge separates into an upper and lower plume. Physical descriptions of effluent dynamics and particle transport differ substantially for the two plumes.

- Drill cuttings (parent material from the drill hole) are generally coarse materials that are deposited rapidly following discharge and settle within the 100-m radius mixing zone.

- Drilling materials discharged to deep-water marine environments tend to be rapidly diluted and dispersed. Dilutions of particulate material on the order of 1,000 to 10,000:1 have been predicted in the upper plume at the edge of the mixing zone [100 m (330 ft)] of the discharge during OCS studies (Tetra Tech 1984, Appendix A).

- The dilution of drilling materials discharged in shallow areas less than 15 m (49 ft), where the depth of the mixing zone is limited, is less than that of deeper waters. Dilutions as low as 167:1 have been measured at the edge of a 100 m (330 ft) mixing zone (U.S. EPA 1988b, p. 3-2).

- Of the four disposal methods available (open-water, above-ice, below-ice, and with shunting), below-ice and shunting disposal are least desirable because of lower dilution and dispersion potential for discharges.

- Discharged drilling materials typically settle in the immediate vicinity of the discharge area. However, deposition patterns are extremely variable and are strongly influenced by several factors, including the type and quantity of mud discharged, hydrographic conditions at the time of discharge, and height above the seafloor at which discharges are made.

The items listed above provide a general overview of the results obtained for some other sale locations. Jones & Stokes (1990) discuss the fate and effects of drilling discharge in the Beaufort Sea and Chukchi Sea Areas of Coverage. Modeling results for cases representative of drilling discharge conditions within the proposed area of coverage are presented in Section 3.1.3.

3.1.2 Oceanographic and Meteorologic Conditions Affecting Dilution and Dispersion

The oceanographic and meteorologic conditions affecting dilution and dispersion for the Beaufort and Chukchi Seas will be briefly summarized below and will include relevant information on conditions within the coastal waters of each of these areas.

3.1.2.1 Physical Description.

Beaufort Sea Area of Coverage. The proposed area includes approximately 8.95 million ha (22.1 million ac) of the Beaufort Sea Planning Area (Figure 1). The area extends from the U.S./Canadian boundary in the Beaufort Sea (approximately 141° W) westward to Icy Cape in the Chukchi Sea (161° W). It is located about 5 to 260 km (3 to 140 nmi) offshore in water depths ranging from about 2 to 1,000 m (7 to 3,280 ft). A preliminary estimate of the water depths of lease blocks within the area indicates that approximately 5 percent lie in waters less than 20 m (66 ft) deep, 15 percent in waters 20 to 40 m (66 to 131 ft) deep, and 80 percent in waters deeper than 40 m (131 ft) (U.S. DOI 1990, p. II-7).

Chukchi Sea Area of Coverage. The proposed area includes approximately 12 million ha (29.7 million ac) located offshore along the northern Alaskan coast from Cape Lisburne to Peard Bay in the Chukchi Sea. The area extends offshore to 169° W and northwards to 73° N latitude (Figure 1). The entire area of coverage is located on the continental shelf in water depths from 6 m (20 ft) to 80 m (262 ft). Approximately 80 percent of the area lies in water depths between 30 m (98 ft) and 60 m (197 ft). Within the proposed area, the continental shelf is broad, has low relief, and is gently inclined to the north (U.S. DOI 1991 p. III-1).

State Waters. While precise estimates are not available, Alaskan state waters are generally less than 20-m deep. State waters west of Pt. Barrow are generally less than 20-m deep. State waters greater than 20-m deep, but less than 40-m deep occur off Icy Cape, Cape Lisburne, and Point Hope. State waters that exceed 40-m water depth occur off Pt. Barrow, and along the coast from Wainright to Pt. Franklin.

Coastal features in the waters adjacent to the Beaufort and Chukchi Seas include deltas at the mouths of large rivers, barrier islands, capes and points, bays, and lagoons. The relatively broader expanse of shallow areas in state waters of the Beaufort Sea is dominated by barrier islands, lagoons, and river deltas. Three types of lagoons are recognized which have varying degrees of exchange with open water (U.S. DOI 1990, p. III-A-6). The coastal waters of the Chukchi Sea are relatively deeper and more steeply sloped than those of the Beaufort Sea and are dominated by barrier island protected bays and points and capes that extend from the coast and occasionally form protected bays.

3.1.2.2 Meteorology.

Beaufort Sea Area of Coverage. The proposed area is located in the Arctic climate zone. Mean annual temperature is about -12° C (10° F). Precipitation ranges from 13 cm (5.1 in) at Barrow to 18 cm (7.1 in) at Barter Island and occurs mostly as summer rain (U.S. DOI 1990, p. III-A-3). This region is a particularly harsh environment, especially during winter (roughly October to May) when the sun remains below the horizon for 49 consecutive days. With the ocean to the north and level tundra to the south, there are no downslope drainage areas to aid the flow of cold air to lower levels, and no natural wind barriers to reduce wind velocities. Mean annual wind speed is 5 m/sec (10 kn) at Barrow and 6 m/sec (12 kn) at Barter Island (U.S. DOI 1990, p. III-A-3).

During winter, the area of coverage lies between a semipermanent high pressure system to the north and a low pressure system located to the south over the Gulf of Alaska. The northerly high pressure system results in clear to partly cloudy skies much of the time. Strong westerlies are a common feature of this region in winter. Cold stable air moving from the north is stacked against the Brooks Range and results is a west wind parallel to the mountains. The strength and dominance of the westerly winds increase as the Brooks Range is approached. Stations to the east of Prudhoe Bay have more frequent westerly winds than stations to the west, such as Barrow. Most of the snow falls during September and October, when there is still open water on the Beaufort Sea to provide a source of moisture. The typical amount of snow received in this region is equivalent to approximately 2.1 cm (0.8 in) of precipitation (U.S. EPA 1988a, p. 3-5).

Surface winds in the Beaufort Sea area blow from between 30 to 90 degrees (compass bearing) approximately 60 percent of the time (U.S. EPA 1984a, p. 32). Mean monthly wind speeds are fairly constant throughout the year, averaging 3.6 to 5.6 m/sec (7 to 11 kn). September and October are the windiest months, with average wind speeds of 6.2 m/sec (12 kn) (U.S. EPA 1984a, p. 32). Average wind speed during the summer months is approximately 5 m/sec (10 kn) (U.S. EPA 1988a, p. 3-6).

Chukchi Sea Area of Coverage. The proposed area is located in the Arctic climate zone. Along the Chukchi Sea coast north of Point Hope, the average summer temperature range is from -2° to 12° C (28° to 54° F), and the average winter temperature ranges from -33° to -6° C (-27° to 21° F). The average annual precipitation within the area of coverage ranges from 13 cm to 38 cm (5 to 15 in). Surface winds along the coast between Point Lay and Barrow commonly blow from the east and northeast, while winds at Cape Lisburne are predominantly from the east and southeast. Coastal wind speeds are typically between 4 to 8 m/sec (8 to 16 kn), with winds exceeding 8 m/sec (16 kn) occurring less than 4 percent of the time (U.S. DOI 1991, p. III-3).

Weather patterns within the area are influenced by the high pressure systems located over the Beaufort Sea and the Siberian High located southwest of the Beaufort High, and the low pressure systems commonly found north of 60° N. Storm systems generally move northeast through the Bering Sea into the Chukchi Sea, where they follow the northwestern Alaska coast. Within the area of coverage, fog occurs about 10 percent of the time when ice covers the region and 20 to 30 percent of the time during open-water periods (U.S. DOI 1991, p. III-3).

State Waters. During winter, cold and clear or partly cloudy days predominate. Strong westerly winds are common during this time. In summer (roughly June to September), temperatures at the coast remain within a few degrees of freezing. The ice-covered Beaufort Sea to the north depresses temperatures near the coast, while the Brooks Range limits flow of warm air from the south. The severity of ice conditions during the summer correlates with sea level pressure over the Arctic Ocean. The pressure gradient associated with higher-than-normal sea level pressure northeast of Alaska produces surface winds that push the ice away from the coast. Light-ice summers create mild fall temperatures; the open waters cause relatively higher air temperatures near the coast (U.S. EPA 1988a, p. 3-5). Local nearshore winds are predominantly from the east-northeast. Maximum wind speeds occur nearest the coast due to a land-sea temperature gradient that results in a sea breeze circulation pattern (U.S. EPA 1984a, p. 32).

3.1.2.3 Sea Ice.

Beaufort Sea Area of Coverage. The area is essentially ice-covered for all but 2 months of the year. Breakup typically begins as early as June and coincides with the initiation of spring river discharge. As nearshore melting continues, a coastal lead (open water) forms between Point Barrow and Demarcation Bay, which varies annually in offshore extent from several kilometers to several hundred kilometers. Open water conditions typically persist through September when the refreezing process begins (U.S. EPA 1988a, p. 3-6). The timing of breakup and freezeup is variable from year to year.

In an average year, the edge of the summer Arctic pack ice is located approximately 48 to 64 km (26 to 35 nmi) offshore; however, this boundary may occur anywhere within a region that is about 260 km (140 nmi) wide (Jones & Stokes 1990, p. 22). Sea ice concentrations of five-tenths or greater (the amount of ice above which ice-breaking vessels are needed for navigation) are expected to occur over approximately half of the area of coverage east of Point Barrow even during the summer "open water" period. That portion of the area west and seaward of Point Barrow in the Chukchi Sea lies generally farther to the north, and a greater percentage of this area is covered by sea ice (U.S. EPA 1988a, p. 3-6).

Chukchi Sea Area of Coverage. The area is ice covered for most of the year. Sea ice typically begins forming in late September or early October, covering most of the area by mid-November or early December. By July, the pack ice in the area begins retreating northward. The portion of the area south of 70° N latitude is generally ice-free between the beginning of August and the end of October (U.S. DOI 1991, p. III-5).

The winter ice has been classified into several zones (i.e. the landfast-ice zone, the stamukhi zone, and the pack-ice zone) based on differences in sea ice features and dynamic behavior within these zones. Detailed descriptions of these sea-ice zones are provided in the FEIS for Sale 126 (U.S. DOI 1991, pp. III-6 - III-10).

State Waters. Most of the year these waters are ice-covered. By about mid-May, the nearshore ice begins to melt in response to the spring river discharge. As discussed in the Sale 109 ODCE (U.S. EPA 1988a, p. 22), sea ice in the nearshore region is more mobile during periods of ice breakup and initial freezing than it is during winter. Ice movement occurs primarily in response to local wind and current forces, and may move up to several kilometers per day during these periods. The spring flood by the Colville River alters the surface of the sea ice. The water flow may extend several km seaward on top of the sea ice and rapidly drain through cracks in the ice (U.S. EPA 1984a, p. 35).

3.1.2.4 Circulation.

Beaufort Sea Area of Coverage. The circulation in the Beaufort Sea can be divided into four regimes: nearshore, inner shelf, outer shelf, and Beaufort Gyre. The circulation patterns characteristic of each region have been described in the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a, p. 32).

In addition to the circulation patterns described in the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE, the portion of the Beaufort Sea Area of Coverage lying to the north and west of Point Barrow may be strongly influenced by the Alaskan coastal current. This easterly flowing countercurrent enters the Beaufort Sea along Barrow Canyon to the west of Point Barrow. The current is a continuation of flow that begins as far south as the Bering Sea, and flows through the Bering Strait northward along the coast of the Chukchi Sea, where it turns toward the east near Point Barrow. At Point Barrow, the current moves offshore and lies at depths between 50 and 200 m (160 to 660 ft). This current has been identified as far east as Kaktovik (U.S. EPA 1988a, p. 3-7).

Chukchi Sea Area of Coverage. The circulation in the Chukchi Sea in the vicinity of the Area of Coverage is described in detail in the FEIS for Sale 126 (U.S. DOI 1991, pp. III-3 - III-5) and the following is a brief summary of the information provided in that document. Water from two water masses, the Bering Sea Water (BSW) and the Alaska Coastal Water (ACW), enter the Chukchi Sea through the Bering Strait. The BSW water, which has a higher salinity, flows northward through the western Bering Strait. Near the latitude of Point Hope, the BSW flows northeasterly into the Arctic Ocean, and does not generally flow through the area. The ACW water, which has a lower salinity and is warmer than the BSW water, flows through the eastern Bering Strait and along the western coast of Alaska through the Chukchi Sea. North of Cape Lisburne, the ACW forms a narrow fast-moving current [Alaskan Coastal Current (ACC)] flowing northeasterly approximately parallel to the 20-m (66-ft) isobath.

The ACC flow is variable and directional reversals can persist for several weeks; a large part of the variability is wind-driven (Johnson 1989, p. 2057). During ice-free periods, southwesterly winds establish a warm coastal jet in the nearshore region and remove cooler bottom water. Easterly winds shift the ACC current offshore, centering it approximately 20 km (11 nmi) from the coast, while westerly winds shift the current closer to the coast.

State Waters. The nearshore environment consists of semienclosed lagoons and open embayments landward of the 10 m (33 ft) isobath. The circulation is wind-driven in this region and flushing rates and currents are largely dependent to local winds (U.S. EPA 1984a, p. 32). Water motion in this region varies widely within the range of 5 to 50 cm/sec (0.16 to 1.6 ft/sec). Measurements indicate a general westward movement along the coast during the summer. During winter; nearshore motion is generally slow, with a net drift to the west (U.S. EPA 1984a, p. 32).

Nearshore circulation is influenced considerably by the flow of the Colville River, the largest river on the Alaskan North Slope. River flow begins in May and continually decreases throughout the summer, stopping by late fall. Flooding usually occurs for approximately two weeks, discharging 60 to 80 percent of the annual flow (U.S. EPA 1984a, p. 35).

3.1.2.5 Currents.

Beaufort Sea Area of Coverage. Currents in the Beaufort Sea during the summer months range from less than 2 cm/sec (0.07 ft/sec) to greater than 95 cm/sec (3.1 ft/sec), the latter being measured at the onset of a storm in mid-August. Details of current measurements for the lease sale are given in the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a, p. 33).

Chukchi Sea Area of Coverage. Current speeds of 20 to 30 cm/sec (0.66 to 1.0 cm/sec) are characteristic of the eastern Chukchi Sea. Additional details on currents in the Chukchi Sea are given in U.S. DOI (1991, p. III-4).

State Waters. Current speeds near the Sagavanirktok River Delta in the Beafort Sea averaged 13 cm/sec (0.43 ft/sec) with a maximum of 53 cm/sec (1.7 ft/sec)(U.S. EPA 1984a, p. 33). Coastal currents with speeds of 50 cm/sec (1.6 ft/sec) have been reported near Cape Lisburne, and speeds of 51 to 87 cm/sec (1.7 to 2.9 ft/sec) have been reported south of Icy Cape (U.S. DOI 1991, p. III-4).

3.1.2.6 Tides.

Beaufort Sea Area of Coverage. Tides within the area are semidiurnal and of low amplitude, with a range from 10 to 30 cm (4 to 12 in). Tidal currents that typically have velocities between 1 to 5 cm/sec (0.03-0.16 ft/sec) are several orders of magnitude less than currents associated with storm surges. Water levels can vary by +3 m to -0.9 m (+10 ft to -3 ft) as a result of storm surges (U.S. EPA 1984a, p. 34).

Chukchi Sea Area of Coverage. Tides in the area are semi-diurnal and of low amplitude, with a range between 2 to 20 cm (0.8 to 8.0 in) (Jones & Stokes 1990, p. 24).

State Waters. Tides in nearshore waters are semi-diurnal of low amplitude. Average tidal currents shoreward of the 10 m (33 ft) isobath range from 1 to 5 cm/sec (0.03 to 0.16 ft/sec)(U.S. EPA 1984a, p. 34).

3.1.2.7 Stratification, Salinity, and Temperature.

Beaufort Sea Area of Coverage. In general, the summer surface salinity over the shelf ranges from less than 5 to 30 ppt. Surface salinities tend to be reduced because of melting sea ice and advected fresh water from river discharge. At 10 m (33 ft) and 30 m (98 ft), salinities vary from 25 to 31 ppt and from 30 to 32.5 ppt, respectively (U.S. EPA 1984a, p. 34). Surface and 10 m (33 ft) depth temperatures range from -1 to 6° C (30 to 43° F). At 30 m (100 ft), they vary from -1 to 7° C (30 to 45° F) (U.S. EPA 1984a, p. 34).

Chukchi Sea Area of Coverage. Nearshore waters consist of a two-layered system, with fresher water from riverine input overlying a more saline oceanic water. The surface layer shows a marked decrease in salinity in the vicinity of major rivers, such as the Kukpowruk River. In the winter, the lack of freshwater input into coastal waters results in only weak stratification.

State Waters. Nearshore salinity measurements have identified a two-layer system. The upper layer, consisting of fresher water from riverine input, rests on top of a layer containing more saline oceanic water. A marked decrease in surface water salinity occurs in proximity to the major rivers such as the Sagavanirktok, Kuparuk, and Colville Rivers. Freshwater input also causes a marked division between nearshore and offshore waters occurring at the 6 m (20 ft) isobath. Details of relevant studies may be found in Section 3 of the Sale 87, which includes the State Lease Sales 39, 43, and 43a, and Sale 97 ODCEs (U.S. EPA 1984a; 1988a).

3.1.2.8 Sediment Transport.

Beaufort Sea Area of Coverage. Several factors influence the rate and quantity of sediment transport in the Beaufort Sea, including ice gouging, entrainment in sea ice, wave action, currents, and disturbance of sediments by the activity of benthic organisms (bioturbation). The bulk of sediment on the Alaskan shelf is transported westward on the inner shelf (Barnes and Reimnitz 1974). Catastrophic transport associated with severe storms is an important transport mechanism, particularly in the fall when such storms are associated with fresh ice, which enhances the erosion and often entraps sediments in the forming ice. Subsequent ice movement and melting in the spring can deposit sediment large distances from the point of entrapment (Jones & Stokes 1990, p. 25).

Chukchi Sea Area of Coverage. Sediment transport and distribution in the Chukchi Sea is controlled by several factors, including storms, ice gouging, entrainment in sea ice, wave action, currents, and bioturbation. The bulk of sediment on the Alaskan continental shelf is transported northwards in the direction of the prevailing current.

Sediment transport in response to severe storms is an important means of sediment transport within the area of coverage. Storm transport is particularly effective in the fall months when storms are associated with fresh ice, which enhances erosion and often entraps sediments in new ice. In the spring, the breakup and melting of this sediment-laden ice can result in sediment being transported large distances from the point of entrapment (Jones & Stokes 1990, p. 25).

State Waters. Sediments on the inner shelf landward of the 20 m (66 ft) isobath are influenced strongly by waves and currents. The OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE and Sale 97 ODCE (U.S. EPA 1984a; 1988a) also noted that sediments experienced intensive current reworking in areas landward of the 15 m (49 ft) isobath. Bedload transport rates of up to 43,500 m^3/yr (1.5 million ft^3/yr) landward of the 6 m (20 ft) isobath have been estimated (U.S. EPA 1984a, p. 35).

3.1.3 Modeling of Drilling Mud Transport, Deposition, and Dilution

Prediction of the fate of discharged muds and cuttings from exploratory oil drilling relies on a computer model developed by the Offshore Operators Committee (OOC) and Exxon Production Research Company (the OOC Mud Model Version 1.0), and is based on the U.S. Army Corps of Engineers Dredge Spoil Model (Brandsma et al. 1980). The OOC model considers the drilling discharge plume to be divided into an upper plume, which contains fine-grained solids, and a lower plume, which contains the majority of solids. The dilution of the drilling effluent is simulated by considering three phases of plume behavior: convective descent, dynamic collapse, and a later passive diffusion phase. A Gaussian formulation is used to sum the three component phases and to track the distribution of solids to the bottom. The model predicts concentrations of solids and soluble components in the water column and the initial deposition of solids on the seafloor.

The OOC model results do not include cuttings. These are expected to be of coarser grain size than muds and will, therefore, settle rapidly to the seafloor. Jones & Stokes (1989b, p. 38) indicate that the majority of cuttings will probably be deposited within the 100-m (330-ft) designated mixing zone radius from the point of discharge at all depths and current speeds. However, the total discharge of cuttings is generally about 1.3 times greater than (as dry weight) the total discharge of drilling muds for these operations. Therefore, the nearfield estimates (within 100 m of the point of discharge) of bottom accumulations of drilling mud should be considered underestimates due to the exclusion of cuttings discharge from the OOC model.

The OOC Mud Model Version 1.0 (herein referred to as the OOC model) was first made available to OOC member companies and federal and state agencies concerned with offshore drilling discharge regulation in 1983 (U.S. EPA 1984a; O'Reilly et al. 1989). Comparison of model results with field observations indicates that the model is capable of predicting many important aspects of drilling mud discharge plume behavior. For example, a field verification study was conducted offshore of Huntington Beach, California, in waters with an average depth of approximately 18 m using a modified version of the OOC model (O'Reilly et al. 1989). The model predicted water column solids concentrations were within the range of concentrations measured at 75 percent of the sampling locations. In the lower water layer where the majority of the solids formed the lower plume, the model predicted the solids concentrations at 86 percent of the lower water layer sampling locations. However, comparison of the model predictions of bottom solids accumulation with field sediment trap data was less satisfactory, possible due to errors associated with the field measurement technique that was used.

The OOC model makes several simplifying assumptions that may vary from actual conditions at any given site (e.g., a single discharge of limited duration and unidirectional currents). Therefore, the model predictions discussed below provide a generalized picture of expected dilution and deposition; but the model is not expected to predict exact conditions at any one well location. The model version employed for this ODCE is Version 1.0 supplied by Brandsma Engineering and operated on an RS IBM 6000 (Model 320) computer (Brandsma, M.G., 17 May 1994, personal communication).

The OOC model was used to examine discharge scenarios that were 1) likely to occur in the areas of coverage, and 2) representative of the maximum allowable discharges. Discharge scenarios were determined by examining relevant information sources describing exploratory oil and gas drilling practices. Maximum allowable discharges are those specified in the NPDES general permit for the Arctic. With reference to drilling mud discharges, the proposed permit states that:

"the total drilling muds and drill cuttings discharge rate shall not exceed:

(a) 1,000 bbl/hour in water depths exceeding 40 m
(b) 750 bbl/hour in water depths greater than 20 m but not exceeding 40 m
(c) 500 bbl/hour in water depths greater than 5 m but not exceeding 20 m
(d) 250 bbl/hour in water depths greater than 2 m but not exceeding 5 m
(e) discharge of muds and cuttings are prohibited between the shore (mainland and barrier island) and the 2 m isobath."

In addition to the depth-related discharge requirements, the proposed NPDES general permit also specifies the following seasonal requirements:

"during open-water conditions, discharge in the area from the 2 to 20 m isobaths shall be released no deeper than 1 m below the surface the receiving water"

"during unstable or broken ice conditions, the following conditions apply for discharges shoreward of the 20 meter isobath: (1) Discharge shall be prediluted to 9:1 (ratio of seawater to drilling muds and cuttings), and (2) Environmental monitoring is required"

"during stable ice conditions, unless authorized otherwise by the Director, the following conditions apply: (1) Discharges shall be to above-ice locations and shall avoid to the maximum extent possible areas of sea ice cracking or major stress fracturing, and (2) Predilution and flow rate restrictions do not apply."

The estimate of the average amount of drilling muds and cuttings produced by each exploratory well is based on the predicted average depth necessary for each well. The average exploratory well depth for the Beaufort Sea Area of Coverage is predicted to be 3,100 m (10,000 ft) (U.S. DOI 1990, B-4). Based on this average drilling depth, it was estimated that the average exploratory well will produce 571,526 kg (1,260,000 lb) of dry drilling muds and 743,891 kg (1,640,000 lb) of dry rock cuttings (U.S. DOI 1990, B-4). Since it is estimated that the average exploration well in the Chukchi Sea Area of Coverage will average 3,170 m (10,400 ft), the predicted average production of drilling mud and rock cuttings in the Chukchi Sea area of coverage is slightly higher than that for the Beaufort Sea [i.e., 598,742 kg (1,320,000 lb) of dry drilling muds and 771,107 kg (1,700,000 lb) of dry cuttings (U.S. DOI 1991, B-4)]. At present no estimate of the predicted average drilling depth or the average production of drilling mud and cuttings is available for the adjacent coastal water areas of the Beaufort and Chukchi Seas. In order to simplify the following analysis of the dilution and deposition of drilling muds in offshore waters of the Beaufort and Chukchi Seas, and adjacent coastal waters, the higher average total drilling mud production estimate for the Chukchi Sea Area of Coverage of 598,742 kg (1,320,000 lb), which is only 5 percent higher than the average Beaufort Sea Area of Coverage estimate, will be used as the average total amount of drilling mud discharged to these waters following the completion of the average exploratory well.

Since each actual exploratory well drilled will be unique, it can be assumed that the actual quantity of drilling muds produced will vary for each individual well. Since the dilution of the discharged mud is primarily a function of the discharge rate, and not of the total mass discharged, variation in the total amount of drilling muds discharged will not affect the predicted dilutions of dissolved and solid components in the water column. However, variation in the total amount of drilling mud discharged will affect the model-predicted depth of sediments deposited on the bottom.

Therefore, the model-predicted maximum sediment depths for a range of total drilling muds discharged (10 to 500 percent of the average value) will also be explored. This will assist in the evaluation of the potential smothering effect of these various discharge scenarios on benthic organisms that occur within the areas (Section 5.3).

OOC model test cases that reflect the permit stipulations discussed above were run for open-water discharges, shunting, and below-ice discharges; results of the model runs are discussed below. Above-ice discharges are also discussed. Model runs for discharges allowed in water depths of 2-5 m (6.6-16 ft) were performed, but the model did not perform adequately for these cases. The maximum depth of mud accumulation for these cases was 10-20 times greater than the water depth. Mud accumulations of this magnitude would effectively bury the drilling mud outfall, making any calculation of dilution values meaningless. Results for these cases are not reported below.

3.1.3.1 Open-Water Discharges. During a typical year, ice covers more than 90 percent of the Beaufort Sea Area of Coverage from November through May (U.S. DOI 1990, p. III-A-10). During these months drilling discharge will have to occur above or below the ice. At other times of the year, depending on the location, discharge into open water may be possible.

The Chukchi Sea Area of Coverage is ice-covered for most of the year, with ice-free conditions occurring south of 70° N latitude from the beginning of August to the end of October (U.S. DOI 1991, p. III-5). During this brief interval, discharge into open water will be possible.

Open-ice formation begins in the spring in nearshore areas of the Beaufort and Chukchi Seas due to warming of nearshore waters, increased freshwater runoff from rivers, and winds that push ice offshore (U.S. DOI 1990, p. III-A-4). During the open-ice period during summer, exploratory drilling activities in the Alaskan state coastal waters adjacent to the Beaufort and Chukchi Sea Areas of Coverage may result in drilling discharges to open-water.

Open-water discharges were modeled for three depth and discharge combinations. Model parameters held constant for all test cases are given in Table 6. OOC model predictions for the open-water discharge test cases are shown in Table 7. These test cases reflect the maximum discharge rates allowed by the NPDES general permit in different water depths [1,000 bbl/h (159,091 L/h) in water 40 m (131 ft) deep, 750 bbl/h (119,318 L/h) in water 20 m (66 ft) deep, and 500 bbl/h (79,545 L/h) in water 5 m (16 ft) deep. As noted above, model runs for the allowable discharge of 250 bbl/h (39,773 L/h) in water 2 m (6.6 ft) deep] are not reported because of deficiencies in the model. Discharge to waters less than 2 m (6.6 ft) deep is prohibited by the NPDES general permit for oil and gas exploration; therefore, this discharge scenario was not modeled. All model runs assume a 1-h discharge of muds that have an initial solids concentration of 1.44 kg/L (505 lb/bbl) and a unidirectional current speed of 10 cm/sec (0.33 ft/sec).

The quantity of mud necessary to drill one average exploratory well that was used in the following analysis is the reported estimate for the Chukchi Sea Area of Coverage. This estimate [598,742 kg (1,320,000 lb) (U.S. DOI 1991, B-4)] is 5 percent greater than that expected for an average well in the Beaufort Sea Area of Coverage [571,526 kg (1,260,000 lbs) (U.S. DOI 1990, B-4)]. This quantity of mud is 2.6, 3.5, 5.2, and 10.4 times greater than the quantity of mud modeled for discharge rates of 1,000 bbl/h, 750 bbl/h, 500 bbl/h, and 250 bbl/h, respectively. [The OOC model test cases assume a discharge duration of 1 hour.] Although the estimates of minimum solid- and dissolved-fraction dilutions will not be affected by the differences between modeled and actual discharge amounts, solids deposition will be underestimated. An estimate of the solids deposition resulting from the discharge of the quantity of mud necessary to drill an average exploratory well was obtained by multiplying the OOC model predictions by a factor (e.g., 2.613) that represents the ratio of the total amount of mud discharged to the amount discharged in one hour. An explanation of this calculation, and calculation of the factors used in this ODCE are provided in Appendix D. This method of estimating mud accumulation assumes that areal deposition patterns will be unchanged for discharges of different quantities of mud and is reasonable provided that the rate of mud discharge does not vary from that predicted in the modeling. Mud deposition depths shown in Table 7 are the depths expected to occur after completion of an exploratory well.

5-m Water Depth. Modeling results for the maximum allowable discharge rate occurring at depths of 5 m (16 ft) show that the minimum solids dilution at 100 m (328 ft) was 7,400:1; the minimum dissolved dilution at 100 m (328 ft) was 356:1. The maximum depth of deposited mud was 452.4 cm (178.1 in) and occurred less than 10 m (33 ft) from the discharge. The mud deposition depth at the edge of the mixing zone was 0.32 cm (0.13 in). Approximately 98.8 percent of the discharged solids were deposited within the 100 m (328 ft) mixing zone (Table 7).

Previous shallow water studies of drilling effluent disposal within the Beaufort Sea Area of Coverage have measured dilution factors and solids deposition patterns which support the results predicted by the OOC model. These studies were conducted from man-made gravel islands in depths of less than 15 m (49 ft) (Northern Technical Services 1981; 1983; 1985). Of these studies, only one considered discharges during the open water period. Northern Technical Services (1983) conducted a drilling effluent disposal study at Tern Island located in the Beaufort Sea. Case 1 conditions included a mud discharge rate of 13.3 m^3/h (84 bbl/h), a predilution of 30:1 with seawater, and an average current velocity of 12 cm/sec (0.39 ft/sec) at 3.4 m (11.2 ft) above the seafloor. Case 2 conditions included a mud discharge rate of 5.4 m^3/h (34 bbl/h), predilution of 75:1 with seawater, and an average current of 11 cm/sec (0.36 ft/sec). The minimum dilution (due to ambient waters only) measured for test plot 1 was 167:1 at 100 m (330 ft) and 320:1 at 160 m (530 ft) from the discharge for test plot 2. During this study, effluents remained within 0.5 m (1.6 ft) of the seafloor in the nearfield [within 10 m (33 ft) of the discharge point], and most solids were deposited within 240 m (787 ft) of the discharge point in shallow water, approximately 5.5 m (18 ft) in depth (U.S. EPA 1988a, p. 3-9).

20-m Water Depth. Model results for maximum allowable discharge rates at a depth of 20 m (66 ft) reveal that the minimum solids dilution at 100 m (328 ft) was 1,326:1 and the minimum dissolved-component dilution at 100 m (328 ft) was 747:1. Approximately 84.4 percent of the discharged solids were deposited within the mixing zone, with a maximum deposition depth of 112.0 cm (44 in). The maximum mud depth occurred 30 m (98 ft) from the discharge; the mud depth at the edge of the mixing zone was 7.15 cm (2.8 in) (Table 7).

40-m Water Depth. The modeled discharge of 1,000 bbl/h (159,091 L/h) of drilling muds to waters 40 m (131 ft) deep caused a minimum solids dilution of 1,173:1 at 100 m (328 ft) and a minimum dissolved-fraction dilution of 1,592:1 at 100 m (328 ft). A maximum mud deposition depth of 63.9 cm (25.1 in) occurred 10 m (33 ft) from the discharge. The mud depth at the end of the mixing zone was 7.33 cm (2.9 in) and the estimated percentage of discharged solids deposited within the mixing zone was 39.9 percent (Table 7).

Effect of varying total discharge on predicted-maximum sediment depth. The drilling mud deposited on the sediment surface may physically impact benthic communities within the area of coverage, and the potential impact depends on the character and depth of the deposited solids (see Section 5.3). Since the total amount of drilling mud produced by each exploratory well may vary somewhat about the predicted average, the model-predicted mud depth at the edge of the mixing zone was calculated for a range of total discharge scenarios. These scenarios ranged from 10 to 500 percent of the average total drilling mud discharge for a typical well in the Chukchi Sea area [i.e., 59,874 to 2,993,710 kg (131,000 to 6,600,000 lb) of drilling muds]. The depth of deposited mud for each water depth and total mud discharge was calculated using the appropriate conversion factor as outlined above. All open-water cases represent a modeled unidirectional current speed of 10 cm/sec (0.33 ft/sec).

The model-predicted mud deposition depth at the edge of the mixing zone for discharge to waters 40 m deep ranged from 0.8 to 36.5 cm (0.3 to 14.4 in) (Table 8). Mud deposits of less than 1-cm depth are predicted to occur at the edge of the mixing zone for discharges of 59,874 kg (132,000 lb) or less (i.e., 10 percent of the average or less). Mud deposits beyond the mixing zone are predicted to be less, and the maximum mud depth [63.9 cm (25.2 in) for the average total discharge] occurs within the mixing zone (see Table 7).

TABLE 6. OOC MODEL INPUT PARAMETERS HELD CONSTANT	
Discharge Conditions	
Duration (hr)	1.0[a]
Angle of Pipe (Degrees Downward From Horizontal)	90.0
Depth Of Pipe Mouth (m)	0.3
Pipe Radius (m)	0.1
Rig Type	Jackup
Rig Length (m)	70.1
Rig Width (m)	61.0
Rig Wake Effect	Included
Drilling Mud Characteristics	
Bulk Density (g/cm^3)	2.085
Initial Solids Concentration in Whole Mud (mg/l)	1,441,000

Mud Particle Distribution

Class No.	Density (g/cm^3)	Volume Fraction In Whole Mud (cm^3/cm^3)	Settling Velocity (cm/sec)	Settling Velocity (ft/sec)
1	3.959	0.0364	0.658	0.021600
2	3.959	0.0364	0.208	0.006820
3	3.959	0.0437	0.085	0.002780
4	3.959	0.0728	0.044	0.001430
5	3.959	0.1383	0.023	0.000758
6	3.959	0.0364	0.013	0.000427

Receiving Water Characteristics

Significant Wave Height (m)[a]	0.6
Significant Wave Period (sec)[a]	12.0
Surface Water Density (σ_t)	22.0
Density Gradient ($\Delta\sigma_t$/m)	+0.1

[a] All under-ice model runs omitted the effect of waves in the model.

TABLE 7. SUMMARY OF OOC MODEL RESULTS FOR OPEN-WATER DISCHARGE TEST CASES REPRESENTATIVE OF THE ARCTIC NPDES GENERAL PERMIT AREA OF COVERAGE

Modeling Test Case	OWC1	OWC2	OWC3	OWC4
Water Depth	40 m	20 m	5 m	2 m
Discharge Rate	1,000 bbl/h (159,091 L/h)	750 bbl/h (119,318 L/h)	500 bbl/h (79,545 L/h)	250 bbl/h (39,773 L/h)
Total Solids Discharged (kg)	598,742	598,742	598,742	598,742
Unidirectional Current Speed (cm/sec)	10	10	10	10
Minimum Solids Dilution at 100 m	1,173:1	1,326:1	7,400:1	NM
Minimum Dissolved Dilution at 100 m	1,592:1	747:1	356:1	NM
Maximum Depth of Deposited Mud (cm)[a]	63.9	112.0	452.4	NM
Distance from Discharge for Maximum Mud Depth (m)	10	30	< 10	< 10
Estimated Mud Deposition Depth (cm) at Edge of Mixing Zone[a]	7.33	7.15	0.32	NM
Estimated Percentage of Discharged Solids Deposited Within the Mixing Zone	39.9	84.4	98.8	NM

[a] Derivation of this value assumes a discharge of 598,742 kg (1,320,000 lb) of dry drilling mud for the average exploratory well depth of 3,170 m (10,400 ft).

NM = Not meaningful. The maximum depth of mud deposition was greater than the discharge depth. As a result, any calculations of dilution and mud accumulation at the edge of the mixing zone are meaningless.

The model-predicted mud deposition depth at the edge of the mixing zone for discharge to waters 20-m deep ranged from 0.7 to 36.0 cm (0.3 to 14.2 in) (Table 8). Mud deposits of less than 1-cm depth are predicted to occur at the edge of the mixing zone for discharges of 59,874 kg (132,000 lb) (i.e., 10 percent of the average). Mud deposits beyond the mixing zone are predicted to be less, and the maximum mud depth [112 cm (44 in) for the average total discharge] occurs within the mixing zone (see Table 7).

The model-predicted mud deposition depth at the edge of the mixing zone for discharge to waters 5-m deep ranged from 0.03 to 1.5 cm (0.01 to 0.59 in) (Table 8). Mud deposits of less than 1-cm depth are predicted to occur at the edge of the mixing zone for discharges of 1,796,226 kg (3,960,000 lb) (i.e., 300 percent of the average) or less. Mud deposits beyond the mixing zone are predicted to be less, and the maximum mud depth [452 cm (178 in) for the average total discharge] occurs within the mixing zone (see Table 7).

3.1.3.2 Below-Ice Discharges. Ice typically covers more than 90 percent of the Beaufort Sea Area of Coverage from November through May (U.S. DOI 1990, p. III-A-10). Therefore, if exploratory drilling is to occur during these months, drilling mud discharge must take place below or above the ice.

Ice coverage impacts drilling discharges mainly by reducing current velocities. Currents below the ice within the Beaufort Sea Area of Coverage possess mean speeds up to 5 cm/sec (0.2 ft/sec) (U.S. EPA 1988a, p. 3-15). Higher velocities have been recorded in some areas. Current measurements taken 100 m (330 ft) below the ice in 225 m (740 ft) of water north of Oliktok Point had a mean speed of 13 cm/sec (0.4 ft/sec), with episodic speeds reaching more than 50 cm/sec (1.6 ft/sec) (U.S. EPA 1984a, p. 51). Under-ice drifter releases near Prudhoe Bay showed a net shoreward movement of water some 10 km (5.4 nmi) offshore (U.S. EPA 1984a, p. 51). Nearshore movements tended to be slow (a few cm/sec) (U.S. EPA 1984a, p. 51).

The nearshore Chukchi Sea is covered by ice for approximately 8 months of the year, from early October through late May. Current velocities under the ice pack are typically less than 5 cm/sec (0.1 kn) (Jones & Stokes 1990, p. 34), much lower than current speeds found during the open water season. The OOC model predicts that for discharges occurring at a given depth and water column density structure, reducing current speed will increase the dilution of solid components at the edge of the mixing zone [100 m (330 ft) from the point of discharge] due to increased settling of particles prior to reaching the mixed zone boundary.

The low current velocities during periods of ice cover is expected to lead to minimal dilution and dispersion. This agrees with results obtained for several shallow-water studies evaluating under-ice effluent disposal in Alaskan OCS areas.

Northern Technical Services (1981) conducted two shallow water under-ice effluent disposal studies in 8.4 m (27.6 ft) and 5.5 m (18.0 ft) off Reindeer Island in the Beaufort Sea. The minimum dilution was 112:1 at a distance of 61 m (200 ft) from the point of discharge. This value is about an order of magnitude lower than solids dilutions typical of open-water disposal studies (see Table 7).

Northern Technical Services (1984, pp. 1-27) conducted a study to determine the areal extent and distribution of drilling solids discharged from Seal Island, an artificial gravel island located at a depth of 12 m (39 ft) in the Beaufort Sea. The area of cuttings deposited was limited mainly to the submerged portion of the island. Cuttings 8-15 cm (3-6 in) thick extended less than 61 m (200 ft) beyond the toe of the island.

Northern Technical Services (1985) identified the distribution of drilling muds discharged under the ice from Mukluk Island, an artificial gravel island located approximately 45 km (24 nmi) offshore in a depth of 15 m (49 ft). Analysis of trace metal concentrations in bottom sediments near the Mukluk Island discharge site indicated that drilling muds were deposited up to 155 m (509 ft) from the toe of the island (U.S. EPA 1988a, p. 3-17). Although metals levels were elevated from the ambient levels for the area, they were still within the range of values found elsewhere in the Beaufort Sea.

Below-ice drilling mud discharges were examined with the OOC model for the same depth and discharge rate scenarios used when evaluating open-water discharges. However, current speeds for below-ice runs were reduced from the 10 cm/sec (0.33 ft/sec) speed used in the open-water runs to 2 cm/sec (0.07 ft/sec).

5-m Water Depth. The modeled maximum allowable drilling mud discharges [500 bbl/h (79,545 L/h)] into waters 5 m (16 ft) deep caused a minimum solids dilution of 27,521:1 at the edge of the mixing zone and a minimum dissolved dilution of 972:1 at the edge of the mixing zone. A maximum mud depth of 487.2 cm (191.8 in) occurred less than 10 m (33 ft) from the discharge. The estimated mud deposition depth at the edge of the mixing zone was 0.02 cm (0.008 in); more than 99 percent of the discharged solids were deposited within the mixing zone (Table 9).

20-m Water Depth. In waters 20 m (66 ft) in depth the modeled discharge of drilling muds at a rate of 750 bbl/h (119,318 L/h) caused a minimum solids dilution of 5,584:1 and a minimum dissolved dilution of 1,052:1 at the edge of the mixing zone. A maximum mud deposition depth of 257.6 cm (101.4 in) occurred less than 10 m (33 ft) from the discharge. An estimated 89.5 percent of the discharged solids were deposited in the mixing zone, with a mud deposition depth at the edge of the mixing zone of 0.14 cm (0.06 in) (Table 9).

40-m Water Depth. The modeling of the maximum allowable drilling mud discharges into waters 40 m (131 ft) in depth caused a solids dilution of 1,552:1 and a dissolved dilution of 1,938:1 at the edge of the mixing zone. A maximum mud deposition depth of 67.1 cm (26.4 in) occurred 50 m (164 ft) from the discharge. The drilling mud depth at the edge of the mixing zone was 1.1 cm (0.43 in); 54.6 percent of the discharged solids were deposited in the mixing zone (Table 9).

Effect of varying total discharge on predicted-maximum sediment depth. The drilling mud deposited on the sediment surface may physically impact benthic communities within the area of coverage, and the potential impact depends on the character and depth of the deposited solids (see Section 5.3). Since the total amount of drilling mud produced by each exploratory well may vary somewhat about the predicted average, the model-predicted mud depth at the edge of the mixing zone was calculated for a range of total discharge scenarios. These scenarios ranged from 10 to 500 percent of the average total drilling mud discharge for a typical well in the Chukchi Sea Area of Coverage [i.e., 59,874 to 2,993,710 kg (131,000 to 6,600,000 lb) of drilling muds]. The depth of deposited mud for each water depth and total mud discharge was calculated using the appropriate conversion factor as outlined above. All below-ice cases represent a modeled unidirectional current speed of 2 cm/sec (0.066 ft/sec).

The model-predicted mud deposition depth at the edge of the mixing zone for discharge to waters 40-m deep ranged from 0.19 to 9.5 cm (0.07 to 3.7 in) (Table 10). Mud deposits of less than 1-cm depth are predicted to occur at the edge of the mixing zone for discharges of 229,371 kg (660,000 lb) or less (i.e., 50 percent of the average or less). Mud deposits beyond the mixing zone are predicted to be less, and the maximum mud depth [67.1 cm (26.4 in) for the average total discharge] occurs within the mixing zone (see Table 9).

The model-predicted mud deposition depth at the edge of the mixing zone for discharge to waters 20-m deep ranged from 0.014 to 0.70 cm (0.005 to 0.28 in) (Table 10). Mud deposits of less than 1-cm depth are predicted to occur at the edge of the mixing zone for all percentages of the average discharge which were evaluated. Mud deposits beyond the mixing zone are predicted to be less, and the maximum mud depth [257.6 cm (101.4 in) for the average

TABLE 8. ESTIMATED DEPTH OF DRILLING MUDS AT THE EDGE OF THE MIXING ZONE FOR OPEN-WATER DISCHARGE

Water Depth and Discharge Rate	Percent of average total discharge							
	10%	25%	50%	100%	200%	300%	400%	500%
	Total drilling mud discharged in kilograms (pounds)							
	59,874 (132,000)	149,686 (330,000)	229,371 (660,000)	598,742 (1,320,000)	1,197,484 (2,640,000)	1,796,226 (3,960,000)	2,394,968 (5,280,000)	2,993,710 (6,600,000)
	Mud depth at edge of mixing zone (cm)							
40 m 1000 bbl/h (159,091 L/h)	0.8	1.9	3.7	7.3	14.6	21.9	29.2	36.5
20m 750 bbl/h (119,318 L/h)	0.7	1.8	3.6	7.2	14.4	21.6	28.8	36.0
5 m 500 bbl/h (79,545 L/h)	0.03	0.08	0.15	0.3	0.6	0.9	1.2	1.5

Note: Shaded areas indicate model scenarios that predict a drilling mud depth of less than 1 cm in areas beyond the 100-m mixing zone boundary.

TABLE 9. SUMMARY OF OOC MODEL RESULTS FOR BELOW-ICE DISCHARGE TEST CASES REPRESENTATIVE OF THE ARCTIC NPDES GENERAL PERMIT AREA OF COVERAGE

Modeling Test Case	UIC5	UIC6	UIC7	UIC8
Water Depth	40 m	20 m	5 m	2 m
Discharge Rate	1000 bbl/h (159,091 L/h)	750 bbl/h (119,318 L/h)	500 bbl/h (79,545 L/h)	250 bbl/h (39,773 L/h)
Total Solids Discharged (kg)	598,742	598,742	598,742	598,742
Unidirectional Current Speed (cm/sec)	2	2	2	2
Minimum Solids Dilution at 100 m	1,552:1	5,584:1	27,521:1	NM
Minimum Dissolved Dilution at 100 m	1,938:1	1,052:1	972:1	NM
Maximum Depth of Deposited Mud (cm)[a]	67.1	257.6	487.2	NM
Distance from Discharge for Maximum Mud Depth (m)	50	< 10	< 10	NM
Estimated Mud Deposition Depth (cm) at Edge of Mixing Zone[a]	1.1	0.14	0.02	NM
Estimated Percentage of Discharged Solids Deposited Within the Mixing Zone	54.6	89.5	99.3	NM

[a] Derivation of this value assumes a discharge of 598,742 kg (1,320,000 lb) of dry drilling mud for the average exploratory well depth of 3,170 m (10,400 ft).

NM = Not meaningful. The maximum depth of mud deposition was greater than the discharge depth. As a result, any calculations of dilution and mud accumulation at the edge of the mixing zone are meaningless.

total discharge] occurs within the mixing zone (see Table 9).

The model-predicted mud deposition depth at the edge of the mixing zone for discharge to waters 5-m deep ranged from 0.002 to 0.10 cm (0.0008 to 0.04 in) (Table 10). Mud deposits of less than 1-cm depth are predicted to occur at the edge of the mixing zone for all percentages of the average discharge which were evaluated. Mud deposits beyond the mixing zone are predicted to be less, and the maximum mud depth [487.2 cm (191.8 in) for the average total discharge] occurs within the mixing zone (see Table 9).

3.1.3.3 Above-Ice Disposal. The relevant information regarding above-ice disposal of drilling muds in offshore waters of the Beaufort and Chukchi Seas, and adjacent coastal waters are discussed below. No modeling results are presented due to the lack of an adequate model for above-ice drilling mud disposal.

The discharge of drilling muds and cuttings above ice is usually accomplished by depositing the effluent on the ice in large frozen chunks. It may also be spread in thin layers on the ice within berms to keep the disposal site intact as long as possible. Dilution and dispersion of the effluent occur at ice breakup.

Modeling of the transport and fate of muds in above-ice disposal sites is difficult due to the complexities of ice breakup processes. According to U.S. EPA (1984a, p. 50), field studies have found that the maximum mud concentration entering the marine environment from above-ice disposal sites is much less than the concentration introduced by below-ice discharge. Dilution of muds discharged above ice should be similar to or greater than that occurring during discharge to open waters, as the solids are released slowly during ice melting and breakup allowing greater dispersion.

3.1.3.4 Shunting of Discharges. The relevant information regarding the shunting of drilling mud discharges to offshore waters of the Beaufort and Chukchi Seas, and adjacent coastal waters are discussed below.

Both open-water and below-ice discharges can be shunted (i.e., discharged at depth rather than near the surface). Shunting of drilling mud reduces the effective depth of the discharge, and therefore, reduces both the dissolved- and solids-fraction dilution. Table 11 provides dilution and deposition results obtained when using the OOC model with discharges shunted below the surface. Although the shunting cases modeled are not directly comparable to the other open-water and below-ice cases, they do illustrate the reduced dissolved dilutions obtained when discharges are shunted. The frequency of shunting during exploratory oil and gas drilling is unknown, as are the discharge depths that occur during shunting. However, it is likely that any shunting that does occur is only to a depth equivalent to the draft of the drilling ship or rig used (Choof, B., 3 October 1991, personal communication). The effects of shunting are likely to be minimal in deep waters, but may potentially be a cause of concern in shallower waters.

3.2 SUMMARY

Computer modeling of drilling discharges and results obtained in other OCS areas support the following conclusions for drilling mud discharges in the area of coverage:

- Drilling muds tend to be diluted rapidly following discharge. For a given discharge rate and mud density, the dilution is dependent on the density structure of the water column, the water depth, and current speed. During open-water discharge, dilution of dissolved components are on the order of 750-1,600:1 in deep waters [20 to 40 m (66 to 131 ft)] and 356:1 in shallow waters [5 to 20 m (6.6 to 66 ft)] within 100 m (330 ft) of the discharge (Table 7).

- Of the three disposal methods available--open water, above-ice, and below-ice disposal--below-ice disposal is the least desirable due to the lesser dilution and dispersion potential for discharges.

- The deposition and dilution of drilling muds for above-ice disposal has not been modeled; however, dilution of muds is thought to be similar or greater than that occurring during discharge to open water (U.S. EPA 1984a, p. 50).

- Exploratory drilling solids deposition and accumulation is limited to the immediate discharge area. Studies of actual discharges from gravel islands in the Beaufort Sea (Northern Technical Services 1984; 1985) have shown that the area of significant deposition is generally limited to an area within 500 m (1,650 ft) of the discharge site.

- Based on OOC model results, deposition of drilling mud may exceed a depth of 1 cm (0.4 in) outside the mixing zone for open-water discharge in water-depths from 20 to 40 m (66 to 131 ft) and surface current speeds of 10 cm/sec (0.20 kn) (Table 7). For below-ice discharges, muds deposited in excess of 1-cm (0.4-in) in depth outside the mixing zone may occur during discharges to water depths of 40 m (131 ft) (Table 9).

- Based on estimates of mud deposit depths for open-water discharge of various total drilling mud discharges it was determined that drilling mud deposits less than 1-cm deep outside of the mixing zone for surface current speeds of 10 cm/sec (0.20 kn) are not predicted by the model for discharges to waters 40- and 20-m deep unless the total drilling mud discharged is reduced by 90 percent.

- Based on estimates of mud deposit depths for below-ice discharges of various total drilling mud discharges it was determined that a drilling mud deposits less than 1-cm deep outside of the mixing zone for surface current speeds of 2 cm/sec (0.04 kn) are predicted by the model for total mud discharges as high as 5 times the average to waters 5-m or 20-m deep. For discharges to waters 40-deep, mud deposits less than 1-cm deep beyond the mixing zone are not predicted by the model unless the total drilling mud discharged is reduced by 50 percent (Table 10).

- Shunting of drilling muds should be avoided in shallow waters due to the reduced dissolved-fraction dilution it causes. Data concerning the frequency of shunting and the depths at which it occurs are not available.

TABLE 10. ESTIMATED DEPTH OF DRILLING MUDS AT THE EDGE OF THE MIXING ZONE FOR BELOW-ICE DISCHARGE

Water Depth and Discharge Rate	Percent of average total discharge							
	10%	25%	50%	100%	200%	300%	400%	500%
	Total drilling mud discharged in kilograms (pounds)							
	59,874 (132,000)	149,686 (330,000)	229,371 (660,000)	598,742 (1,320,000)	1,197,484 (2,640,000)	1,796,226 (3,960,000)	2,394,968 (5,280,000)	2,993,710 (6,600,000)
	Mud depth at edge of mixing zone (cm)							
40 m 1000 bbl/h (159,091 L/h)	0.11	0.28	0.55	1.1	2.2	3.3	4.4	5.5
20 m 750 bbl/h (119,318 L/h)	0.014	0.035	0.07	0.14	0.28	0.42	0.56	0.70
5 m 500 bbl/h (79,545 L/h)	0.002	0.005	0.01	0.02	0.04	0.06	0.08	0.10

Note: Shaded areas indicate model scenarios that predict a drilling mud depth of less than 1 cm in areas beyond the 100-m mixing zone.

TABLE 11. SUMMARY OF OOC MODEL RESULTS FOR SHUNTING TEST CASES

Modeling Test Case	SHC9	SHC10	SHC11	SHC12
Water Depth	40 m	40 m	40 m	40 m
Shunting Depth	20.3 m	35.3 m	35.3 m	38.3 m
Discharge Rate	750 bbl/h (119,318 L/h)	500 bbl/h (79,545 L/h)	250 bbl/h (39,773 L/h)	250 bbl/h (39,773 L/h)
Total Solids Discharged (kg)	598,742	598,742	598,742	598,742
Unidirectional Current Speed (cm/sec)	10	10	10	10
Minimum Solids Dilution at 100 m	1,284:1	1,821:1	3,595:1	>1,000,000:1
Minimum Dissolved Dilution at 100 m	150:1	293:1	566:1	242:1
Maximum Depth of Deposited Mud (cm)[a]	152.4	463.3	461.8	507.5
Distance from Discharge (m) for Maximum Mud Depth	20	<10	<10	<10
Estimated Mud Deposition Depth (cm) at Edge of Mixing Zone (100 m)[a]	9.62	2.76	2.39	0.00
Estimated Percentage of Discharged Solids Deposited Within the Mixing Zone	84.0	98.2	97.7	100

[a] Derivation of this value assumes a discharge of 598,742 kg (1,320,000 lb) of dry drilling mud for the average exploratory well depth of 3,170 m (10,400 ft).

4.0 POTENTIAL IMPACTS OF DRILLING MUD ON ARCTIC MARINE ORGANISMS

Drilling muds, or fluids, are complex mixtures of clays and chemicals, and their potential impact on marine organisms has been examined in several studies. Recent reviews of studies conducted in federal OCS areas include Neff (1982), National Research Council (1983), Petrazzuolo et al. (1985), and Parrish and Duke (1990). Other studies identified in the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a, Section 5) also present data from federal OCS areas.

This section briefly summarizes studies of both the chemical and physical effects of drilling mud on Alaskan marine organisms. It includes lethal and sublethal toxicity, potential for bioaccumulation, possible human health impacts, and potential physical effects such as smothering of the benthos, sediment alteration, and indirect effects through food supply reduction. Impacts on various taxonomic groups are discussed in greater detail in the Diapir Field OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a, Section 5 and Appendices A-E) and Norton Basin Sale 100 ODCE (U.S. EPA 1986a, Section 5 and Appendices A-E). Studies of chemical effects (toxicity and bioaccumulation) of drilling mud discharges are discussed in detail in the Sale 100 ODCE (U.S. EPA 1986a, Section 5 and Appendix F).

Research conducted in previous studies provides sufficient information to make reasonable judgments concerning some of the effects of discharged drilling mud on aquatic organisms, although these tests often have limitations. One general difficulty is that exposure to drilling mud may cause both chemical toxicity and physical effects. In tests of some species, particularly larvae, it may be difficult to separate chemical toxicity from physical effects such as burial of the test organism, clogging of gills, and abrasion (U.S. EPA 1986a, p. 5-1). Physical effects on marine organisms should, therefore, be considered in conjunction with chemical toxicity when evaluating the environmental impacts of drilling mud discharges.

Field studies generally are not designed to distinguish between chemical and physical effects of drilling mud and cuttings discharges. Limitations and descriptions of previous studies may be found in the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a, pp. 83-84).

4.1 CHEMICAL TOXICITY OF DRILLING MUD

A variety of Alaskan marine organisms have been exposed to drilling mud in laboratory or field experiments. Most of these studies have addressed short-term acute effects in a relative or "screening" sense, with little effort directed at separating chemical from physical causes. [In aquatic toxicity tests, a response measuring lethality observed in 96 hours or less is typically considered acute (U.S. EPA 1990)]. A few studies have looked at chronic sublethal effects and bioaccumulation of heavy metals from drilling mud. Chronic refers to a stimulus that lingers or continues for a relatively long period of time, often one-tenth of the life span of an organism or more (U.S. EPA 1990). Results are typically reported as LC50s (concentrations lethal to 50 percent of the test organisms) or median effective concentrations [EC50s (concentrations at which a designated effect is displayed by 50 percent of the test organisms)]. Because drilling discharges are episodic and typically only a few hours in duration (Jones & Stokes 1990, p. 44), organisms that live in the water column are not likely to have long-term exposures to drilling muds; risks to these organisms are best assessed using acute toxicity data. Benthic organisms, particularly sessile species, are likely to be exposed for longer time periods; risks to these organisms are best assessed with chronic toxicity data.

4.1.1 Acute Lethal and Sublethal Effects

The effects of drilling muds on biological organisms are most commonly assessed by conducting acute laboratory toxicity tests. Unfortunately, in many cases, comparison of toxicity test results obtained in different studies are difficult because different drilling muds were used, the animals were exposed to different portions of drilling mud (liquid, suspended particulates, or solids) that may have been prepared in a different manner, or experimental procedures differed between investigators. Nevertheless, results obtained in the majority of studies to date have not shown drilling mud to have a high degree of acute toxicity (U.S. EPA 1988a, p. 5-2; 1988b, p. 5-3). For example, Parrish and Duke (1990, p. 215) reviewed research findings on the toxicity of drilling muds used in the Gulf of Mexico and concluded that available models suggest that discharges made from oil platforms in open, well-mixed waters deeper than about 20 m (66 ft) will result in no detectable acute effects, except within a few hundred meters of the point of discharge.

The current NPDES permits for the Chukchi and Beaufort Seas have incorporated a standard acute toxicity test using the mysid *Mysidopsis bahia*. Under these permits, discharge of muds with a LC50 of less than 30,000 ppm SPP (suspended particulate phase) is prohibited. Drilling mud toxicity data compiled by U.S. EPA, Region 10 (1993b) from Alaskan exploratory and production wells indicate that the muds used in all current and recent operations are acutely toxic only to a slight degree to *Mysidopsis bahia*. LC50s for the 91 valid toxicity test data points ranged from 2,704 to 1,000,000 ppm SPP (suspended particulate phase) with a mean of 540,800 ppm. Only 7 of the 91 tests had a LC50 less than the 30,000 ppm limit. The complete mud toxicity database is reproduced in Appendix B. Some of the records in this database (shaded) were not included in the above statistics due to pH or other protocol breaches, incomplete reports, etc.

In general, planktonic and larval forms appear to be the most sensitive of the Alaskan organisms that have been exposed to drilling mud in acute lethal bioassays (see Appendix C). Several examples are mentioned in the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a), including the following: the diatom *Skeletonema costatum*, which had EC50s as low as 540 parts per million (ppm) in mixed whole drilling mud and 1,600 ppm in mixed barite, a major drilling mud component; pink salmon fry (*Oncorhynchus gorbuscha*), which had a LC50 of 3,000 ppm in whole mud; and dock shrimp (*Pandalus danae*), which had a LC50 of 600 ppm when exposed to whole used drilling mud. As discussed in the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a, p. 78), the data obtained for the dock shrimp are not considered to be representative of the generic muds that would be discharged in the Arctic region, as the mud tested was formulated with a component containing hexavalent chromium, which is highly toxic to marine life.

Not all planktonic organisms are sensitive to short-term exposure to drilling muds. Carls and Rice (1984, p. 45) found several drilling muds to have low toxicity to the larvae of six Alaskan species of shrimp and crab. The 96-h LC50s for the suspended particulates phase of a drilling mud seawater mixture ranged from 500 to 9,400 ppm. Toxicity was far less when the particulates were removed: the 96-h LC50s ranged from 5,800 to 119,000 ppm.

The LC50s for these Alaskan species can be compared to estimated concentrations of whole mud at the edge of the mixing zone [100 m (330 ft) from the point of discharge]. In the Sale 109 ODCE (U.S. EPA 1988b, p. 5-4), drilling mud concentrations at the edge of the mixing zone were estimated to be approximately 4,000 ppm for a dilution (fluid component) of 248:1. A similar calculation for dilutions predicted for open-water discharge in the Beaufort and Chukchi areas of coverage (Case OWC1, Table 7) gives an estimated mud concentration of 399 ppm for dissolved components and 1,228 ppm for solid components at the edge of the mixing zone. While the LC50s for the diatom species and the dock shrimp lie within the estimated range calculated for drilling mud concentration, it is unlikely that organisms will be exposed to these concentrations for periods of time typically used to determine acute toxicity (96 h), as drilling mud discharges are episodic with durations of only a few hours (Jones & Stokes 1990, p. 44).

There are several Alaskan taxa that have not been exposed to drilling mud but may be relatively sensitive. The temperate copepod, *Acartia tonsa,* has exhibited one of the lowest LC50s (100 ppm) of any organism in a drilling mud test (see OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE, U.S. EPA 1984a, p. 79). Alaskan copepods have not been tested, but there is no reason to believe their tolerances would fall outside variability in tolerances of other marine copepods.

The majority of Alaskan organisms apparently show high tolerance to acute exposure to drilling mud (see Appendix C). Sublethal effects observed following acute exposure have included alteration of respiration and filtration rates, enzyme activities, and behavior (see U.S. EPA 1984a, Appendix F, Table F-2).

4.1.2 Chronic Effects

Few studies have evaluated impacts on Alaskan species following chronic exposure to drilling muds. The species that have been tested are all invertebrates. The test results are summarized in Appendix Table F-2 of the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a). The lowest reported concentration of drilling mud producing a significant sublethal chronic effect was 50 mg/L for 30 days of continuous exposure with bay mussels, and there was no attempt to separate chemical from physical effects (U.S. EPA 1988a, p. 5-3).

A recent laboratory study examined the chronic toxicity of cuttings from Beaufort Sea wells on the sand dollar (*Echinarachnius parma*) (Osborne and Leeder 1989). Exposure to mixtures as low as 10 percent cuttings/90 percent sand were found to affect the survival of the benthic organisms, with 100 percent mortality occurring within 23 days in some test cases.

4.1.3 Bioaccumulation

Bioaccumulation of heavy metals and petroleum hydrocarbons are two topics of concern. Existing data for Alaskan species are inadequate for quantification of potential long-term effects. However, the available data suggest that there appears to be a toxicologically insignificant hazard to aquatic life (e.g., invertebrates, fish, marine mammals, and birds) from consumption of aquatic organisms that have been exposed to discharges from exploratory oil drilling operations. The same conclusion applies to commercial, recreational, and subsistence harvests. The basis for these conclusions is provided in the Sale 100 ODCE (U.S. EPA 1986a) and in the discussion below.

Heavy metals and petroleum hydrocarbons undergo varying degrees of bioconcentration [the process whereby chemical substances enter aquatic organisms directly from the water through gills or epithelial tissue (Macek et al. 1979, p. 252)] and bioaccumulate [the process that includes bioconcentration along with any increase in chemical residues from dietary intake (Macek et al. 1979, p. 252)] in marine organisms. Organisms equilibrate with the food and water concentrations of the chemicals to which they are exposed. The chemical residues retained by the organisms are believed to be a function of their lipid contents, and concentrations of certain chemical-binding proteins and peptides that are involved in detoxification (Brown et al. 1985, p. 365; Gossett et al. 1983, p. 389; Veith et al. 1979, p. 1044). Bioconcentration is considered the main route of uptake (Macek et al. 1979, p. 251), with dietary sources usually supplying a minor fraction of the body burden. When marine organisms are transferred from higher to lower concentrations of heavy metals, they will depurate (eliminate via excretion) the substances to varying degrees. Only for certain compounds is depuration so slow that tissue concentrations remain elevated for the life of the organism (U.S. EPA 1986a, p. F-25).

4.1.3.1 Heavy Metals. A variety of heavy metals occur in drilling muds (see Section 2.0). Metal accumulation studies for Alaskan species are discussed in Appendix F of the Sale 83 ODCE (U.S. EPA 1984b) and results of investigations on both Alaskan and non-Alaskan species are summarized in Appendix F of the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a) and Appendix Table F-3 of the Sale 100 ODCE (U.S.

EPA 1986a).

Bioaccumulation of mercury, one of the few metals known to bioaccumulate and undergo biomagnification, has not been studied in laboratory tests of drilling mud using Alaskan species. A recent study by Neff et al. (1989) examined the bioaccumulation of mercury and other trace metals found naturally in barite, the major weighting agent in most water-based drilling muds, using four benthic species from Massachusetts waters. Two of these species, the sand worm (*Nereis virens*) and the soft-shell clam (*Mya arenaria*), are congenic (same genus) in Alaskan waters. Mercury and arsenic appeared to be the least bioavailable of all the metals tested. Metals did not show consistent and statistically significant bioaccumulation in any of the four species of test animals. Although mercury discharged in drilling muds is largely inorganic and not bioavailable, virtually any mercury compound may become a bioaccumulation hazard for organisms since bacteria common to most natural waters are capable of biomethylating the metal (Callahan et al. 1979). Additional studies need to be performed to determine the degree to which discharge of drilling muds to Alaskan waters, which contain on average 0.1 mg/kg mercury (Table 1), may increase the possibility for its bioaccumulation in Alaskan marine organisms. Mercury exists naturally in sediments in many areas of Alaska and a variety of marine mammals have been found to have tissue concentrations in excess of FDA standards for human consumption (U.S. EPA 1984a, Appendix F).

Cadmium can accumulate to high levels in marine organisms (Olla et al. 1988), can biomagnify, and is toxic to humans. Trace metal concentrations, including cadmium, have been monitored in several Beaufort Sea invertebrate species in 1986, 1987, and 1989 (Boehm et al. 1990, p. 5-18). No consistent trend in cadmium bioaccumulation was apparent between the 1986-87 data and the 1989 data even though the two-year gap in the monitoring program between 1987 and 1989 was characterized by an increased level of exploratory oil drilling (Boehm et al. 1990, p. 5-51). Cadmium concentrations ranged from 0.8 mg/kg for the amphipod *Anonyx* in 1986-87 to 14 mg/kg for the clam *Astarte* in 1986-87. Table 1 indicates that drilling muds can contain cadmium concentrations as high as 12 mg/kg. If drilling mud discharges significantly increase cadmium concentrations in marine or anadromous organisms eaten by people, adverse impacts to human health could ensue. The Sale 100 ODCE for Norton Basin, Alaska (U.S. EPA 1986a, p. F-25) stated that the potential threat to human health accruing from consumption of fish and shellfish contaminated with cadmium, chromium, lead, zinc and barium is not serious enough to warrant FDA setting "action levels" for these metals because of the magnitude of the bioconcentration factors (BCF) (the ratio of the tissue metal concentration to the metal concentration in the test media), the rapidity of depuration, and the absence of bioaccumulation for these metals.

Barium is a major constituent of drilling muds and is the metal that has been observed to accumulate to the greatest extent in organisms exposed to drilling mud (U.S. EPA 1984a, p. 56). Laboratory studies of barium uptake have not been performed with Alaskan species; however, 350-fold accumulations have been reported in other species. A field study found no statistically significant increase in barium concentrations for Beaufort Sea clams and amphipods during a period of exploratory drilling from 1986-87 to 1989 (Boehm et al. 1990, p. 5-18). Concentrations ranged from 21 mg/kg for the clam *Astarte* in 1986-87 to 117 mg/kg for the clam *Macoma* in 1986-87. Barium is less toxic to humans than either mercury or cadmium. Calculations provided in the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a, Appendix F) estimate that 5-15 kg (11-33 lb) of contaminated seafood would need to be consumed within a very short time [biologic half-life is less than 24 hours for humans (Goyer 1986)] to cause an adverse effect in a human.

4.1.3.2 Petroleum Hydrocarbons. A major question surrounding the disposal of oil-based muds is the potential for hydrocarbon bioaccumulation. The polycyclic aromatic hydrocarbons (PAH) are of particular concern due to their mutagenic and carcinogenic nature. PAH concentrations were measured in several Beaufort Sea invertebrate species in 1984-86 and 1989; the time period between the studies was characterized by an increased level of exploratory

EPA 1984a), including additional information presented by taxon in Appendices A-E of the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE.

4.3.1 Exposure to Suspended Solids

As discussed in Chapter 3, dispersion and dilution of the discharge plume is expected to be rapid, and discharges intermittent and localized. Therefore, adverse physical effects to biota from drilling discharge should be limited to the nearfield vicinity of exploratory drilling. Within this region, zooplankton and fish larvae near the discharge may experience altered respiratory or feeding ability due to stress, abrasion, or clogging of gills and feeding apparatus. Phytoplankton entrained in the discharge plume may have reduced productivity due to decreased light availability and exposure to elevated concentration of trace metals. These impacts should result in negligible impacts to populations in the region, as impacts should be restricted to the immediate vicinity of the discharge, and discharges are expected to be intermittent. Mobile invertebrates, fish, birds, and mammals presumably will avoid the discharge plume if conditions become stressful. Therefore, impacts are also expected to be negligible to these organisms.

Infaunal or sessile organisms near the discharge most likely will be adversely impacted by drilling discharge, but the area affected should be limited to the region in the immediate vicinity of the discharge.

4.3.2 Exposure to Deposited Solids

4.3.2.1 Smothering of Benthos. Many benthic invertebrates are relatively sedentary and sensitive to environmental disturbance and pollutants. Short-term effects of drilling muds and cuttings on benthic invertebrates are expected to include smothering of biota, especially by cuttings in the area near the discharge. As discussed in the Sale 100 ODCE (U.S. EPA 1986a, p. 5-13), deposition is likely to reduce abundances of benthos such as polychaetes, molluscs, and crustaceans, and may affect demersal eggs of various benthic species and fish. The greatest impact would be expected downcurrent along the plume's median axis.

Little information is presently available concerning the effects of various deposition depths on benthic communities. Most studies that have investigated deposition impacts on benthos have examined deposition of dredged materials (Hale 1972; Kranz 1974; Mauer et al. 1978; Oliver and Slattery 1973; Saila et al. 1972; Schafer 1972; Schulenberger 1970, Wilber 1992). These studies indicate that the response to deposition and survival following such an event is species-specific. Of the species examined, burial depths from which organisms were able to migrate to the surface ranged from 1 to 32 cm (0.4 to 12.6 in). If it is assumed that most benthos are not adversely affected by deposition of drilling muds less than 1 cm, benthos in the vicinity of the discharge receiving deposition in excess of this amount may be acutely impacted by drilling activities.

The long-term impacts of dredged sediments to the benthic community in the vicinity of a mining operation near Nome, Alaska have been examined (ENSR 1990a, 1990b). The recolonization by this community to the most severely impacted region of the mining operation [e.g., a dredge tailings pile 8.5 m (28 ft) deep] occurred within 5 years. This may indicate that the chronic effects of deposited sediments (or drilling muds) are reversible within a relatively short period of time.

The "mixing zone" concept incorporated into most NPDES permits, including those for oil and gas exploration, generally permits adverse impacts to benthic communities within the mixing zone. For the purposes of the general oil and gas permits, the mixing zone has been defined as a circle with a 100 m (328 ft) radius. Adverse impacts to benthic communities outside the mixing zone are not permitted. If it is assumed that solids deposition of greater than 1 cm represents an "adverse impact" to benthos, solids deposition outside the mixing zone must be less than 1 cm to meet previous permit requirements. For each of the OOC model case runs discussed in Chapter 3, the maximum depth of solids deposition occurred within the mixing zone. However, the predicted mud depth at the edge of the mixing zone was greater than 1 cm for all three of the open-water discharge scenarios modeled and the 40-m depth scenario for the under-ice discharges.

It is not possible to predict accurately the area within the entire Beaufort or Chukchi Sea Area of Coverage receiving deposition exceeding 1 cm, because of the uncertainty of drilling rig location and site-specific oceanographic conditions. A "worst case" scenario can be developed by using the largest calculated area from the OOC model case runs that would be expected to receive greater than 1 cm of solids deposition. For the open-water disposal option in a water depth of 40-m, approximately 1,651 m^2 (17,771 ft^2) would be expected to receive greater than 1 cm of mud deposition. This area multiplied by the total number of wells expected for the High Resource scenario in the Beaufort Sea (25 exploratory and 11 delineation well sites), would cover approximately 59,436 m^2 [5.9 ha (14.7 ac)]. Since the Beaufort Sea Area of Coverage encompasses approximately 8.95 million ha (22.1 million ac), approximately 0.0001 percent of the lease area would potentially receive greater than 1 cm deposition of drilling mud for this "worst case" scenario. An identical exercise using data from the Chukchi Sea yields a similar percentage. Although resource scenarios were not available for state waters, an estimate can be made assuming a resource scenario similar to that proposed for the Beaufort and Chukchi Sea Areas of Coverage. The area of the five proposed lease sales in state waters is approximately 1.06 million ha (2.63 million ac)(Alaska DNR 1993). The area expected to receive greater than 1 cm in drilling muds under a "worst case" scenario was calculated above as 5.9 ha (14.7 ac). This area represents only 0.0006 percent of the total proposed area of coverage in state waters for 1995-1997.

As mentioned above, the area value used in the above calculation does not include cuttings, and thus, should be considered an underestimate. However, given the extremely small percentage of the Beaufort and Chukchi Sea Areas of Coverage and state water areas of coverage expected to be covered by greater than 1 cm of deposited solids, the inclusion of cuttings in the calculations would not alter the conclusion that the impacted area is extremely small relative to the total areas. Also, the area receiving deposition greater than 1 cm (0.4 in) would most likely be less than these worst case estimates.

4.3.2.2 Demersal Fish Eggs. While no specific demersal fish spawning locations have been identified in any of the Arctic areas of coverage, a number of important species, including most cottids and eelpout, possess demersal eggs. Although unlikely during exploratory activities in either the Beaufort or Chukchi Seas due to the anticipated emphasis on deeper offshore drilling sites, demersal eggs could be smothered if discharge in a spawning area coincides with the period of egg production. Exploratory operations in state waters are more likely to adversely impact demersal fish spawning activities because spawning grounds are more commonly found in nearshore waters. The potential of drilling muds and cuttings to smother demersal fish eggs is probably the most serious potential impact of exploratory drilling to fish species.

Discussion of the potential relative sensitivity of demersal eggs to smothering effects, and a worst case evaluation, appears in the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a, p. 88).

4.3.3 Alteration of Sediment

Alteration of sediment characteristics is expected to impact the benthic community structure more subtly, but at greater distances from the point of discharge, than smothering. Benthos would be the group most affected by changes in the sediment, but other organisms may be affected as well. Impacts to benthic communities could conceivably affect epibenthic and pelagic invertebrates, fish, birds, and mammals that rely on benthic invertebrates for food.

Judging from impacts observed in other OCS areas, the magnitude of the observed impact depends on the total area receiving mud deposits, the depth of deposition, the difference between native sediments and deposited mud and

5.0 THREATENED AND ENDANGERED SPECIES

5.1 INTRODUCTION

The federal action under discussion in this document is the discharge of drilling muds, cuttings, and other fluids associated with exploratory oil and gas drilling. The wastestreams which can be legally discharged are listed in the general NPDES permits for the Beaufort and Chukchi Seas. The primary wastestreams considered in this evaluation are drilling muds and cuttings, which are of concern due to the large volumes discharged and the potentially toxic components of drilling muds (e.g., metals). Other minor pollutant sources which are potentially of concern and were considered in this evaluation are 1) deck drainage, 2) sanitary waste, 3) domestic waste, and 4) test fluids. A more complete discussion on these wastestreams can be found in the Fact Sheet for the Arctic NPDES General Permit for Oil and Gas Exploration. Additional permitted wastestreams were not considered in this evaluation because the volumes discharged are very small relative to the primary wastestreams.

The bowhead whale is currently identified by NMFS as an endangered species in the geographical area prescribed by the Arctic permit (Smith, B. 14 February 1995, personal communication; Zimmerman, S., 8 February 1993, personal communication; Pennoyer, S., 4 February 1994, personal communication). Steller's eider (Alaska breeding population), the spectacled eider, and the Arctic peregrine falcon, have been identified by USFWS as proposed as threatened, threatened and delisted/candidate 2 species in the above referenced area (U.S. DOI, 1 December 1994; Fadley, J., 6 February 1995; personal comunication). The Arctic peregrine falcon has been delisted but according to USFWS it should be evaluated as if it were a candidate species for the next 5 years so is included in this BE (Fadley, J., 6 February 1995; personal communication). These species are hereafter referred to as "listed species". The endangered whale species, the bowhead whale, is frequently found within the Beaufort and Chukchi Sea Planning Areas. The bowhead whale migrates through the Beaufort and Chukchi Seas but obtains little food during its migration. Two eider species, the Steller's eider, a Candidate 1 species, and the spectacled eider, a threatened species, can be found within the Beaufort and Chukchi Sea Planning Areas. The delisted Arctic peregrine falcon and both of the above eider species, are found in state waters adjacent to these planning areas.
This document serves as a biological evaluation conducted to identify any potential impacts on federally listed endangered, threatened, or candidate species that could result from reissuance of a NPDES permit, under the Clean Water Act (CWA).

The next section of this document (2.0) describes the abundance, distribution, and critical habitat for endangered or threatened species found in the Chukchi and Beaufort Sea Planning Areas, and adjacent state waters. The following section (3.0) discusses potential adverse impacts associated with oil and gas exploratory activities and assesses the likelihood that impacts will occur. The last section (4.0) assesses the likelihood that exploratory oil and gas drilling discharges will affect the continued existence of any of the identified listed species.

5.2 ABUNDANCE AND DISTRIBUTION OF THREATENED AND ENDANGERED SPECIES

5.2.1 Endangered Whale

The endangered whale species that occur frequently in the Beaufort and Chukchi Seas is the bowhead whale. No listed critical habitats were identified by NMFS and no specific habitats critical to the continued existence of the bowhead have been identified (U.S. DOI 1990, 1991).

The western arctic stock of bowhead whales is estimated to be 7,800 individuals (U.S. DOI 1990, p. III-B-11). This estimate may be about 40% of the historic population level prior to the onset of commercial whaling. Bowhead whales pass through the Beaufort and Chukchi Seas as they migrate between summer feeding grounds located in the Canadian Beaufort Sea and wintering areas in the Bering Sea. Generally, few bowheads are seen in Alaskan waters until the major portion of the migration occurs, typically between mid-September and mid-October (U.S. DOI 1991, p. III-25). The bowhead's northward spring migration appears to be timed with the breakup of the ice, usually beginning in April. The primary migration route generally follows the coast between Smith Bay and Barrow, then is centered roughly 30 km (16 nmi) offshore between Barrow and Wainwright, to about 120 km (65 nmi) offshore northwest of Icy Cape (Moore and Clark 1990, p. 31). Bowhead whales are not likely to frequent coastal waters since they prefer open water (George, C., 16 February 1993, personal communication). Bowhead whales feed throughout the water column on euphausids, mysids, copepods, and amphipods (U.S. DOI 1991, p. III-24). Most feeding occurs in their summer feeding grounds in the Canadian Beaufort Sea. However, bowheads are opportunistic feeders and may feed at any time during their migration route if the conditions are favorable (U.S. EPA 1984, Appendix D; U.S. DOI 1990, pp. III-B-11 - III-B-12; Moore and Clarke 1990, pp. 22-39).

Gray whales have been delisted by the National Marine Fisheries Service (Smith, B. 14 February 1995, personnal communication). This delisting is due in large part to the fact that the eastern Pacific gray whale stock has recovered to, or now exceeds, its size prior to commercial whaling (U.S. DOI 1991, p. III-25). Recent estimates put the population at 21,000 individuals (U.S. DOI 1991, p. III-25). For more information, about the grey whale, the reader is referred to the draft Biological Evaluation for this permit (Tetra Tech, Inc., 1994).

5.2.2 Endangered Birds

The Arctic peregrine falcon, which has recently been delisted but is considered to be a candidate species for this analysis, can be found nesting in tundra areas along the coast, as well as inland. Based on 1988 surveys, the population of Arctic peregrine falcons in Alaska was estimated at 80 pairs and 120 young (U.S. DOI 1990, p. III-B-12). Arctic peregrine falcons are present in Alaska from about mid-April to mid-September and egg-laying on the North Slope begins in the middle of May. The young fledge from about the end of July to mid-August. Although Arctic peregrine falcons have been observed along the coast east of the Colville River, nest sites generally occur about 40 km (21.6 nmi) inland (U.S. DOI 1990, p. III-B-12). Falcon nest sites which have been identified during recent censuses can be considered special habitat. However, no critical habitat for this species was listed by USFWS. In addition, the majority of these nest sites are located well inland of the area of potential oil and gas exploratory activities. Arctic peregrine falcons feed primarily on other birds, including shorebirds, gulls, seabirds, waterfowl, and small land birds (U.S. DOI 1991, p. III-26).

The Alaska breeding population of Steller's eider (*Polysticta stelleri*), a proposed as threatened species (Fadley, J., 6 February 1995; personal communication), nests west of the Colville River to Barrow. They tend to nest on the coast as well as up to 15 miles inland. Barrow, AK is the only remaining place in North America where Steller's eiders are known to breed (Ambrose, S., 24 February 1994, personal communication). The eiders feed on crustaceans (e.g., gammarid amphipods), sea cucumbers, and molluscs (e.g., blue mussels and boring clams) in protected bays (Ebasco

1993, p. 7). During migration, Steller's eiders use coastal lagoon areas such as Kasegaluk Lagoon. Steller's eiders have been observed at Cape Island and on the spit west of Akiliakatat Pass in Kasegaluk Lagoon (U.S. DOI, 1994). Steller's eiders winter along the south side of the Alaska Peninsula and coastal areas in southcentral Alaska (Ibid.).

The spectacled eider (*Somateria fischeri*) was listed as a threatened species on May 10, 1993 (Ambrose, S., 24 February 1994, personal communication). It nests near ponds or meadows and along the coast, primarily across the North Slope from Demarcation Point to Point Hope (North 1990; Kessel 1989, Dau and Kistchinski 1977). The spectacled eider feeds on mollusks, invertebrates, crustaceans and possibly amphipods taken in deeper waters (Kessel 1989). After breeding the eiders leave to molt and winter in unknown locations, possibly in the Chukchi or Bering Seas (U.S. Fish and Wildlife Service 1992b). No specific habitats critical to the continued existence of either eider species have been listed or identified.

5.3 EFFECTS OF PERMITTED DISCHARGES AND OTHER ACTIVITIES ON THREATENED AND ENDANGERED SPECIES

5.3.1 Potential Impacts of Permitted Discharges

Exploratory oil and gas drilling generates a wide range of waste materials related to the drilling process, equipment maintenance, and personnel housing. These materials are commonly discharged directly from the rig into the receiving water. Discharges of primary concern to this evaluation are drilling fluids, also called drilling muds, and cuttings. Drilling muds are the fluids used to lubricate the drill bit and stem and to remove waste rock particles ("cuttings") that are brought up from the hole during the drilling operation.

During a typical drilling operation, the drilling fluids are recirculated. The major components of the mud are mixed on board. These components are fed into mud pits or bins that are then pumped down the central shaft of the drill pipe to the drill bit. At this point, they pass through holes in the bit, pick up rock chips (cuttings) loosened by the bit and return to the surface between the drill pipe and the bore hole. At the surface, the mud and cuttings are passed through a shale shaker, where the cuttings and mud are separated. The cuttings are either saved for analysis or are washed overboard. The mud is returned to the mud pits for recycling. As drilling proceeds, fine clay and colloidal components accumulate and eventually the mud becomes too viscous for further use. When this happens, a portion of the mud is discharged, and water and mud additives are added to the remaining drilling mud to bring concentrations back to proper levels (Menzie 1982). According to U.S. EPA (1985, p. 2-54), discharges occur at intermittent time intervals ranging from less than 1 h/day to 24 h/day, depending on the type of operations and the characteristics of the specific well. Exploratory drilling activities are of relatively short duration (as compared to production activities).

Components of potential concern in drilling muds include trace metals and specialty additives used with generic drilling mud systems. Drilling muds can adversely affect marine life provided exposures are sufficiently long and concentrations sufficiently high. Effects can occur due to chemical toxicity, clogging of feeding or respiratory structures with particulates, smothering, and modifications of habitat. Because drilling discharges are episodic and typically only a few hours in duration (Jones & Stokes 1990, p. 44), organisms that live in the water column are not likely to have long-term exposures to drilling muds.

The most toxicologically important constituents of drilling muds are aromatic compounds and heavy metals. The current NPDES permits for the Chukchi and Beaufort Seas have incorporated a standard acute toxicity test using the mysid *Mysidopsis bahia*. Under these permits, discharge of muds with a LC50 of less (i.e., more toxic) than 30,000 ppm SPP (suspended particulate phase) is prohibited. Drilling mud toxicity data compiled by U.S. EPA, Region 10 (1993) from Alaskan exploratory and production wells indicate that the muds used in all current and recent operations are acutely toxic only to a slight degree to *Mysidopsis bahia*. Only 7 of the 91 tests had a LC50 less than the 30,000 ppm limit.

Overall, larvae and planktonic organisms are apparently the most sensitive to drilling discharges, and effects on them will primarily be a function of dilution and dispersion of the discharge plume. It is unlikely that the chemical toxicity of drilling muds will substantially impact pelagic organisms near exploratory drilling sites because concentrations of toxic constituents are estimated to be below levels known to be acutely lethal at the edge of the 100-m (328 ft) mixing zone. In addition, trace metals in drilling mud discharges from exploratory oil and gas wells are not expected to exceed acute marine water quality criteria and the one organic compound that could be evaluated, naphthalene, was shown to have little potential to exceed marine water quality criteria (Tetra Tech 1994).

Bioaccumulation of heavy metals and petroleum hydrocarbons are two other possible sources of toxicity. Existing data for Alaskan species are limited and quantification of potential long-term effects has not been done. However, the available data suggest that (qualitatively) there appears to be a toxicologically insignificant hazard to aquatic life (e.g., invertebrates, fish, marine mammals, and birds) from consumption of aquatic organisms that have been exposed to discharges from exploratory oil drilling operations (U.S. EPA 1986).

Exploratory drilling solids deposition and accumulation is limited to the immediate discharge area. Studies of actual discharges from gravel islands in the Beaufort lease sale area (Northern Technical Services 1984; 1985) have shown that the area of significant deposition is generally limited to an area within 500 m (1,650 ft) of the discharge site. A worst case analysis predicted by the OOC model of the High Resource Scenario (25 exploratory and 11 delineation wells in the Beaufort Sea and 53 wells in the Chukchi Sea) indicates that approximately 0.001 percent of the lease sale area would receive deposition of drilling muds in amounts thought to have an adverse impact on benthic communities [i.e., 1 cm (0.4 in)] (Tetra Tech 1994, p. 100).

Exploratory oil and gas well drilling activities produce a wide range of waste materials in addition to muds and cuttings that are discharged into receiving waters. These discharges may include sanitary and domestic wastes, desalination unit wastes, boiler blowdown, test fluids, deck drainage, blowout preventer fluids, uncontaminated ballast and bilge water, excess cement slurry, compounds used for equipment and drilling maintenance activities, non-contact cooling water, and fire control system test water. Regulation and potential minimal impacts of these permitted discharges are discussed in the Fact Sheet for the Arctic NPDES General permit for Oil and Gas Exploration. Based on the small quantity of these discharges and the permit limitations imposed on them, it is unlikely that they will impact the marine environment or any listed species.

Endangered or threatened species may be adversely impacted by exploratory oil and gas operations either directly, by the discharged muds and cuttings and other permitted discharges, or indirectly, via impacts to their habitat and food supply (e.g., bioaccumulation of metals from discharge of muds and cuttings). The potential adverse effects of drilling muds and cuttings discharges are of primary concern due to the large volume discharged and the presence of potentially toxic components (e.g., metals) in the discharged muds.

5.3.2 Endangered Whales

The bowhead whale is a seasonal feeder which obtains its food primarily on their summer range. The bowhead whale summer range is in the Canadian Beaufort Sea. Bowhead whales are less reliant on the benthos as a food supply, and would be less likely to consume prey organisms contaminated with discharged muds or cuttings. The consumption of contaminated prey items could result in the bioaccumulation of metals (i.e., cadmium or organic forms of mercury) by the whales, potentially resulting in a variety of toxicological effects. The degree to which food supplies of these whales would be impacted would depend on the area affected and the concentrations of these metals in the discharge.

Based on the limited areal extent of impacts in relation to the total area containing potential prey, the episodic nature of the discharges, the low concentrations of metals in the discharge, and the mobility of whales and their prey, the discharge is not likely to adversely affect the bowhead whale.

It is likely that whales will avoid the activity occurring in the drilling areas and thus avoid contact with benthic prey residing within the more concentrated portions of the plume during discharge. The majority of bowhead whales exposed to recordings of drillship noise in the Beaufort Sea oriented away from the noise source. Noise levels eliciting an avoidance response were estimated to extend 4-11 km (2-6 nmi) from a drillship (Richardson et al. 1990, p. 156).

No specific habitats critical to the existence of the endangered whale species has been identified. Calving for the bowhead is the Bering Sea and occurs outside the area under consideration in this document. Given the mobility of many of the prey species of these whales, feeding habitats are ephemeral and are not usually subject to extensive study. Due to the absence of identified critical habitats in the area proposed for exploratory oil and gas drilling, the potential for adverse impacts to habitat can not be determined definitively. However, it is unlikely that discharges from the limited exploratory activities proposed would adversely impact these feeding habitats.

5.3.3 Endangered Birds

Potential indirect effects to the Arctic peregrine falcon are those that may be transmitted through the food chain (Tetra Tech 1992). The impact on the food chain of the Arctic peregrine falcon is expected to be minimal, since most discharges from exploratory drilling sites in this area would be restricted due to the shallow water depth. Important habitats identified for the delisted Arctic peregrine falcon are nest sites. Nest sites closest to the coast occur about 40 km (25 mi) inland (U.S. DOI 1990, p. III-B-12). The likelihood of permitted discharges from exploratory oil and gas drilling and other activities destroying this important habitat is negligible.

No direct impact from the discharge of exploratory oil and gas drilling muds and cuttings are expected on the Steller's or spectacled eiders. The eiders may be indirectly affected from impacts of the discharge/effluent to their food supply, primarily mollusks and crustaceans. Any adverse impact on the prey species of either eider would be negligible since most exploratory drilling site would be in waters too shallow for allowable discharges of drilling muds and cuttings (Tetra Tech 1992).

Feeding habitats for the endangered or threatened bird species are probably not found at permanent locations. Also, feeding by these bird species typically occurs close to shore, in water depths where discharges are typically restricted. No critical habitats have been listed for either of the eider species. Available information suggests (U.S. DOI 1990; 1991; Tetra Tech 1992; 1994), however, that permitted discharges from oil and gas drilling and other associated activities are unlikely to destroy or adversely modify habitats critical to either eider species.

According to regulations governing the implementation of section 7 of the ESA (50 CFR Part 402), formal consultation is required for any Federal agency action that may affect any federally listed species. The EPA and the FWS have concurred that the proposed general permit will not adversely affect listed species. Events serious enough to cause an adverse effect to the species include the following:

- Discharged muds and cuttings were ingested directly
- Consumption of prey contaminated by drilling muds in numbers sufficient to cause lethality or a decline in reproductive fitness

- Decline in prey populations due to toxic effects of discharged muds and cuttings.

There are no available data on the likelihood of endangered or threatened species directly ingesting discharged muds or cuttings. However, if such discharges were present in the vicinity of the animals' preferred feeding grounds, it is likely that these highly mobile species would avoid the impacted areas. Given the limited areal extent of these effects, and the avoidance of drilling activities by the endangered whale and bird species, it is likely that only a small quantity, if any, of prey contaminated by discharged muds and cuttings could be consumed by any particular individual. The consumption of a small quantity of contaminated prey is not likely to result in lethality or a significant decline in reproductive fitness.

The decline of prey populations due to the discharge of drilling muds and cuttings is not considered likely due to the typically low toxicity of the discharged muds and cuttings (see Section 5.0 of Tetra Tech 1994), and the limited areal extent of the exploratory drilling. It should be noted that although drilling muds do not appear to be highly toxic to *Mysidopsis bahia* (the approved species for toxicity tests on drilling muds), this species has not been identified as a prey item for any of the endangered or threatened species. Available data on the toxicity of drilling muds to other species identified as prey for listed species (e.g., mussels and clams) do not indicate that prey populations would be negatively impacted, even in a localized area, by the toxic effects of drilling muds (see Appendix A).

Other permitted discharges, such as sanitary and domestic waste, are not expected to adversely impact the ocean environment (see Tetra Tech 1994) and thus, do not represent a significant threat to listed species.

Based on the available information pertaining to the theoretical impacts listed above, it is not expected that exploratory oil and gas permitted discharges and related activities will adversely affect any of the listed species discussed in the above sections.

6.0 COMMERCIAL, RECREATIONAL, AND SUBSISTENCE HARVEST

This section describes the commercial, recreational, and subsistence fisheries in the Beaufort and Chukchi Seas, and northern Alaska state coastal waters, and the potential impacts exploratory drilling may have on these activities.

Two major determinants of whether a fishery is viable are the abundance and biomass of the target species. Large populations of marine mammals and birds inhabit the region; however, fish biomass and diversity in both the Beaufort and Chukchi Seas are relatively low (U.S. EPA 1988a, p. 6-1; U.S. DOI 1990; U.S. EPA 1988b, p. 6-1; and U.S. DOI 1991, p. III-23 - III-24, respectively). The abundance and biomass for epibenthic invertebrates appear to be low as well, based on limited-scale bottom trawl survey efforts in the Beaufort and Chukchi Seas (Morris 1981).

Marine mammals are protected under the Marine Mammal Protection Act of 1972 and may not be taken for commercial or sport purposes. They are, however, taken for subsistence purposes, with most being harvested from the Chukchi Sea (U.S. EPA 1988a, p. 6-2).

6.1 COMMERCIAL HARVESTS

According to information supplied in the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a, p. 95), the potential for commercial fisheries in Arctic waters is probably limited to nearshore, localized, small-scale efforts.

6.1.1 Beaufort Sea

No commercial fishery is currently operating within the boundaries of the area of coverage. The only continuous commercial fishery operations on the Alaskan North Slope are operated by a single family (Helmericks) during the summer and fall months in the Colville River Delta, adjacent to the Beaufort Sea Area of Coverage. This operation is discussed in Section 7.1.3.

6.1.2 Chukchi Sea

There are no commercial fisheries in the Chukchi Sea Area of Coverage (U.S. EPA 1988b, p. 6-1). Among the most abundant species in the Chukchi Sea (see Section 4.3.1), the majority are not commercially valuable (e.g., sculpins and eelpouts). Trawl survey results for the Chukchi Sea do not indicate any potential for commercial harvests (Morris 1981, p. 95).

6.1.3 State Waters

The Colville River delta fisheries include two commercial enterprises and subsistence harvests from several villages. The subsistence harvest is discussed in Section 7.2.3. Arctic cisco is the most important resource harvested. This species, along with broad and humpback whitefish, are marketed for human consumption. Least cisco is sold for dog food (U.S. DOI 1990, p. III-B-7). The harvest of Arctic and least cisco varies considerably from year-to-year due to variability in juvenile recruitment, and unpredictable physical factors such as the distribution of saline water in the delta (Moulton et al. 1992).

6.2 RECREATIONAL FISHERY

6.2.1 Beaufort Sea

There are no recreational harvests of marine species within the Beaufort Sea (U.S. DOI 1990, p. III-B-7).

6.2.2 Chukchi Sea

There are no recreational harvests of marine species within the Chukchi Sea (U.S. EPA 1988b, p. 6-1).

6.2.3 State Waters

Only limited sport fishing occurs in state waters. Such fishing is associated with villages, DEW-line stations, and oil camps (U.S. EPA 1984a, p. 102). Arctic char is the main species taken.

6.3 SUBSISTENCE HARVESTS

6.3.1 Beaufort Sea

A description of subsistence-harvest patterns and potential areas impacted by exploratory drilling in the Beaufort Sea is provided in U.S. DOI (1990b, pp. III-C-9 - III-C-22). The subsistence areas and activities of five communities (Wainwright, Barrow, Atqasuk, Nuiqsut, and Kaktovik) are expected to be affected, at least indirectly, by drilling activities in the Beaufort Sea. Most of the marine subsistence harvest areas of Nuiqsut and Kaktovik lie within the Beaufort Sea Area of Coverage boundary. Parts of Atqasuk's and Barrow's marine subsistence harvest areas, especially for bowhead whales and other marine mammals, lie within the area of coverage. Wainwright's marine subsistence area is outside the sale area, but subsistence activities could be impacted by pipelines and other onshore facilities associated with exploratory drilling.

6.3.1.1 Fisheries. All of the marine fisheries subsistence harvest takes place within state waters and is discussed in section 7.3.3 (George, C., 16 February 1993, personal communication).

6.3.1.2 Marine Mammals. Marine mammals supply a substantial proportion of the edible resources harvested by subsistence communities. Data presented in U.S. DOI (1990b, Section 3) indicate that mammal species of major importance to subsistence harvests are the bowhead whale, bearded seal and hair seal; ringed seal, belukha whale, other seals, walrus, and polar bear are also taken. The number of marine mammals harvested each year depends on the availability of the resource. The native population are opportunistic hunters. This tendency, along with natural variability in mammal abundances, leads to variability in the number of individuals taken each year. Harvest estimates for different marine mammal species for 1988 to 1989 are shown in Section III-C of the FEIS for Sale 124 (U.S. DOI 1990).

Residents from Barrow, Kaktovik, and Wainwright are the main harvesters of marine mammals, whereas Nuiqsut residents take few. Barrow is the only community where whaling occurs during both the spring and fall. The majority of the marine mammals harvested occur in the Chukchi Sea, except for bowhead whales, which are also harvested east of Barrow during the fall (U.S. EPA 1988a, p. 6-3), and polar bears. Approximately 40 polar bears per year have been harvested since 1980 by residents in the Beaufort Sea area (U.S. Fish and Wildlife Service 1993, p. 18).

Table 6-3 of the OCS Lease Sale 87 and State Lease Sales 39, 43, and 43a ODCE (U.S. EPA 1984a) summarizes availability of various biological resources to coastal Alaskan native villages of the northeastern Chukchi and Beaufort Seas. Figures III-C-13, III-C-14, III-C-15, III-C-16, and III-C-17 of the FEIS for Sale 124 (U.S. DOI 1990) illustrate the relative seasonal cycles of subsistence resources at the five subsistence communities.

6.3.2 Chukchi Sea

Both of the communities adjacent to the Chukchi Sea -- Point Lay and Point Hope (see Figure 1)--rely extensively on resources harvested within or adjacent to the Chukchi Sea. A description of subsistence-harvest patterns for each community and potential areas impacted by exploratory drilling in the Chukchi Sea is provided in U.S. DOI (1990a, pp. III-42 - III-59). Important species harvested include bowhead whale; belukha whale; bearded, spotted, and ringed seals; walrus; cods; flounders; caribou; and migratory birds. Subsistence harvests occur year-round, with different species being emphasized during different seasons. Detailed examples of idealized subsistence cycles for Point Lay and Point Hope are provided in the final EIS for Sale 126 (U.S. DOI 1991, Section III-C). Several fishes and marine mammals harvested for subsistence are benthic feeders. Exploratory drilling is more likely to have a negative impact on animals associated with the ocean bottom. Therefore, special attention should be given to these animals when evaluating the effects of drilling discharges.

6.3.2.1 Fisheries. All of the marine fisheries subsistence harvest takes place within state waters and is discussed in section 7.3.3 (George, C., 16 February 1993, personal communication).

6.3.2.2 Marine Mammals. Marine mammals supply a substantial proportion of the edible resources harvested by subsistence communities. The bowhead whale is the single most important marine resource to Point Hope, both economically and culturally. Because they migrate too far from shore, bowheads are unavailable to the people of Point Lay (U.S. DOI 1991, p. III-43). In Point Lay, a communal hunt of the belukha whale serves many of the same economic and social purposes that bowhead whaling does for other North Slope communities. Point Hope residents hunt bowheads only during the spring season.

Seals are hunted year-round with each species assuming a greater importance during different seasons. Seals are a preferred food and their skin, particularly that of the bearded seal, is used to cover the whaling boats. Point Lay residents harvest seals, as well as walrus and migratory birds, within the area of coverage. The subsistence harvests of other communities are concentrated adjacent to the area of coverage.

Walrus are hunted by all communities during the summer months. In spite of the walrus' increasing population, the importance of walrus for human consumption has been decreasing (U.S. DOI 1991, p. III-52). In 1991, only 22 walrus were killed by Native residents of Barrow, all north and west of the village. Walrus meat is traditionally used, particularly in Point Lay, for dog food.

The harvest of polar bears has remained relatively constant since 1980. Approximately 85 animals have been taken annually by residents of the Chukchi and Bering Seas (U.S. Fish and Wildlife Service 1993, p. 18).

6.3.3 State Waters

Although the marine subsistence areas of each of the communities described above partially overlap either the Beaufort or Chukchi areas of coverage, the communities themselves are all located adjacent to state waters.

6.3.3.1 Fisheries. A discussion of the subsistence fisheries appears in U.S. DOI (1990b, Section III-C). Both marine and riverine fishes are seasonally important to subsistence communities. The relative importance of fisheries to the annual subsistence harvest varies between communities depending on the availability of other food resources.

Harvested species include burbot, arctic char, Pacific herring, whitefish, flounder, grayling, chum and pink salmon, ling cod, capelin, smelt, saffron cod, capelin, least cisco, sculpin, and trout. Marine fishing is conducted with gill nets, baited hooks, and by jigging. Marine fishes are typically harvested in the summer months. Riverine fishes are harvested primarily during the fall. Smelt and saffron cod may be harvested through the ice during the winter.

The Colville River gill-net fishery is seasonally important to the communities of Colville Village, located in the outer delta of the Colville River, and Nuiqsut, located approximately 75 km upriver (Moulton et al. 1992). The target species for this fishery are Arctic cisco and least cisco. All of the fishing effort from these villages takes place inside the boundary between inland and marine waters.

Among other communities which rely on subsistence harvests from state waters, marine fish represent approximately 11% of the total subsistence harvest by weight from Barrow (Braund 1993).
Whitefish is the primary fish species harvested.

6.3.3.2 Marine Mammals. The large majority of the harvest area for marine mammals occurs outside state waters (George, C., 16 February 1993, personal communication). The discussions of marine mammal subsistence harvest patterns in Sections 7.3.1 and 7.3.2 are largely applicable to state waters as well.

6.3.3.3 Other Wildlife. The caribou is the primary source of meat for all of the subsistence communities on the North Slope. As the possibility of drilling discharges affecting the populations of caribou is very slight, they will not be discussed here.

Migratory birds are harvested in the spring and early summer and are important sources of food at a time when fresh meat is not readily available. Birds are particularly important to the whaling camps even though they are harvested incidentally to other subsistence activities.

6.4 EFFECTS OF DRILLING DISCHARGES ON HARVEST QUANTITY

6.4.1 Beaufort and Chukchi Seas

The subsistence harvest of marine mammals may be affected by exploratory drilling activities if the animals avoid drilling sites or discharge plumes. Richardson et al. (1990, p. 156) observed that bowhead whales in the Beaufort Sea tended to move away from recordings of drillship noise, and that such avoidance responses were estimated to extend 4-11 km from the noise source. The potential impact will depend on drilling rig location and density.

6.4.2 State Waters

Disposal of drilling muds in state waters, via any discharge technique, is not expected to directly interfere with commercial fish harvests in the Colville River delta, subsistence fish harvests, or with the minor recreational harvests that occur in this delta and other nearshore areas (U.S. EPA 1988a, p. 6-4).

6.5 EFFECTS OF DRILLING DISCHARGES ON HARVEST QUALITY

6.5.1 Beaufort and Chukchi Seas

The exploratory drilling operations in the Beaufort and Chukchi Seas are anticipated to have insignificant impacts on the quality of marine mammals harvested, based on the relatively limited volume of wastes discharged, the limited number of exploratory wells to be drilled, the limited areal extent of toxic concentrations in the water column and sediments, and the mobility of harvested species (U.S. EPA 1988a, p. 6-5).

6.5.2 State Waters

The exploratory drilling operations in state waters are not expected to significantly impact the quality of the commercial fish harvest in the Colville River delta, or the subsistence fisheries activities in the communities of the Alaskan north slope.

6.6 SUMMARY

Nearshore locations used for commercial, subsistence and recreational fisheries are predominantly outside areas that could conceivably be impacted by activities conducted during Beaufort Sea and Chukchi Sea exploratory drilling. Exploratory operations within state waters have a higher likelihood of adverse impacts to fisheries, although overall the impact is expected to be minimal.

Mammal subsistence harvesting may be affected to the extent that discharge sites may alter distribution of the animals. However, effects should be insignificant if discharge locations are not in close proximity to each other. The likelihood of significant metal uptake or transference to humans is small due to the limited number of expected discharges, their limited areal extent, and the mobility of potentially exposed species (U.S. EPA 1988a, p. 6-5).

Residues of pollutants accumulated in the marine biota are not expected to pose a significant hazard to people.

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The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Royalty Management Program** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic